IRASA International Scientific Conference
SCIENCE, EDUCATION, TECHNOLOGY AND INNOVATION
SETI VI 2024
Book of Proceedings

DOI: `https://doi.org/10.62982/seti06.igjo.20

SUSTAINABILITY EDUCATION IN TRANSPORTATION INFRASTRUCTURE ENGINEERING PROGRAM

Igor Jokanovic[74], Milica Pavic[75]

Abstract

Road and railway engineering are pivotal in advancing transportation infrastructure, integrating civil engineering principles with modern transportation system complexities. This field's research and education are essential for designing, constructing, and managing sustainable transportation networks, which are vital for the efficient movement of goods and people, driving economic growth, and maintaining regional connectivity. However, current engineering curricula often lack comprehensive education on sustainable practices, leaving graduates underprepared for future roles in promoting sustainable development. It is crucial to emphasize sustainable and resilient infrastructure solutions in education, equipping graduates to develop transportation networks that are safe, environmentally friendly, and adaptable. This paper analyzes standard engineering curricula and identifies specific transportation infrastructure courses where sustainability concepts can be integrated with minimal disruption, enhancing the educational framework to better prepare future engineers for sustainability challenges.

Key words: *Transport infrastructure, sustainability, education, curricula, courses.*

Introduction

Sustainability has become a critical topic in global development discourse due to the increasing awareness of environmental degradation, resource depletion, and social inequality. In essence, sustainability refers to the ability to meet present needs without compromising the ability of future generations to meet their own needs. This concept was popularized by the Brundtland Commission in 1987 [1] and is typically viewed as having three core pillars: environmental sustainability, social sustainability, and economic sustainability [2]. Each of these pillars interacts in a dynamic relationship that requires balancing current and future needs across different spheres of human activity.

[74] Associate Professor Igor Jokanović, PhD, University of Novi Sad, Faculty of Civil Engineering Subotica, Subotica, Republic of Serbia, jokanovici@gf.uns.ac.rs
[75] Milica Pavić, MA, Teaching Assistant, University of Novi Sad, Faculty of Civil Engineering Subotica, Subotica, Republic of Serbia, milica@gf.uns.ac.rs

Sustainability is rooted in the recognition that the Earth's resources are finite, and that human activity has long-term effects on ecosystems, communities, and economies. The traditional development paradigm has focused on growth and resource consumption, often at the expense of environmental and social well-being. This model has led to various global challenges, including climate change, loss of biodiversity, pollution, deforestation, and social inequalities.

The environmental dimension of sustainability focuses on maintaining the health of natural ecosystems, ensuring that resource use does not exceed the planet's capacity to regenerate them. This includes the need to reduce greenhouse gas emissions, conserve water and soil, protect biodiversity, and promote renewable energy sources. The social dimension of sustainability, on the other hand, emphasizes human well-being, including equitable access to resources, social justice, and the development of inclusive communities that promote diversity, equity, and human rights. Economic sustainability is about creating economies that can grow and provide prosperity for all without destroying the natural or social systems on which they depend. It seeks to develop business practices that are not only profitable but also responsible toward both people and the planet.

Despite the consensus around the importance of sustainability, there are numerous challenges to implementing sustainable practices globally. One of the most significant barriers is the conflict between short-term economic interests and long-term environmental and social goals. Many industries and governments prioritize immediate economic growth and profitability over the careful management of natural resources, leading to unsustainable practices such as over-extraction of resources, deforestation, and fossil fuel dependence.

Climate change is one of the most critical issues directly linked to unsustainability [3]. The continued reliance on fossil fuels and energy-intensive industries has led to rising global temperatures, more frequent natural disasters, and a myriad of other environmental crises. These challenges highlight the need for a shift toward renewable energy sources, reduced consumption, and the development of resilient infrastructure systems.

Furthermore, social inequality often exacerbates sustainability challenges. Vulnerable populations, especially in developing countries, are disproportionately affected by environmental degradation, lack of access to clean water, food insecurity, and inadequate housing. This highlights the need for a holistic approach to sustainability that addresses not only environmental concerns but also the social and economic factors that contribute to inequality and poverty.

Transportation infrastructure plays a critical role in shaping modern societies. Roads, railways, bridges, and ports form the backbone of economic activities, connecting cities, regions, and countries and enabling the movement of goods and people. However, transportation infrastructure also has significant environmental and social impacts, making it a key area of focus in sustainability efforts.

The connection between sustainability and transportation infrastructure lies in the sector's potential to either contribute to or mitigate environmental degradation [4]. Traditional modes of transportation, particularly those reliant on fossil fuels such as

cars, trucks, and airplanes, are significant contributors to greenhouse gas emissions, air pollution, and energy consumption. Additionally, the construction and maintenance of transportation infrastructure often involve large-scale land use changes, resource extraction, and habitat destruction, further contributing to environmental degradation.

In response to these challenges, there is a growing emphasis on developing sustainable transportation infrastructure that minimizes environmental impact while promoting social and economic well-being [5]. Sustainable transportation systems focus on reducing carbon emissions, enhancing energy efficiency, and promoting the use of renewable energy sources. This includes the transition from fossil-fuel-powered vehicles to electric vehicles, the development of public transportation systems that reduce individual car use, and the integration of cycling and walking infrastructure to promote healthy, low-impact modes of transportation.

Furthermore, the construction of transportation infrastructure itself must be designed and implemented in ways that minimize environmental damage. This includes the use of sustainable materials, energy-efficient construction practices, and careful planning to reduce the impact on natural habitats and biodiversity. Incorporating renewable energy sources, such as solar-powered streetlights or energy-efficient railway systems, can further enhance the sustainability of transportation networks.

Socially, sustainable transportation infrastructure can contribute to reducing inequality by improving access to mobility for all population groups, including those in marginalized or underserved communities. Well-planned public transportation systems can reduce travel costs for low-income populations and provide access to job opportunities, healthcare, and education, thus contributing to social equity and economic growth.

Despite the clear benefits, transitioning to sustainable transportation infrastructure is not without challenges. One of the main barriers is the significant upfront investment required for green infrastructure projects [6]. Electric vehicles, renewable energy systems, and energy-efficient transportation infrastructure often have high initial costs, which can be prohibitive for both governments and private sector actors. However, these costs are often offset by long-term savings through reduced fuel consumption, lower maintenance costs, and improved public health outcomes.

Political and institutional challenges also play a role. Sustainable transportation policies require long-term planning and cooperation between various levels of government, private industry, and civil society. In many cases, there is a lack of political will or coordination to implement sustainable transportation policies effectively, particularly in regions where economic growth is prioritized over environmental sustainability.

Moreover, the success of sustainable transportation systems relies heavily on public behavior. Encouraging individuals to shift from private cars to public transportation or cycling requires not only the availability of infrastructure but also public education and incentives to change habits and preferences [7].

As global priorities increasingly shift toward sustainable development, it is essential that engineering programs evolve to meet the demands of this new paradigm. The

integration of sustainability concepts into the education of future engineers is critical, as these professionals will play a key role in designing and implementing infrastructure that is environmentally, economically, and socially responsible. Transportation infrastructure presents significant opportunities and challenges for sustainability, making it vital for engineering curricula to emphasize these principles. This paper explores the importance of incorporating sustainability education into transportation infrastructure engineering programs, with a specific focus on civil engineering faculties in Serbia. It highlights the need for a systematic approach to teaching sustainability, ensuring that students acquire the knowledge, skills, and ethical perspectives required to design infrastructure that balances the needs of current and future generations. By analyzing the current state of sustainability education in Serbian civil engineering programs, this study aims to identify gaps and propose enhancements that align with international best practices in sustainable engineering for transportation infrastructure.

Current Condition of Transportation Infrastructure Education

Civil engineering programs around the world, including those in Serbia, have traditionally focused on delivering comprehensive technical education in the design, construction, and maintenance of infrastructure. These programs typically cover a broad range of topics, including foundational engineering principles such as structural mechanics, material science, and hydrology, alongside more specialized areas like road and railway construction, bridge design, and geotechnics [8]. These disciplines form the backbone of any civil engineering education and equip students with the technical expertise required to build essential infrastructure systems.

However, despite the growing emphasis on sustainability in global discourse, many civil engineering curricula, particularly those focused on transportation infrastructure, exhibit a notable gap when it comes to integrating sustainability principles into the core of their education [6]. This gap is evident in the limited inclusion of courses or modules that focus on sustainable design practices, environmental impacts, and the long-term implications of infrastructure projects on ecosystems and communities. An analysis of existing curricula in several civil engineering faculties, including those in Serbia, reveals that while topics such as environmental engineering, green building design, and resource management may be covered to some extent, the application of sustainability in transportation infrastructure is often underrepresented.

Transportation infrastructure plays a critical role in economic development, yet it is also one of the sectors most responsible for environmental degradation [4]. Roads, railways, airports, and seaports consume significant amounts of resources, contribute to habitat loss, and generate considerable greenhouse gas emissions. In the face of climate change, resource scarcity, and increasing urbanization, it is no longer feasible to design and construct transportation systems based purely on traditional engineering principles without accounting for their broader environmental and social impacts.

Despite these pressing realities, sustainability-related topics such as carbon reduction strategies, the use of renewable materials, energy efficiency in construction processes, and life cycle assessments (LCA) are often treated as peripheral rather than central to transportation infrastructure education. This limited focus on sustainability creates a significant gap in preparing future engineers for the complexities of modern infrastructure challenges [9]. Engineers entering the workforce without a deep understanding of sustainable practices may inadvertently contribute to the perpetuation of unsustainable systems that fail to address the long-term needs of society and the environment [5].

For example, courses on road and railway design may focus heavily on the technical aspects of alignment geometry design, spatial position, material selection, load-bearing capacities, and traffic flow optimization but fail to address how these infrastructure systems can be designed to minimize environmental harm. Concepts like reducing the carbon footprint of transportation networks, designing for resilience in the face of climate change, or incorporating green infrastructure (e.g., vegetated swales, permeable pavements) into road and rail designs are often omitted from core course offerings.

The omission of sustainability from transportation infrastructure programs has far-reaching consequences [7]. As future engineers, civil engineering students are on the front lines of designing the infrastructure that will shape our cities, economies, and daily lives. Without adequate education in sustainable practices, these engineers may lack the knowledge or skills to incorporate innovative, eco-friendly solutions into their projects. This not only hampers efforts to reduce the environmental impacts of infrastructure but also leaves them ill-prepared to respond to evolving regulations and client demands for sustainable, resilient projects.

Furthermore, the lack of sustainability education undermines the ability of engineers to anticipate and mitigate the social and environmental risks associated with large-scale infrastructure projects. For instance, poorly planned road or railway networks can disrupt ecosystems, displace communities, or contribute to urban sprawl, exacerbating environmental degradation and social inequality. By contrast, an education that integrates sustainability into the transportation engineering curriculum could help future professionals design systems that promote mobility, reduce emissions, and enhance the quality of life for urban and rural populations alike.

Gaps in Sustainability Education for Transportation Infrastructure in Serbia

The civil engineering faculties in Serbia, like those in many other countries, provide a solid foundation in transportation infrastructure, covering essential topics such as road and railway design, structural engineering, and geotechnics. Institutions like the University of Belgrade - Faculty of Civil Engineering [10], University of Novi Sad - Faculty of Technical Sciences [11] and Faculty of Civil Engineering Subotica [12], and University of Niš - Faculty of Civil Engineering and Architecture [13] are recognized

for offering comprehensive programs that equip students with the technical expertise required to plan, design, build, and maintain transportation systems. However, a closer examination of their syllabuses reveals a significant underrepresentation of sustainability concepts, particularly in transportation infrastructure courses.

A review of syllabuses from these institutions indicates that while core technical subjects related to transportation infrastructure are well covered, sustainability-related courses are either optional or embedded superficially within broader topics. For instance, the University of Belgrade's Faculty of Civil Engineering offers limited exposure to sustainability, with only a few elective courses like "Environmental Protection" touching on sustainable practices. However, these courses are not integrated into the mandatory curriculum for transportation infrastructure.

Similarly, at the University of Novi Sad's Faculty of Technical Sciences, courses that focus on transportation infrastructure primarily deal with traditional engineering approaches - material selection, construction methods, and traffic planning - without systematically addressing the environmental impacts of these activities. While the university has made strides in offering programs related to environmental engineering, these are often separate from the core civil engineering courses, leaving a gap in interdisciplinary learning where transportation and sustainability intersect. Interestingly, Faculty of Civil Engineering Subotica offers a mandatory course on "Transportation Infrastructure and Environment" which includes significant portion of sustainability aspects in its syllabus.

The University of Niš Faculty of Civil Engineering and Architecture also presents a similar pattern. While it offers courses that introduce students to environmental management, there is little emphasis on how sustainable design principles can be incorporated into transportation infrastructure projects. Topics such as the life cycle assessment of infrastructure, green transportation technologies, or carbon footprint reduction strategies in road and railway design are rarely discussed in detail.

The primary challenge facing these institutions is the fragmented approach to sustainability education. Rather than being a core, integrated part of transportation engineering curricula, sustainability is often treated as an auxiliary topic, taught in standalone, mostly elective courses. This separation limits the ability of students to see sustainability as a guiding principle in the design and implementation of infrastructure projects.

Another key issue is the lack of interdisciplinary collaboration. Civil engineering students in Serbia typically have limited opportunities to work with students or faculty from environmental science, urban planning, or economics departments. This isolation prevents them from gaining a broader perspective on how transportation systems can be designed not only for efficiency and safety but also to meet long-term environmental and social sustainability goals.

Additionally, there is a notable gap in practical, hands-on experience in sustainable infrastructure development. Many faculties lack partnerships with industries or governmental bodies that prioritize sustainable infrastructure projects. As a result, students have few opportunities to work on real-world projects that challenge them

to apply sustainable design principles. Without this practical experience, they may struggle to translate theoretical knowledge into actionable solutions in their future careers.

Lastly, one of the structural barriers is the absence of updated policies and national standards that mandate the inclusion of sustainability in civil engineering education. Serbia, like many countries in the region, is still in the process of aligning its higher education and professional practices with the European Union's sustainability goals and standards, such as the European Green Deal [14]. Until national curricula are reformed to reflect these broader goals, the gap in sustainability education is likely to persist.

Integrating Sustainability in the Transportation Infrastructure Curriculum

The growing recognition of the importance of sustainability in civil engineering underscores the need for significant reforms in educational curricula [15]. Civil engineering programs must adapt to include sustainability as a central theme, not just an optional topic. This involves integrating sustainability concepts across all aspects of transportation infrastructure education - ensuring that students not only understand the technical specifications of road and railway design but also grasp how these systems can contribute to or mitigate environmental harm.

To bridge the current gap, civil engineering faculties in Serbia and elsewhere must consider revising their curricula to include courses that focus specifically on sustainable transportation systems [16]. These could cover a range of topics, from sustainable materials in construction to green logistics, smart transportation technologies, and the role of policy and regulation in promoting sustainability. Furthermore, interdisciplinary approaches that link civil engineering with environmental science, urban planning, and economics can help students understand the broader context in which infrastructure projects are planned and executed.

Incorporating sustainability into transportation infrastructure education also requires practical learning experiences. Universities should provide students with opportunities to work on real-world projects that emphasize sustainability goals, such as reducing carbon emissions, enhancing energy efficiency, or improving resilience against natural disasters. Collaborative efforts between universities and industry stakeholders, including government agencies, construction companies, and environmental organizations, can provide invaluable learning opportunities that prepare students to meet the challenges of the future.

Sustainability can be integrated into several courses within the transportation infrastructure curriculum. For example, road design and construction courses can include topics on sustainable materials, energy efficiency, and the environmental impacts of construction techniques. Similarly, railway engineering courses can explore ways to reduce emissions and incorporate renewable energy sources into the design and operation of rail systems.

Several countries have successfully integrated sustainability into their civil engineering education. For instance, in Germany, sustainability is a core component of the curriculum, with a strong emphasis on energy-efficient designs and green infrastructure. Similarly, Scandinavian countries incorporate lifecycle assessments and renewable energy considerations in transportation projects, providing examples of how sustainability can be seamlessly integrated into engineering education.

Despite these challenges, there are significant opportunities to close the gap between traditional civil engineering education and the demands of sustainable transportation infrastructure. Serbian faculties can benefit from revising their curricula to make sustainability an integral part of the civil engineering education framework. This could include mandatory courses focused on sustainable infrastructure, interdisciplinary project-based learning, and stronger industry-academia partnerships to give students practical exposure to sustainable design and construction practices. Aligning educational programs with international standards, such as the United Nations Sustainable Development Goals (SDGs) [17], would also help ensure that future engineers are prepared to meet the environmental challenges of tomorrow.

Proposed Educational Framework for Sustainable Transportation Infrastructure Engineering

To meet the growing demand for sustainable solutions in the field of transportation infrastructure, it is critical to integrate sustainability concepts into civil engineering education [15]. This section outlines a comprehensive framework aimed at embedding sustainability throughout transportation infrastructure engineering curricula in Serbian civil engineering faculties. The framework focuses on five key aspects: (i) incorporating sustainability modules in core courses, (ii) introducing new elective courses, (iii) encouraging project-based learning, (iv) collaborating with industry partners, and (v) providing faculty development programs. These elements aim to ensure that future engineers are well-equipped to design and implement infrastructure projects that balance economic growth with environmental stewardship and social responsibility.

Including sustainability modules in core transportation courses

One of the most effective ways to integrate sustainability into engineering education is to incorporate sustainability modules within existing core courses. Many civil engineering programs in Serbia, and globally, offer core courses in road and railway design, traffic engineering, and construction management. However, sustainability is often treated as an afterthought or confined to elective courses that students may not choose to take.

The proposed framework suggests embedding sustainability modules into these core courses, ensuring that every civil engineering student gains a fundamental understanding of how transportation infrastructure can be designed and constructed

in ways that minimize environmental impact and promote long-term resilience [16]. For instance, modules could cover topics such as reducing the carbon footprint of transportation networks, using sustainable materials in road construction, and integrating green infrastructure (such as bioswales or permeable pavements) into urban transportation systems.

By making sustainability an inherent part of core transportation courses, students will be required to think critically about the long-term environmental and social impacts of their designs, rather than treating sustainability as a secondary consideration.

Introducing new elective courses on sustainable transportation engineering

While it is important to integrate sustainability into core courses, the introduction of specialized elective courses on sustainable transportation engineering can provide students with more in-depth knowledge [18]. These elective courses could cover topics such as advanced sustainable transport planning, the use of renewable energy in transportation systems, smart mobility solutions, and sustainable urban transport networks.

For example, a course on "Sustainable Transport Planning" could explore how cities around the world are implementing strategies to reduce traffic congestion, improve public transit systems, and encourage the use of alternative modes of transportation such as cycling and walking. Another course could focus on "Smart Transportation Technologies", examining how innovations like electric vehicles, autonomous systems, and intelligent transport networks can reduce emissions and increase the efficiency of transportation systems.

Introducing these courses as electives would allow students who are particularly interested in sustainability to develop a deeper expertise, positioning them to take on leadership roles in sustainable infrastructure development after graduation.

Encouraging project-based learning with a focus on sustainability

Project-based learning (PBL) is an educational approach that encourages students to apply theoretical knowledge to real-world problems [19]. In the context of sustainable transportation engineering, PBL can be an invaluable tool for fostering innovation and critical thinking. By requiring students to work on projects that challenge them to develop sustainable infrastructure solutions, they gain hands-on experience in applying sustainability concepts.

For example, students could be tasked with redesigning a section of a city's road network to reduce pollution and promote the use of public transportation. Alternatively, they might develop proposals for retrofitting existing railway lines to improve energy efficiency and minimize environmental disruption. These projects not only allow students to put theory into practice but also encourage collaboration, creativity, and problem-solving, all of which are essential skills for addressing the complex challenges of sustainability.

Moreover, interdisciplinary project-based learning could be promoted, where civil engineering students collaborate with peers from environmental science, urban planning, and economics departments to develop comprehensive solutions to sustainable infrastructure problems.

Collaborating with industry partners on real-world infrastructure projects

A critical component of this framework is fostering collaborations between universities and industry partners [20]. Many engineering students in Serbia lack practical exposure to sustainable infrastructure projects, which limits their ability to apply classroom learning in real-world contexts. To address this gap, universities should build partnerships with companies and governmental agencies that are involved in sustainable transportation infrastructure development.

These collaborations could take the form of internships, guest lectures, and joint research projects. For example, companies working on large-scale transportation infrastructure projects could offer students internships where they can observe sustainable practices in action, such as the use of recycled materials or the implementation of green technologies in highway construction. Government agencies could also invite students to participate in the planning and execution of urban transportation projects aimed at reducing carbon emissions or improving the accessibility of public transit.

By working on real-world projects, students would gain invaluable insights into the challenges and opportunities of sustainable infrastructure development, better preparing them for the demands of the professional world.

Providing faculty development programs

The final aspect of the proposed framework is focused on faculty development. For sustainability to be effectively taught in civil engineering programs, it is essential that faculty members themselves are well-versed in sustainability concepts and possess the tools and knowledge needed to integrate these ideas into their teaching.

This can be achieved through targeted faculty development programs. These programs could include workshops on sustainable engineering practices, training on the latest developments in sustainable transportation technologies, and opportunities for faculty to collaborate with industry experts or participate in research projects focused on sustainability. By equipping educators with resources they need to teach sustainability effectively, universities can ensure that students receive a high-quality education that is both technically rigorous and environmentally conscious.

In addition to providing training, universities should encourage faculty members to incorporate sustainability-related research into their work. By conducting research on topics such as carbon reduction strategies in transportation, renewable energy integration, or the environmental impacts of infrastructure development, faculty can contribute to the advancement of sustainable engineering while also enriching their teaching with real-world insights.

Conclusion

In summary, civil engineering programs have successfully equipped students with the technical skills required to design and construct transportation infrastructure. However, there is a significant gap in integrating sustainability into the curriculum. This oversight limits the ability of future engineers to develop environmentally responsible transportation systems capable of addressing the pressing challenges of our time, such as climate change, resource depletion, and social inequality.

Sustainability education is increasingly recognized as a critical component of civil engineering programs, particularly in the context of transportation infrastructure. This paper highlights the current gaps in curricula within Serbian engineering faculties and proposes actionable strategies for integrating sustainability concepts into their offerings. By implementing these strategies, future engineers will be better prepared to design and execute transportation systems that are not only efficient and cost-effective but also environmentally responsible and adaptable to future challenges.

While current curricula typically emphasize technical aspects of transportation infrastructure - including materials, construction techniques, and structural design - there is often insufficient coverage of sustainability practices. Topics such as environmental impact assessments, life-cycle costing, and renewable energy integration receive little attention. This lack of focus leaves graduates unprepared to tackle the environmental challenges that accompany large-scale infrastructure projects.

Incorporating sustainability into civil engineering education is essential for equipping future engineers to meet the complexities of climate change, resource scarcity, and urbanization. The proposed educational framework emphasizes several key components: integrating sustainability into core courses, introducing specialized electives, promoting project-based learning, collaborating with industry partners, and providing faculty development programs. By adopting this comprehensive approach, Serbian civil engineering faculties can ensure that their graduates are not only highly skilled engineers but also responsible stewards of the environment and society.

Ultimately, reforming the education system to prioritize sustainability in transportation infrastructure will better prepare the next generation of engineers. This shift will enable them to create innovative solutions that balance economic growth with environmental stewardship and social well-being, paving the way for a more sustainable future.

References

[1] Our Common Future, World Commission on Environment and Development, Oxford University Press, United Kingdom, 1987

[2] Elkington, J., *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*, New Society Publishers, Gabriola Island, Canada, 1998

[3] IPCC Special Report, Global Warming of 1.5°C, Intergovernmental Panel on Climate Change, 2018 (https://www.ipcc.ch/sr15/, accessed September 15, 2024)
[4] Litman, T., Sustainable Transportation and TDM: Planning that Balances Economic, Social, and Environmental Objectives, Victoria Transport Policy Institute, Victoria, Canada, 2021, available at: https://www.vtpi.org/tdm/tdm67.htm, accessed on: September 15, 2024
[5] Hickman, R., Hall, P., Banister, D., Planning More for Sustainable Mobility, *Journal of Transport Geography*, 33(C), 2013, pp. 210-219, DOI: 10.1016/j.jtrangeo.2013.07.004
[6] Banister, D., The Sustainable Mobility Paradigm, *Transport Policy*, 15(2), 2008, pp. 73-80, DOI: 10.1016/j.tranpol.2007.10.005
[7] Steg, L., Vlek, C., Encouraging Pro-Environmental Behavior: An Integrative Review and Research Agenda, *Journal of Environmental Psychology*, 20(3), 2009, pp. 309-317, DOI: 10.1016/j.jenvp.2008.10.004
[8] Civil Engineering Body of Knowledge: Preparing the Future Civil Engineer, American Society of Civil Engineers, Reston, USA, 2019 (https://www.asce.org/career-growth/cebok, accessed August 25, 2024)
[9] *Sustainability on University Campuses: Learning, Skills Building and Best Practice*, eds. Filho, W.L., Bardi, U., World Sustainability Series, Springer Nature, Switzerland, 2019
[10] Undergraduate and Master Programs in Civil Engieering, University of Belgrade, Faculty of Civil Engineering, Belgrade, available at: https://www.grf.bg.ac.rs/home, accessed on: August 10, 2024
[11] Undergraduate and Master Programs in Civil Engineering, University of Novi Sad, Faculty of Technical Sciences, Novi Sad, available at: https://ftn.uns.ac.rs/, accessed on: August 10, 2024
[12] Undergraduate and Graduate Programs in Civil Engineering, University of Novi Sad, Faculty of Civil Engineering Subotica, Subotica, available at: https://www.gf.uns.ac.rs/, accessed on: August 10, 2024
[13] Undergraduate and Graduate Programs in Civil Engineering, University of Niš, Faculty of Civil Engineering and Architecture, Niš, available at: https://gaf.ni.ac.rs/, accessed on: August 10, 2024
[14] The European Green Deal, European Commission, Brussels, Belgium, 2020, available at: https://ec.europa.eu, accessed on August 30, 2024
[15] Sterling, S., The Future Fit Framework: An Introductory Guide to Teaching and Learning for Sustainability in Higher Education, *Journal of Education for Sustainable Development*, 7(1), 2013, pp. 134-135, DOI: 10.1177/0973408213495614b
[16] Mulder, K.F., Engineering Education in Sustainable Development: Sustainability as a Tool to Open Up the Windows of Engineering Institutions, *Business Strategy and the Environment*, 13(4), 2004, pp. 275-285, DOI: 10.1002/bse.407
[17] Sustainable Development Goals (SDGs), United Nations, New York, USA, available at: https://sdgs.un.org/goals, accessed on August 30, 2024
[18] Fenner, R.A., Ainger, C., Cruickshank, H., Guthrie, P., Embedding Sustainable Development at Cambridge University Engineering Department, *International Journal of Sustainability in Higher Education*, 6(3), 2005, pp. 229-241, DOI: 10.1108/14676370510607205

[19] Dewey, J. *Experience and Education*, Kappa Delta Pi, New York, USA, 1938
[20] Hanieh, A.M.A., Abdelall, S., Krajnik, P., Hasan, A., Industry-Academia Partnership for Sustainable Development in Palestine, Proceedings of 12th Global Conference on Sustainable Manufacturing, Johor Bahru, Malaysia, 2015, pp. 109-114.