TRENDS IN SUSTAINABLE CIRCULAR EDUCATION TRANSFORMATION: A CASE OF FINLAND

Oleksii Sysoiev, PhD, Assoc. Prof.
Lecturer,
Kyiv International University
Kyiv, Ukraine
4998858@gmail.com
https://orcid.org/0000-0001-5899-0244


Abstract. The research presents the case study aimed at in-depth studying of experience of Finland in transition to sustainable circular economy and education. The country is chosen as it has become the first one in taking measures to integrate the Sustainable Development Goals into national economics and education. These two aspects are analysed to seek patterns and determine trends that can be generalised to other countries. The article investigates the current trends in the transition to sustainable circular economy and education in Finland on macro (the EU and the EHEA) and micro levels (participants of the educational process – national government, the labour market and higher education). Particular attention is paid to higher education and the labour market interaction – key actors enhancing decent work and economic growth as well as environmental awareness. Among the trends in higher education, there are the following: introduction of the circular economy principles in education, compliance of training with the goals of circular economy transformation, digitalisation of educational services at all levels of education, higher education modification, the new paradigm of teaching and learning, circulation of knowledge and skills, changing the composition and role of participants in the educational process. Finally, the research results in recommendations to encourage higher education importance in developing a high level of environmental knowledge, environmental awareness and culture among students and society in perspective.

Keywords: circular education; higher education; sustainable circular economy; transformation; trends.

INTRODUCTION

In 2015 the United Nations adopted the Sustainable Development Goals as a universal measure to ensure balanced social, economic and environmental sustainability by 2030. Therefore, environmental sustainability is a core goal of the post-2015 agenda (MDGR, 2015, p. 61). Policymakers believe that the only way to gain this goal is to transit to a new economic model – the circular economy. In this research under “circular economy”, we understand a “sustainable economic system where the economic growth is decoupled from the resources use, through
the reduction and recirculation of natural resources” (Corona et al., 2019). Furthermore, following Velenturf and Purnell (2021), we use the term “sustainable circular economy” that can “contribute positively to most of the sustainable development goals” in case if it fully integrates with sustainable development (Velenturf and Purnell, 2021, p. 1456).

Properly managed, the transition to a circular economy can have strategic advantages at the macro- and micro-economic levels. The circular economy offers significant potential for innovation, employment opportunities, quality of work and, ultimately, a more inclusive economy that serves the needs of all people (GRSPCE, 2020, p. 4). That is why in 2015, the European Commission adopted an action plan to accelerate Europe’s transition to a circular economy, increase global competitiveness, promote sustainable economic growth and create new jobs (FCEAP, 2015). In 2020, the EU developed The EU’s new Circular Economy Action Plan, which is an ambitious plan to build a carbon-neutral economy (COM/2020/98, 2020). This plan has become a vital element of the European Green Deal presented in 2021.

The transition to a sustainable circular economy requires changes in society, the state, the labour market and education. Education is a crucial player in transition because it “must prepare students and learners of all ages to find solutions for the challenges of today and the future” (ESD, 2021), and on the other hand – to train “green” professionals in the circular economy, who should provide sustainable development. That new educational paradigm requires a sustainable circular transformation of education systems, i.e. providing new methodology and even an education model. The situation is more challenging as national education systems are expected to create their unique way of transformation whose valuable experience can contribute to other countries development. For a short time, there is a country pioneer – Finland, which has managed to be the first to gain particular experience in sustainable circular economy and education transformation. Therefore, Finland attracts our attention, as some lessons can be drawn from its successful experience for the last 3–5 years. Thus, our research is focused on revealing trends in sustainable circular education transformation in the case of Finland.

MATERIALS AND METHODS

This research is a case study aimed at the in-depth study of the experience of one EU Member State (Finland) in transition to a sustainable circular economy and education. The country is chosen as it has become the first one in taking measures to integrate the United Nations and the EU sustainable goals into national economics and education. These two aspects are analysed to seek patterns and determine trends that can be generalised to other countries. This type of study is appropriate for the research needs as it allows collecting and analysing various information presented in national and international reports, policy documents, publications, websites, guidelines, educational programs and even MOOCs content available on the Internet. The collected material analysis makes it possible to investigate trends in the transition to sustainable circular economy and education in Finland and generalise results to more countries.

MAIN RESULTS

Finland as a pioneer in sustainable circular economy and education transformation

The EU initiatives and regulations have prompted the EU Member States to move to a circular economy, making Finland the first country. The strengthening of the circular economy market is likely to positively impact the Finnish economy in the long run (Government Resolution on the Strategic Program for Circular Economy, 2021). In Finland, a positive impact
on employment is projected in the consumer electronics, construction and forestry sectors (Gass and Roth, 2019; Bassi and Palaske, 2020). To implement European initiatives, the Finnish Innovation Fund Sitra developed the world’s first national “Finnish road map to a circular economy 2016–2025” in 2016. This plan has become a powerful tool for initiating change and building a solid commitment to the circular economy in Finnish society. As a result, 88% of Finns surveyed in 2021 by the Fund Sitra believe that they can play an essential role in promoting the principles of the circular economy; 82% expect to create new jobs in the circular labour market (Järvinen and Sinervo, 2021). In addition, based on the Finnish experience, the Fund Sitra has developed a guidelines to help the EU Member States create a national action plan for a circular transition (Järvinen and Sinervo, 2020).

Education has played an essential role in promoting the principles of sustainable circular economy in society. The promotion of the circular economy in Finland began in 2015 under the leadership of the Fund Sitra, with the “Circular economy teaching for all levels of education” project that in 2018 covered the entire education system of Finland. The projects focus on implementing circular economy skills and competence in national educational programs (Silvennoinen and Pajunen, 2019). As a result, since 2018, the teaching of circular economy in Finland has implemented at all levels of education, i.e. in secondary, vocational and higher education institutions. Accordingly, the organisation of professional education and training in circular economy is provided in a close relationship of all educational institutions, which is the key to continuing education and lifelong learning, and also helps to meet the students’ needs in obtaining a “green job” (see Fig. 1).

The content of professional education and training in the circular economy is based on the goals and needs of society in terms of economic transformation, which essential features are the principles of consistency and gradual complication of educational information and skills development. That is, the content begins to form from school with gradual complication and final disclosure in the higher education institution (HEI). The competency in the circular economy is developed vertically from the bottom to the top, when in secondary schools, students are taught to understand the environment and the principles of the circular economy, formed worldview and civic qualities in a world of new challenges and opportunities.

In vocational schools, students obtain knowledge and skills, conduct applied research to improve the circular transformation of the selected industry sector. In HEIs, students
develop professional competencies in circular economy that conduct basic or applied research considering the prospects for developing society, science, technology in the sustainable circular transition. It is worth noting, that Finland has developed the most significant amount of educational programs in higher education in the world. Finnish Universities of Applied Sciences and universities provide Bachelor’s, Master’s and PhD programs and courses in the circular economy. Based on successful pilot educational projects, national educators conclude that the circular economy cannot be tied to one discipline or job sector, as its success requires collaboration among different actors. It should be an inter-social economic model needed in various sectors of the economy. Therefore, the teaching of the circular economy should be interdisciplinary and cover different educational fields (Mäkiö and Virta, 2019).

Trends in sustainable circular education transformation in macro-and micro-levels

It is worth noting that the trends in sustainable circular education transformation in Finland closely intersect with global trends in the transition to a circular economy. Therefore, we identify trends in Finland considering global trends, particularly at the macro and micro levels. Following the recent researches (Mospan, 2019, p. 334; Mospan, 2022, p. 119; Sysoieva and Mospan, 2019, p. 80) the macro level is referred to the EU and the EHEA, and the micro-level includes the participants of the educational process and stakeholders benefited from education and training students in the circular economy. They are the state (national government), the labour market (enterprises/companies) and higher education (universities).

There are the following trends in the sustainable circular economy and education transformation at the macro level, particularly at the EU and the EHEA levels.

**Greening of the economy.** Countries worldwide are trying to reduce resource shortages, protect livelihoods and combat climate change. To this end, countries with developed economies are beginning to green their economies, where circular strategies are of paramount importance. Circular economy strategies that go beyond a narrow focus on energy consumption and contribute to resource efficiency can reduce 39% of global emissions. The movement towards a circular economy is accompanied by a decline in capital-intensive and extractive industries and an increase in labour-intensive circular processes, including reuse, reconstruction and repair of goods, and labour market automation (Haigh and Brown, 2021).

**The emergence of new “green jobs”**. New green jobs are emerging to realise the ambitions of greening due to the introduction of new policies, programs and strategies for the transition to a circular economy by governments and enterprises. High labour intensity is provided mainly at the assembly, processing, and reconstruction of goods and materials enterprises. By 2030 the green economy is expected to create 24 million new jobs, while 7 million will be lost (ILO, 2020).

**Digitalisation of industry.** The COVID-19 pandemic has intensified the digitalisation of all sectors of the economy and society as a whole. Experts believe that we have experienced a “turning point in the development of technology” during the lockdowns, which led to the transformation of the usual format of study, work, and life. Businesses and companies have been acutely aware of the rapid transformation of the work format (for example, the emergency transition from office to remote work from home). Digitalisation comes with increasing technological progress to improve resource- and energy-efficient practices to support the transition to a circular economy. The rapid technologies implementation into industry makes basic digital skills and lifelong learning extremely important.

Construction is a crucial sector with the increasing number of digital tools. Current traditional construction works are gradually being transformed through the use of secondary materials and digitalisation. In practice, building information management systems (BIM), 3D printing, blockchain, robotics, machine learning, drones are increasingly used. The
digitalisation of the construction sector contributes to its sustainable circular transformation, as the construction sector accounts for 28% of global emissions (Haigh and Brown, 2021).

*Increasing life expectancy and work.* People all over the world live and work longer. Life expectancy can stimulate new lifelong learning models, which allow employees to improve their skills during their professional careers. In the transition to a circular economy, older workers can offer in-depth knowledge of the economy and society and become a vital resource by reducing the working-age population. The skills of older workers are especially relevant in changing industries and governments through the greening of the economy. The in-depth professional experience and skills of older workers can be a crucial asset. Experienced employees working many years in the industry will have the opportunity to explore new ways to transform the industry into more resource-efficient and sustainable mode and will teach new workers basic skills combined with new ones. An essential prerequisite for this is a well-structured knowledge transfer system as a human resources tool. Experienced professionals are good at supporting knowledge sharing and applying inherited skills (Haigh and Brown, 2021).

*Upskilling is crucial to reduce the skills gap* – the mismatch of qualifications to the labour market requirements. During a rapid transition to the circular economy, promotion of digitalisation, and working life increase, the paradigm of qualifications in the circular labour market is changing, where there will be a demand for workers with transversal skills. The development of transversal skills among workers can increase labour mobility and resilience in the circular labour market (Brown et al., 2021). These skills are becoming increasingly popular with students to successfully adapt to rapidly changeable world and lead meaningful and productive lives.

*The importance of vocational education.* Training and development of job specific skills are essential for unlocking the circular economy’s social, economic, and environmental potential. With proper management of this potential, the transition to a circular economy opens up opportunities for labour markets, emission reductions, and the fight against climate change and resource scarcity. Higher education and vocational education, in particular, are crucial mechanisms for providing the circular labour market with a skilled workforce and for stimulating society’s transition to a circular economy. Vocational education is crucial to stimulate the implementation of circular strategies, promote equality and reduce the skills gap, integrate into the labour market and support large-scale and continuous education and training. In the transition to a circular economy, the vocational education transformation to the circular labour market demands is based on a deep understanding of the key skills needed for circular strategies in different contexts. This understanding can be transmuted into new qualifications, evaluation criteria, and competency frameworks backed by effective policy, funding, leadership, and stakeholder participation (Brown et al., 2021).

There are the following trends in sustainable circular economy transformation at the micro-level, particularly at the level of participants in the educational process (state, labour market/enterprise and higher education).

The tendencies at the state (national government) level include, in particular:

*Leadership in the circular innovations implementation.* Finland has become the first country in the world to recognise the transition to a circular economy as a national strategy. In 2016, the Finnish Innovation Fund Sitra, in collaboration with stakeholders, developed the world’s first national Roadmap for the Circular Economy 2016–2025 and is disseminating this experience internationally. In recent years, various industries in Finland have improved resource efficiency. As a result, the CMU was about 7% in 2018. The modern circular economy accounts for about 5% of Finland’s current GDP (GRSPCE, 2020, p. 2).

*Financing the sustainable development strategy.* The transition to a circular economy at the state level is supported by significant investments by independent organisations and
foundations. For example, Business Finland is funding the Bio and Circular Finland program with € 150 million in 2018–2022. The Finnish Innovation Fund Sitra finances implementing the national Roadmap for the Circular Economy 2016–2025 (GRSPCE, 2020).

**Dissemination of experience in the sustainable circular economy and education transition.** Based on the Finnish experience, The Sitra Found has developed a guidelines to help the EU Member States make the circular transition and develop national plans, which can become a meaningful way to launch new circular economy initiatives (Järvinen and Sinervo, 2020). Moreover, educational resources and materials in circular economy for all levels of education are in free access in the Internet.

**Interaction of higher education, the labour market and government in the educational process** occurs at the national level, where each participant performs specific roles. Higher education, particularly universities of applied sciences, organise innovative projects in circular economy. Students in a multidisciplinary team implement a project that starts with an assignment (problem) and ends with a solution presented to a client. The project involves research, mapping, development and testing, innovation and rapid piloting, Master’s or PhD dissertation, or even the production of goods. The labour market through companies and industrial facilities puts forward requirements for the content and methods of education and training, as well as the competencies in the circular economy; makes an order for an educational product (project); finances projects; directly participates in the educational process and evaluation of project results; employs graduates. The government finances and legalises educational services of universities to train students in a circular economy, develops qualifications frameworks, regulates the higher education interaction with the circular labour market.

The tendencies at the labour market level include, in particular:

**The emergence of a circular labour market.** In Finland, construction, textiles, food production, mining, forestry and electronics are considered promising industries to create new jobs in the transition to a circular economy. In addition, employment is projected to positively impact the consumer electronics and forestry sectors (Bassi and Palaske, 2020; GRSPCE, 2021).

**Employment of students and graduates.** Universities do not guarantee employment to graduates. They only outline the sectors of the economy where the graduate can find a job. However, during the project-based learning in cooperation with the “client” (employers, professionals, government officials, and research organisations), companies can offer students internships or employ promising graduates (Mäkiö and Virta, 2019).

The trends in higher education level include, in particular:

**Implementation of pilot projects in higher education.** The professional education and training in the circular economy started through the implementation of pilot projects in 2017. With the financial support of the Fund Sitra for the “Circular economy teaching for all levels of education”, new subjects in circular economy have been introduced in vocational schools, universities and Universities of Applied Sciences in Finland. Besides, since 2018, professional training in the circular economy has been implemented at all levels of education based on the close connection of secondary, vocational and higher education.

**Introduction of the circular economy principles in education.** Finland and the Netherlands have become the first EU member states to implement the circular economy principles in education. As a result, 38% of HEIs in Finland, and the Netherlands offer courses in the circular economy (CELL, 2019, p. 11). Furthermore, since 2017 Finland has started teaching circular economy at all levels of education, including primary, secondary and vocational schools, universities and Universities of Applied Sciences (Silvennoinen and Pajunen, 2019).

**A strategic priority of the circular economy principles in education** is defined in regulations, particularly in the Finnish Strategic Program for the Circular Economy, adopted in 2021. The program provides for various activities in education, in particular: inclusion of competencies
in the circular economy in the education system and work-life skills; joint anticipation of the need for competence in the circular economy by higher education and the labour market; the circular economy inclusion in curricula, qualification requirements and educational degree; increasing the teaching of circular economy in Finnish schools; encouraging universities and vocational schools to include the circular economy educational programme as a strategic priority; increasing continuing education in the circular economy for teachers; accelerating cooperation, partnerships and research between companies, vocational schools, HEIs, research institutes on the circular economy (GRSPCE, 2021).

The HEIs role in training students in circular economy. As it was mentioned above, higher education in Finland offers a significant amount of educational programs and training courses in circular economy. In addition, the principles of the circular economy have been integrated into lifelong learning. Universities of Applied Sciences in Finland have played an essential role in transforming the circular economy principles into practice.

Training compliance with the sustainable development goals of the circular economy transformation. The education and training goals are to develop competencies in the circular economy and innovative competencies among students. That process starts in the secondary schools, aimed at developing awareness of the importance of the circular economy, acquaintance with its principles and improving skills in mathematics and science as well. The vocational school goal is to study the circular economy tools related to a particular job. Based on the current demands of the circular labour market, Finnish universities provide programmes and courses in the following sectors: machinery and equipment, forestry and paper production, agriculture, retail and restaurant services, construction, and design (OCEF, 2015).

Distance learning is a common mode in the circular economy education and training in Finnish HEIs. Though the traditional face-to-face learning is maintained at the Bachelor's level, where courses are offered in a traditional or distance format. However, Master's programs are designed exclusively for distance learning.

Digitalisation of educational services at all levels of education. The widespread use of ICT and the development of open online learning courses in the circular economy on MOOC platforms is evidence of the gradual digitalisation of education. It is worth noting that educational technologies are widely utilized at all levels of education in Finland, i.e. in schools it is mainly online educational games and online courses, and in higher education – ICT tools are used for teaching-learning and evaluating students’ performance.

Shift in higher education form. Although higher education remains institutional (full-time, part-time, distance), learning based on MOOCs is spreading rapidly. At the university, sessions alternate with workshops in the workplace. It allows students to apply gained knowledge during internships under the guidance of a teacher and a professional in a particular sector of economy. Teamwork is a common form of students interaction in the classroom. Assessing measures include the project or Master’s thesis presentation. However, assessing learning outcomes occurs through different project evaluation strategies without multiple-choice tests or traditional examinations (Mäkiö and Virta, 2019).

Shift in teaching paradigm in HEIs. Teaching circular economy differs from traditional teaching in the classroom, which integrates three teaching methods – interdisciplinary, project-based and vocational approaches. It allows students to develop competence in circular economy and be involved in problem-solving in real working life. Furthermore, the teacher organises the learning process in cooperation with clients of educational services (representatives of business, enterprises, companies, government, professionals) (Mäkiö and Virta, 2019).

Shift in the concept of higher education. Project-based learning is the primary method of organising learning, which involves developing a project or product to client’s order (company,
enterprise, government) by an interdisciplinary team of students. The project-based method aims to develop students’ skills and apply theoretical knowledge of circular economy in project development or product manufacturing. It is a form of education that allows students to actualise professional, industry, and social issues in sustainable circular economy transformation.

Circulation of knowledge and skills occurs through exchanging experience and knowledge between students, teachers, employers, professionals and government officials. For example, during collaboration in team learning (project-based method), students share their knowledge with others, and the knowledge of others (teachers, employers, professionals and government officials) is used in problem-solving while working on the project (Mäkiö and Virta, 2019).

Shift in structure and role of participants in the educational process occurs due to higher education cooperation with the labour market and the state for the training students in the circular economy. The purpose of such cooperation is to retain young people in particular sector of economy and maximise the potential for innovation by sharing knowledge between leading professionals, engineers, trainees and students during their internship in companies. Accordingly, the participants in sustainable circular education are teachers, clients (employers, professionals and government officials, research organisations) and students. Besides traditional teaching functions, the teacher acts as an intermediary between university and the company to train students in the circular economy. Furthermore, the teacher considers the client’s opinion at the stage of project development, his consultation with students and evaluation of their learning results, makes a decision regarding the final assessment together with the client or based on his assessment. Moreover, the client takes an active part in training and performs various organisational, training, consulting and assessing functions. In addition, he orders an educational service (project) and finances its development. Students act as developers of projects or products whose activities are governed by a contract with the client.

DISCUSSION

Based on the revealed trends and considering the recommendations offered by Brown et al. (2021) for key participants in the educational process (the labour market, government and higher education) in bridging the gap in qualifications for the circular labour market, here are outlined promising areas in sustainable circular education transformation.

Cooperation between government, higher education, the labour market, and industry is necessary to train students and achieve specific strategies for greening the economy. Professionals from different sectors of the economy through cooperation with universities, integrate new skills in joint educational programs, consider the demands of the circular labour market, promote a culture of lifelong learning, where employees, managers and team leaders are encouraged for upskilling and continuous professional development in line with innovations and technologies.

Government support of vocational education by providing targeted skills development and opportunities to have access to education and training; funding allocation for vocational education and training; coordinating education interaction with the circular labour market and industry; encouraging representatives of the labour market and higher education to make decisions; determining the leading role of vocational education during the transition to a circular economy in the post-pandemic era.

Improving knowledge of the circular economy and implementing the new skills in interdisciplinary courses. HEIs are expected to provide high-quality vocational education and promote adult learning opportunities in the circular economy.

Creating a new digital tool to combine online learning with on-the-job training will be crucial.
CONCLUSIONS

In conclusion, based on Finnish experience, we would recommend the following actions in education:

1. Teach schoolchildren to take care of the environment near their dwellings and schools, in their towns and cities through ensuring greening activities, i.e. planting and watering bushes and trees.

2. Provide a course in sustainable circular development as an obligatory discipline at universities.

3. Implement a course in teaching sustainable circular development for teacher training.

These principles of sustainable development integrated into countries policies and educational programs are likely to make the planet a greener place, reverse forest degradation and even the loss of environmental resources. Furthermore, they justify the importance of developing sustainable circular competence integrated with “the social, emotional and intercultural competencies throughout the professional development of teachers” (Vršnik Perše et al., 2020). Moreover, these measures might facilitate shaping green awareness among the young generation and training professionals in the sustainable construction of the future. In a bottom line, we believe that Finish experience in transition to sustainable circular economy and education proposes reconceptualization of teaching and learning for achieving sustainable development goals.

REFERENCES


