

# High-quality education for better sustainability and resiliency

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**Abstract.** The world meets poly crises in climate, pandemic, energy, food, human rights, and migration; hot and cold wars have come in Europe and other regions. The scope of the tasks becomes unprecedented, and their complexity demands high-level skill sets and teaching culture. Education moves into epicentres of the fight for better sustainability and resilience. The United National Sustainable Development Goals Four (SDG4) supposes allocating and diligently using several trillion US dollars for the next decades. The ambitious goals drive the educational system to be at a decent level regarding outcome and process. Saving gratitude to functions of a fundamental human right, a public good, gender equality, and an absolute right to education for all, the author urges that high-quality education is the priority because it will help society to cope with a new level of challenges and even existential threats the climate-like. The article describes the methodology and the importance of soft-hard skills for teaching and learning. The secondary-based sources research illustrates practical results regarding the educational process. The Triple Bottom Line principle (Planet, Profit, People) encompasses many disciplines engaging the main aspects of sustainability and resiliency and climate change for the university curricula in a coherent way. The article considers future trends in high education and case studies connected with the European Green Deal, environmental, social, and governance (ESG) reporting and practical aspects of Green Growth and De-Growth Theory. The Quality of Education reflects the regulator's requirements and social and personal expectations. Life-long learning becomes a norm. The authors consider university products, processes and platforms through the lens of future trends, threats and opportunities. In times of turbulence, the results obtained through students' upskilling and reskilling programs should fit the demands of new jobs, technologies, and financial mechanisms.

## 1. Introduction

The world meets poly crises in many domains: climate, pandemic, energy, food, human rights, and migration; hot and cold wars have come in Europe and are filtering through other regions. The scope of the tasks becomes unprecedented, and its complexity entails high-level skill sets to meet demands.

Sustainability allows pursuing long-term value and raising resilience to turn disruptions into opportunities. Education is the universal recipe for operating in advance and when challenges emerge.

So, the high quality of education moves into epicentres of the fight for better sustainability and resilience. The United National Sustainable Development Goals Four (SDG4) supposes allocating worldwide and diligently using several trillion US dollars for the next decades. The



ambitious goals drive the educational system to be at a decent level regarding outcomes and flexibility of teaching and learning processes.

The EU Green and Tweens transition [1] and Paris Agreement [2] have initiated a paradigm shift from short-term to long-term values to ensure the internalisation of environmental, social, and governance (*ESG*) externalities. The EU Council approved the Corporate Sustainability Reporting Directive (CSRD), marking it as an expansion of the corporate EU [3]. The latter impacts universities and academia to teach the board members and executives managers because non-financial *ESG* reporting has become mandatory for European companies. The same trend also prevails for the world. Under new regulations, large companies will include reporting on climate-related risks and the impact of activities on climate change. Mandatory disclosure comprises direct and indirect greenhouse gas (*GHG*) emissions, *GHG* reduction targets and how the companies plan to implement these goals. Enforcement of the new rule implies sufficient time to implement the new disclosure requirements. It shapes newly sizable requests for universities and academia to create new courses.

United Nations Sustainable Development Goal (*SDG*) [4] addresses *SDG4* as “Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”. That is a heart for the achievement of all seventeen *SDGs*. *SDG4* articulates gratitude to functions of a fundamental human right, a public good, gender equality, and an absolute right to education for all. During the poly-crisis, the author believes that high-quality education is the priority because it will help society cope with new challenges and even existential threats the climate-like.

The hard truth is that the world can slide into a new period of war, poverty and disease. The Russian aggression forced countries like Germany to increase their defence budget significantly, and countries like Sweden introduced military service again. Education, healthcare, and social workers funding will move to tanks, missiles and cybersecurity [5]. However, even today, most transformative digital companies rapidly scale educational platforms reaching millions of learners, companies, and institutions. Life-long learning becomes an avenue to find new roles, skills, and jobs in a time of uncertainty. Graduates and children need to access high-quality education in their lifecycle terms. These two drivers fuel further development.

Society, stakeholders, and students must obtain a spectrum of general, specific, and 'ready to use' knowledge across targeted domains: energy, climate, security, industries, transport, buildings, agro, and healthcare. For example, energy contributes heavily to achieving many *SDGs*. So, raising energy engineering awareness inside curricula becomes a priority. The same ambition applies to science and innovations, policy and industry retention. Capital flow follows government regulation and market signals to pursue the opportunity to achieve growth and scale. Whatever happens, people, enterprises, and institutions need to grow new leaders, employees and researchers. People deserve to get equal access to education for all.

## 2. Methodology

The system and critical thinking, the theory of changes, and social research methods are the methodologies of this work. Provided the social nature of the researched subject, the secondary sources [6] became the distinguish sources for practical examples. The system thinking approach includes classifying objects, elements, links, and tasks as a holistic system by thinking over models [7]. Critical thinking supports open-minded mode [8] and allows researchers to recognise fakes, biases, half-true statements and narratives, and omitted facts. On the one hand, students can learn this discipline in the framework of high-quality studies and training, and its systematic application helps decision-makers to justify the subjects from many angles, on the other hand. For planning and development, the theory of change (ToC) [9] gives an outcome-based concept directed to complete the list of actions with the following evaluation of strategic individual projects and programs. The ToC presented the results of inputs, activities (short-, medium-,

and long-term changes), outputs, outcomes, and intended impacts. The author uses secondary data analysis as long as the primary public data collects sufficient foundation to process high-quality education for better sustainability and resiliency.

Following Elkington, the author of the Triple Bottom Line principle (Planet, People, Profit), this article does not consider the De-Growth theory as “a communistic narrative” [10]. Indeed, there are resource limits for growth in the world [11] Otherwise, some researchers believe that Green Growth for free does not exist [12] because there is no such thing as a “free lunch”. Under some circumstances, brown growth, or sustainability and resilience necessities, could temporarily leave Green Growth and climate agenda behind. For example, it is compulsory during wars. Typically, “the quality of education” (QE) comprises the education system’s characteristics, reflecting the degree of compliance of accurate educational results achieved with regulatory requirements and social and personal expectations. In this article, the concept of “the quality of education” refers to both the result (outcomes) and the process (offline, online, hybrid) of education. The SDG4 functions’ QE’ as a fundamental human right, a public good, gender equality, and an absolute right to get education for all have taken for granted.

Data works for those familiar with model thinking [13] G.E. Pukhov Institute for Modelling in Energy Engineering of NAS of Ukraine carry on a pioneer study of digital resiliency. Among others, the institute is simulating the future of critical infrastructure regarding the Internet and the decentralised electricity market of Ukraine. Behind these studies stand serious mathematics and topology methods [14]. It brings additional opportunities to spread models and methodology across national infrastructure for long-term planning. Such plans can touch not only energy and utilities but, correspondingly, ICT, finance, healthcare, food, water, transport, defence, databases, and manufacturing domains. The ultimate objective aims at increasing the digital resiliency of critical infrastructure. Digital resiliency is “the ability to anticipate, withstand, recover from, and adapt to adverse conditions, stresses, attacks, or compromises on systems that use or are enabled by cyber resources” [15].

Culture, philosophy, and individual mindset usually impact the context of sustainability and resilience in our perceptions. For example, the difference between resilience and anti-fragility defines differently depending on the consideration method. Resilience increases the system’s stability, and anti-fragility targets it to become a different system. From more traditional standpoints, the subjects of resiliency and anti-fragility can overlap or possibly, be congruent. Culture and Philosophy help to translate ethical dilemmas related to the tsunami growth of artificial intelligence (AI), robots, the Internet of things (IoT), digital technology and uncrewed-driving cars and facilities. That is not an accident that the position of Chief Philosophical Officer (CPO) is a subject of discussion in the specialised literature [16]. Is the golden age of philosophy coming again? Behind granular theories and project management guidance, researchers will see better the big picture of technological systems, jobs and education.

### 3. Future skills: main trends

#### 3.1. Future skills, educational process and life-long learning

The Council of Europe Charter on Education for Democratic Citizenship and Human Rights Education has adopted that all learners acquire the knowledge and skills needed to promote sustainable development according to *SDG4.7, Education for sustainable development and global citizenship* [17]. *UNESCO* highlighted the educational system, teaching and learning processes with outcomes as core elements [18]. The educational system, the policy, institutions, regulation, monitoring, improvements, and resources mobilising complies with *SDG4*. Observing plenty of literature entails the “no consensus” on the definition of quality education, and the latter largely depends on the context. With the Sustainability, Resiliency, and Climate Change context, the quality of education addresses both the results, particularly to meet future skills for the labour market, and the education process.

Online education increased share compared with offline and hybrid education. It happened because of *COVID* – 19 and the blossoming of technology: *ICT* – Information and communication technology, *EFA* – Education for all, *DE* – Distance education. An educational institution can capture this opportunity to teach and learn or sometimes in remote mode with the implication of the e-learning process [19]. When we talk about distance learning, we should indicate what we mean. Distance learning involves a particular program, for example, Moodle, with all the necessary theory, practical tasks, control or test tasks, instructions, and other materials. That allows students to learn the material, work out practical cases and check the material's absorption level. Unlike distance, someone began to call remote training “as not in the classroom”, which is not entirely accurate from a methodological point of view. Indeed, personal contacts are hard during the study through Zoom, Google Meet, Teams, and Webex. However, remote or distance learning allows students from different countries to study the subjects and obtain knowledge.

For technology adoption and automation to create productivity growth in Europe, there are three main prognoses where the educational system and the governments have a role to play: 1. Reskilling and upskilling human capital of the people already in their working lives (more than 50% of the total number); 2. Tens of millions of new jobs; for instance, 80 million people have to retrain in heat pump installation. It is a small part of the clean tech sector. 3. Over 50 million jobs could be automated by 2030. There will be a critical need to create new and teach different jobs [20].

Most jobs requiring green skills represent annual growth within 8-20% and are fresh and new: Sustainability Manager, Wind Turbine Technician, Solar Consultant, Ecologist, Environmental Health and Safety Specialist, Compliance Manager, Facilities Manager, and Technical Sales Representative. Below are some examples of trends-evoking skills and prospective jobs to cover up-skill and re-skill deliverables for the trends. The topic of jobs gained and lost resulting in the technology adoption for the years ahead is always hot. Automatisation and AI will have a tremendous impact. Universities have enough work to maintain the transition from the current status of the workforce to the future architecture of skills aligned with the labour markets. Quite logical that new technologies will displace relatively easy automated workers. Occupations that require a combination of hard and soft skills can seek new employees, given that the last jobs for automation are full of social and emotional skills, creativity, and cognitive capacity.

### *3.2. Sustainability, resilience, and climate change*

Poly-crises and climate change have initiated a paradigm shift from short-term to long-term values where non-financial externalities, environmental, social, and governance(ESG) are the unseparated part of any consideration, products, and practices. So, educational institutions can provide adaptation in their curriculums by measuring performance and return, managing operations, marketing, organisational leadership, incentives and governance [3] and dealing with *ESG* issues foreseen familiarity with bio-diversity, human rights, supply chain equality, diversity and inclusion, climate change mitigation and adaptation [21]. As never before, climate change literacy and numeracy come to the fore. A combination of hard and soft skills allows learners to achieve cross-disciplinary objectives, which causes a necessity to obtain emotional and social intelligence skills [22].

Developing sustainability, resiliency, and climate change initiatives with governmental support through *ESG* policy and blended finance will also impact the new technology and critical market infrastructure. That is an argument for why education has to re-educate the *ESG* teams. For instance, the solar *PV* industry creates an additional 1 300 jobs for each gigawatt capacity just for the manufacturing stage [23]. The culture of lecturers and professors increases the ranking of the institutions. Academic honesty and an ability to create new approaches and absorb existing knowledge and International best practices save stakeholder time to achieve

better sustainability and resiliency.

### 3.3. COVID-19: great reset

COVID-19 has taught society to raise awareness of automation and the urgent need to accelerate related processes towards more tech and digital. In 2016, some academics concluded that up to 86% of restaurants, 75% of retail and 59% of entertainment jobs could be automated by 2035 [24] incumbent understanding of digitalisation becomes much more profound and broader. The following justifications regarding trends and cyber-attacks confirm an increasing role of digitalisation, cybersecurity, AI and immersing technology awareness.

Here are selected business trends in 2023 and further years (selected) [25]: 1. E-commerce growth persists post-pandemic; 2. 5G vastly improves data collection and AI capabilities; 3. Employees actively seek out remote and hybrid work; 4. Companies focus on sustainability; 5. Businesses experiment with immersive technologies like augmented reality (AR), virtual reality (VR), and mixed reality (MR); 6. More people become freelancers and entrepreneurs; 7. Innovation impacts last-mile delivery – nearly all businesses suffered supply chain disruptions due to the pandemic; 8. Customers save costs through AI.

An increasing number of cyber-attacks on critical infrastructure, financial, healthcare, and other networked systems negatively impact *ESG*, environment and social justice. Regulators and the insurance industry cannot tackle cybersecurity. The World Economic Forum [26] suggests including cyber risks in *ESG* strategies because of three foundations: 1. It presents a threat to value, particularly intangible assets; 2. It presents a threat to society; 3. Insurance cannot mitigate the risk indefinitely.

### 3.4. Ukraine, rebuilding – a trillion-dollar challenges

Now post-war future of Ukraine is widely discussed in the world. There are plenty of project estimations that it takes hundreds of thousands to even one trillion dollars to rebuild and rehabilitate the country. The private-public-partnership (*PPP*) is one of the most practical ways for upcoming rebuilding [27].

Rebuilding Ukraine could be the biggest Western project since Marshall Plan after *WW2* [28]. It looks like the venture with a long story of massively failed projects: big budgets, huge promises, big teams, and plans reminded documentation of fantasy. Do not forget to mitigate the risks of corruption. Ukraine and the West do not have the experience to manage these vast opportunities and risks. McGrath urges that learning is the only way out of the uncertainty trap.

Following her adopted advice, she did it together with Flyvbjerg and Gardner [29]: 1. Work backwards, starting with the goal; 2. Understand odds. Most big ambitious projects fail; 3. Plan slow, act fast; 4. Lego blocks. Small steps best build big ones; 5. Build the Team; 6. Master the unknown unknowns. Dispel the myth that exact projects are unique; 7. Know that the most significant risk is the human factor.

Standardisation and regulation barriers frequently stand behind advanced practices, so the revision is urgent, especially for industries with a complicated and safety-significant supply chain [30]. It encompasses several technical, scientific, legal, financial, and military areas, professional education and study. The rebuilding plan for Ukraine should cover regulations much beyond the current status.

Not only Ukraine itself but any country and their unions don't have the traction to cope with the magnitude of the rebuilding objective Ukraine is facing. Behind this new chapter in Ukrainian history should stand advanced technologies and innovations such as new generation internet, modelling, AI, IoT, 5/6G, Data, Quantum computing and censoring, ML, DL, blockchain, clouds, and others. Like any sizable or significant transformations, project leaders matchmake academic, educational, and industry within and across countries. In advance, therefore, the government and universities need to look for teachers, researchers, and experts

from industry, academia, and entrepreneurs. That is a relatively frugal solution and sustainable for any country, even though it takes time.

### 3.5. *R&D internalisation, energy system, and new generation of Internet*

When Ukraine is now more into maintaining the energy system operational, the EU countries address thoughts to market design for fulfilling three objectives: fairness, optimal investment, and optimal operation. [31]. It brings us to analyse some specific concepts:

*Overcentralisation vs decentralisation.* A decentralised market model for the resilient energy system comes to the fore for scientists and practitioners because of overcentralised physical energy structure doesn't fit emergency and market needs. The war is a visible driver to zoom into decentralising the electricity, water, and power market models. With the introduction of new technologies, such as wind, storage, smart grids, solar, and prosumerism concept, these new becomes an integral part of a complex energy system, its elements, and interwoven grids.

*Digital Resiliency and New Generation Internet.* Producers and suppliers can exchange their roles, which gives impetus for prosumerism and smart-response and metering development. That is why digitalisation heavily impacts all processes in the electricity and affiliated markets. The flow of reliable data, in combination with nascent next-generation internet technologies, represents the start of the transition to a new norm.

*R&D internalisation.* Due to nations and companies having unequal access to new technologies, developed countries set up different incentives and institutional frameworks. The US Defence Advanced Research Projects Agency (DARPA) [32] is one of the best role models. Another excellent example is Canada's innovation ecosystem where the Mitacs (Monreal) [33] is a catalysing force with focus areas and application domains fitted to future challenges. Mitacs can engage the expertise of universities, academia, and thousands of experts in Canada and worldwide. What is unique, they deal with big names, such as Ericsson, Cisco, and Oracle. The technological giant Ericsson, for example, launched in Canada's Quantum hub to support research [34]. They also onboard people in the team after up-skilling and re-skilling them using the study's 5G and virtual reality technologies. This practice helps the company to design new processes, methodologies, technologies, and new ways of collaboration.

## 4. High-quality education: case-study

### 4.1. *Disciplines and process*

The effective incorporation of sustainability and resiliency concepts and principles through all levels of the education system may pose particular challenges. The global market only for green energy will exceed \$1.1 tn by 2027. Demand for jobs only for sustainability managers will rise 8% annually until 2030, with up to 14 Mio jobs in 2030 [35]. Such hectic demand for educational service couples with the multidisciplinary nature of the sustainability, resiliency and climate change issues. So, regulators, universities and academia also need to adjust their up-skilling and re-spilling program and standards for specific disciplines, generations, and demography. Targeted competencies find their reflection in the scientific and methodological materials of the courses. Moreover, as a rule, competencies do not depend on the form of training: full-time, distance learning or mixed form. The exception is social skills, which require different approaches to their formation in various processes and platforms for learning.

When it comes to distance learning, the regulatory acts sometimes are not aimed at improving the educational process. In particular, it concerns reducing the pedagogical burden of distance learning. It is always happened, for example, in Ukraine before the war. The factors of optimisation of distance learning include the increased role of visualisation of material (theoretical material presented in the form of video lectures, as well as some practical tasks using video and audio files). The pandemic time shows it is unrealistic to insist on this with a minimum of teaching hours, only relying on the teacher's enthusiasm.

Universities play a central role in developing knowledge, including many domains, such as engineering, sciences, architecture, law, management, economics, sociology and even philosophy. They share knowledge and deal with academia, research institutions, government agencies, civil society and the private sector to ensure better employability of students. The extensive range of disciplines and backgrounds requires different approaches, including the main aspects of sustainability, resiliency and climate change, in the curricula coherently.

#### 4.2. *Distinctive curricula*

The distinct requirements arise from the need to address sustainability, resiliency, and climate change. In today's educational landscape, teachers play multifaceted roles, serving as mentors, interpreters of knowledge, and bridges between generations. Their influence significantly impacts students' personalities and values. Therefore, it is crucial for educational curricula to incorporate specific and general knowledge tailored to students' needs, encompassing the following aspects:

1. *Multidisciplinary and system thinking*: A modern education should equip students with the ability to prioritize effectively. In times of peace, addressing climate change might take precedence, while during periods of turmoil, focusing on the sustainability and resilience of territories or sectors becomes crucial. Universities now emphasize teaching critical thinking and problem-solving skills, as well as the theory of change. Learning is indispensable to navigate uncertainty in situations involving mega projects and potential risks, as evidenced by the case of Ukraine.
2. *Integrating culture and philosophy*: The culture of teaching plays a pivotal role in delivering quality education. Teachers not only impart knowledge but also mold students' personalities, instilling values and fostering critical thinking. Academic integrity is gaining prominence, with a growing emphasis on originality and the ability to express one's ideas. Ensuring academic honesty from the early stages of education fosters respect for others' work.
3. *Developing a comprehensive set of skills*: Training programs need to adapt to the evolving demands of the professional world. This includes equipping students with both hard and soft skills, understanding taxonomy, and cultivating effective stakeholder relations. Striking a balance between theory and practice becomes essential. Specific skills in handling data (primary, secondary, and treaty), sustainable finance, innovative financial mechanisms, and ESG (environmental, social, governance) policies are crucial. Additionally, cybersecurity literacy and numeracy are necessary to manage cyber risks effectively. Equipping students with game-changer and mega-project skills, legal knowledge for public-private partnerships, and financial and technological tools for strategic planning and risk management is essential for their future success.

Incorporating these elements into education enables students to be well-prepared for the complexities of a rapidly changing world and to contribute positively to society's sustainable development.

#### 4.3. *Digital learning and EdTech platforms*

The software makes learning more modern and efficient. The pandemic boosted digital and remote learning all around the world. As never before, the Digital Learning and Edtech industry provides equal opportunity and access to education for all. About 150 best EdTech companies [36] reached over three billion people and generated approximately USD 20 billion in revenue. The Digital Learning market is steadily growing by double digits annually.

Zooms, Teams, Webex, Viber, Facebook, and others became survival facilities for most institutions and companies. The author got a first-hand experience as a lecturer at the university. Here are some pros and cons. In particular, Moodle allows a unified presentation of theoretical

material, including video lectures, practical, test tasks, and methodical recommendations, allowing students to navigate more quickly in the material. Moodle presents an ability to process large amounts of information, including test surveys, and place and check different types of work. Professional Zoom allows the host to divide students into small groups, which is evident during the discussion.

Meanwhile, the teacher can visit subgroups and check how the task goes. Overall, both tools help to engage active methods of training. By conducting classes through Zoom, the lecture encounters some advantages and disadvantages. The advantages include good visibility and audibility of the material, which does not constantly occur in the old-school audience. The Zoom drawbacks are the difficulty obtaining quick feedback and the limited ability to lead a lecture-discussion.

All major universities and companies with good financial positions have advanced EdTech platforms. Let us consider the state of the arts regarding EdTech platforms and Digital Learning. For example, the Yale School of Management offers offline study and two online programs: delivered live and cohort-based asynchronous [37]. The Yale School delivers teaching and research dealing with two online certified learning providers 2U/GetSmarter's learning platform offers 24/7 assistance to fit into a busy lifestyle. Short courses typically last for six-eight weeks in a cohort-asynchronous manner to prepare future leaders. ExecOnline is helpful when the school conducts three or six weeks of courses integrated with interactive programmes with short videos.

The top 150 EdTech companies focus on three major sectors: Life-Long Learning, Higher Ed, and K-12 by leveraging technology to increase access and affordability of quality and outcomes for learners. Re-skilling is an adult consumer learning, as the Life-Long Learning workforce represents 42% of all categories. In parallel, EdTech leaders have achieved the highest Return on Education (RoE), having extraordinary growth and traction. Edtech companies include publicly listed digital learning companies Grammarly, Coursera, 2U/GetSmarter, Grand Canyon Education, Kahoot, Docebo, Upwork, ExecOnline, Afya, and Arco [38]. In other words, universities have a wide choice to pick out what is better for their students and teachers, and it is not easy because of financial reasons and technological items.

#### *4.4. Case study*

Some observers have noted signs of distrust in the levels of university qualifications. Ernst & Young, for example, did not find evidence that university success correlates with work performance achievement. It gives life to skills-based or competency-based hiring practices. Many large companies with extensive human resources (HR) departments can assess applicants for their skills in-house. Small and medium-sized companies, however, still rely on qualifications as they do not have the resources to conduct assessments in-house. Public-sector employers and regulated professions are obliged by law to value qualifications [39].

What can help universities and academia to deliver sustainability and resiliency education and increase the level of trust and quality for diplomas and certificates? The sustainability and resiliency skill requirements are highly innovative. The Hart Research Associates found that the critical skills that distinguish innovators most from non-innovators are creativity, critical thinking, and problem-solving. Linguistic patterns as “come up with new ideas and solutions”, the “willingness to question ideas”, the “ability to present ideas in the audience”, “alertness to opportunities”, “analytical thinking”, and “ability to coordinate activities”; and the “ability to acquire new knowledge”, these are actual signs labelled required non-routine skills [40].

Some selected examples illustrated were moving in the primary, secondary, and tertiary educational processes to cope with climate crises and for better sustainability and resiliency. The Harvard Business School [3] has excellent traction as it is also fair for Columbia Business School [41]. The Black Rock has 'In-House' learning and development programmes [42].

Here are the results of our secondary research regarding the expectation of bachelor students regarding education and the future labour market. The Institute of Sociological Research of the Kyiv National Economic University named after Badym Hetman conducted the primary research in 2022 from 25.01 to 05.04. For successful quality assurance in line with the Bologna Process, the institute used an internal and QA system based on proven ICT, online, and mobile technologies:

- (i) *Offline study.* 79.3% of respondents consider themselves satisfied with studying at university students. If chosen by composition, then the most Satisfied with the role of the teacher: defence teacher and student – 86.2%, the level of teaching – 72.4%. The level of satisfaction with the theoretical (58.6%) and practical (55.1%) secondary training. Worst is the situation with students' social and everyday life and assessment of international relations university (35.4%). Yes, for social infrastructure, 34.5% of respondents were satisfied with the logistics use – 41.3% leisure visits, and 44.8% were students. The results demonstrate that the university's ranking largely depends on the culture of lectors and professors.
- (ii) *Online learning.* When considering this synchronous (Zoom, Team, Meet) e-mode or classroom activity (Moodle and others), respondents equally distributed such difficulties, respectively, 51.7% and 55.2%. Answers indicate significant difficulties tackling hardware, computer tools, and communications equipment, and the software – programs themselves are not a subject of complaints. Such difficulties stem from poor communication because of the types of equipment, low bandwidth, or even zero access to the Internet. Such problems relate to financial or technical obstacles for the students and teachers working from their homes. Now the situation has turned from bad to worse because of the Russian invasion of Ukraine. Teaching and learning are almost impossible because of additional mobile connection problems.
- (iii) *Hybrid learning.* Even though the respondents put first place the negative consequences of the “lack of constant access to the Internet”, 34.5% answered emphasised an inconvenient distance learning platform (Moodle, MS Office 365) – 34.%. That is quite likely that the platform does not support the issue. Insufficient training of students and lectures on how to use the platform is the case. 20.7% of the respondents confirmed this opinion.
- (iv) Interestingly, 79.3% of the students agreed that receiving current and controlled tasks is more convenient. Plus, 75.8% rated having more free time as a positive factor because they got additional time avoiding time-extensive travelling to the university, the road and inconvenient schedules (the availability of free time between classes, even an hour and a half), or long breaks between classes. The students are happy to get more flexibility for productive activity and at home, which indicates a necessity to better instruct the platform's users from the teaching and learning side.

## 5. Conclusions

The quality of education reflects the regulator's requirements and social and personal expectations, a fundamental human right to education as a public good based on inclusivity and gender equality. Quality refers to the content and results obtained through students' up-skilling and re-skilling. The process breaks down into offline, online, and hybrid. Universities should set up and hone their educational products, processes and platforms by covering the following items:

- (i) These disciplines' sustainability, resiliency, and climate have come to the global cutting edge in different orders. The culture of teaching and teaching is paramount for the quality of education, and it impacts all human activities, including policy, law, technology, finance, industries, and a mindset of critical and system thinking and problem-solving. That is

why universities must adopt curricula via environmental, social, and governance(ESG) considerations together with hard and soft disciplines.

- (ii) **Prioritisation.** In a time of peace, climate change is the priority. In wartime or turbulence, sustainability or resilience can be a more important priority in the short and medium-term perspective. Under some circumstances, even brown technologies based on fossil fuel and other necessities could temporarily leave Green development behind. For example, during wars or severe energy and food problems, middle and low-income countries sometimes cannot find another choice to survive.
- (iii) **Wars and Education.** The funding for 'classical' education in a time of peace inevitably succumbs to military and cybersecurity arrangements. The curricula, unfortunately, witness an increasing role of the military. However, ongoing digitalisation, cybersecurity, AI and immersing technology awareness still leave the opportunity for further development for denoted professions.
- (iv) **Demand for New Jobs in the labour market:** Reskilling and upskilling human capital are urgent because about 50% of the total work will change; It embraces tens of millions of new jobs; for instance, 80 million people have to retrain only for heat pumps. Over 50 million jobs could be automated by 2030.
- (v) **The proposal to Teach the New Jobs:** educational institutions should provide adaptation in their curriculums regarding transformation for better sustainability and resiliency, measuring performance and return, incentives and green governance.
- (vi) **Quality process of Education.** Options: 1. The up-skill and re-skill programme for students and specialists. Environmental, social, and governance(ESG) are the unseparated part of any consideration today; 2. Online, Offline, Hybrid. Online education increased share compared with offline and hybrid education. Within online, universities have a choice to deliver live or cohort-based programmes. Eventually, educational institutions can capture teaching with the implication of market fit.
- (vii) **Educational Platforms.** For successful quality assurance, conducting research and delivering teaching in line with the Bologna Process, the universities and academia need to have a system based on proven communication technology and access to online and mobile technologies. There are many current proposals from EdTech Platforms where the cost of licences and technical support are the main bottleneck.

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### References

- [1] 2022 European Climate Law URL [https://climate.ec.europa.eu/eu-action/european-green-deal/european-climate-law\\_en](https://climate.ec.europa.eu/eu-action/european-green-deal/european-climate-law_en)
- [2] 2022 Paris Agreement URL [https://climate.ec.europa.eu/eu-action/international-action-climate-change/climate-negotiations/paris-agreement\\_en](https://climate.ec.europa.eu/eu-action/international-action-climate-change/climate-negotiations/paris-agreement_en)
- [3] Galdón C, Haanaes K, Halbheer D, Howard-Grenville J, Goulven K L, Rosenberg M, Tufano P and Whitelaw A 2022 *Harvard Business Review* ISSN 0017-8012 URL <https://hbr.org/2022/02/business-schools-must-do-more-to-address-the-climate-crisis>
- [4] United Nations 2022 Sustainable Development Goals URL <https://www.un.org/en/sustainable-development-goals>
- [5] 2022 ► About – Implementation of Education Quality Assurance system via cooperation of University-Business-Government in HEIs URL <http://web.elth.ucv.ro/eduqas/about/>
- [6] Bryman A, Bell E, Reck J and Fields J 2021 *Social Research Methods* (Oxford University Press) ISBN 9780190853662

- [7] Sterman J D 2000 *Business Dynamics: Systems Thinking and Modeling for a Complex World* (McGraw-Hill Education) URL [https://sa85c2e82e126a3ae.jimcontent.com/download/version/1360070105/module/6264585279/name/%E6%96%87%E5%AD%97BUSINESS\\_DYNAMICS.pdf](https://sa85c2e82e126a3ae.jimcontent.com/download/version/1360070105/module/6264585279/name/%E6%96%87%E5%AD%97BUSINESS_DYNAMICS.pdf)
- [8] Van Damme D and Zahner D (eds) 2022 *Does Higher Education Teach Students to Think Critically?* (Paris: OECD Publishing) URL <https://doi.org/10.1787/cc9fa6aa-en>
- [9] United Nations Development Assistance Framework 2017 UNDAF companion guidance: Theory of change URL <https://unsdg.un.org/resources/theory-change-undaf-companion-guidance>
- [10] Hogan F 2022 Roar Interviews Environmentalist and Author John Elkington URL <https://roarnews.co.uk/2022/roar-interviews-environmentalist-and-author-john-elkington/>
- [11] Raworth K 2017 *Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist* (Chelsea Green Publishing) ISBN 9781603586740
- [12] Triodos Investment Management 2022 Outlook 2023 - Resilience new solutions URL <https://www.triodos-im.com/articles/2022/long-term-outlook---resilience-and-new-solutions>
- [13] Page S E 2018 *The Model Thinker: What You Need to Know to Make Data Work for You* (Basic Books)
- [14] Zubok V Y and Mokhor V V 2021 *Data Recording, Storage & Processing* **23**(1) 48–58 ISSN 1560-9189 URL <https://doi.org/10.35681/1560-9189.2021.23.1.235297>
- [15] Ross R, Pillitteri V, Graubart R, Bodeau D and McQuaid R 2021 Developing Cyber-Resilient Systems: A Systems Security Engineering Approach NIST Special Publication 800-160, Volume 2 Revision 1 National Institute of Standards and Technology Gaithersburg, MD URL <https://doi.org/10.6028/NIST.SP.800-160v2r1>
- [16] Walsh T 2018 *2062: The World that AI Made* (Carlton: La Trobe University Press) ISBN 978-1-76064-051-4
- [17] Council of Europe 2020 4.7 Education for sustainable development and global citizenship URL <https://www.coe.int/en/web/education/4.7-education-for-sustainable-development-and-global-citizenship>
- [18] Global Education Monitoring Report Team 2004 *Education for all: the quality imperative; EFA global monitoring report, 2005* (Paris: UNESCO Publishing) URL <https://unesdoc.unesco.org/ark:/48223/pf0000137333>
- [19] Emanuel A and Gelche N 2020 Distance Learning: A Viable Option *Quality Education* ed Leal Filho W, Azul A M, Brandli L, Özuyar P G and Wall T (Cham: Springer International Publishing) pp 174–184 ISBN 978-3-319-95870-5 URL [https://doi.org/10.1007/978-3-319-95870-5\\_16](https://doi.org/10.1007/978-3-319-95870-5_16)
- [20] Allas T 2022 The future of work and reskilling in Europe. URL <https://www.mckinsey.com/featured-insights/lifting-europes-ambition/videos-and-podcasts/the-future-of-work-and-reskilling-in-europe>
- [21] Smith P 2022 The digitalising of procurement in 2023 – vital, growing and confusing URL <https://www.cips.org/supply-management/opinion/2022/december/the-digitalising-of-procurement-in-2023-vital-growing-and-confusing/>
- [22] Goleman D 2005 *Emotional Intelligence: Why It Can Matter More Than IQ* 10th ed (New York: Random House Publishing Group) ISBN 978-0-553-38371-3 URL <https://www.academia.edu/37329006>
- [23] 2022 Special Report on Solar PV Global Supply Chains Tech. rep. International Energy Agency URL <https://www.iea.org/reports/solar-pv-global-supply-chains>
- [24] Schwab K and Malleret T 2020 *COVID-19: The Great Reset* (Cologne/Geneva: World Economic Forum) ISBN 978-2-940631-12-4 URL <http://reparti.free.fr/schwab2020.pdf>
- [25] Howarth J 2023 9 Top Business Trends (2023 & 2024) URL <https://explodingtopics.com/blog/business-trends>
- [26] Sarnek A and Dolan C 2022 Cybersecurity is an environmental, social and governance issue. Here's why URL <https://www.weforum.org/agenda/2022/03/three-reasons-why-cybersecurity-is-a-critical-component-of-esg/>
- [27] Maksymenko M and Mushka R 2022 Role of PPP in Rebuilding Ukraine URL <https://ukrainianlawfirms.com/reviews/infrastructure/>
- [28] McGrath R 2022 Rebuilding Ukraine: Huge opportunity, huge risks? URL <https://www.ritamcgrath.com/sparks/2022/12/rebuilding-ukraine-huge-opportunity-huge-risks/>
- [29] Flyvbjerg B and Gardner D 2023 *How Big Things Get Done: The Surprising Factors That Determine the Fate of Every Project, from Home Renovations to Space Exploration and Everything In Between* (Signal) ISBN 9780771098437
- [30] Prazian M 2023 *Nuclear and Radiation Safety* (1(97)) 67–70 URL <https://nuclear-journal.com/index.php/journal/article/view/1000>
- [31] Zachmann G and Heusaff C 2023 Phased European Union electricity market reform URL <https://www.bruegel.org/policy-brief/phased-european-union-electricity-market-reform>
- [32] Mazzucato M 2021 *Mission Economy: A Moonshot Guide to Changing Capitalism Hardcover – March 23, 2021* (New York: Harper Business) ISBN 978-0-06-304623-8

- [33] Mitacs 2021 Innovation Futures: From Idea to Impact: Mitacs Strategic Plan 2021 URL [https://www.mitacs.ca/sites/default/files/mitacs\\_strategic\\_plan\\_2021.pdf](https://www.mitacs.ca/sites/default/files/mitacs_strategic_plan_2021.pdf)
- [34] George K 2022 A digital path to sustainability URL <https://www.mckinsey.com/capabilities/operations/our-insights/a-digital-path-to-sustainability>
- [35] Haanaes K 2022 Bridging the sustainability skills gap URL <https://www.imd.org/ibyimd/sustainability/bridging-the-sustainability-skills-gap/>
- [36] Global Silicon Valley 2023 GSV 150 URL <https://www.asugsvsummit.com/gsv-150>
- [37] Yale School of Management 2023 Executive Education URL <https://som.yale.edu/executive-education>
- [38] Argo A 2022 GSV Edtech 150 — The Most Transformational Growth Companies in Digital Learning URL <https://medium.com/gsv-ventures/gsv-edtech-150-the-most-transformational-growth-companies-in-digital-learning-39b6252048e7>
- [39] OECD 2022 *Education at a Glance 2022: OECD Indicators* (Paris: OECD Publishing) URL <https://doi.org/10.1787/3197152b-en>
- [40] Chittum J R, Enke K A E and Finley A P 2022 The Effects of Community-Based and Civic Engagement in Higher Education: What We Know and Questions that Remain Tech. rep. American Association of Colleges and Universities Washington, DC URL <https://www.aacu.org/research/the-effects-of-community-based-engagement-in-higher-education>
- [41] 2013 MS in Sustainability Management | Curriculum URL <https://www.sustainability.ei.columbia.edu/curriculum>
- [42] BlackRock 2022 Learning & Development - Careers URL <https://careers.blackrock.com/life-at-blackrock-2/learning-and-development/>