Bucharest University of Economic Studies

The Faculty of Theoretical and Applied Economics

Economic convergence in European Union

(ECEU)

Paradigm shifts towards the green economy era

19th edition

Bucharest
7-8th of April 2022

Honorary Committee

Nicolae Istudor, professor PhD – Rector, Bucharest University of Economic Studies
Dumitru Miron, professor PhD – President of the University Senate of Bucharest University of Economic Studies
Carlos Ramírez Valdebenito, professor PhD – Universidad de Santiago de Chile
Sorin Nastasia, professor PhD – Southern Illinois University Edwardsville

Scientific Committee

Prof. PhD Mirela Ionela Aceleanu
Prof. PhD Liliana Crăciun
Prof. PhD Daniela Anca Dachin
Prof. PhD Marin Dinu
Prof. PhD Claudiu Grigoraş Doltu
Prof. PhD Horaţiu Dragomirescu
Prof. PhD Monica Dudian
Prof. PhD Basarab Gogoneaţă
Prof. PhD Cătălin Emilian Huidumac Petrescu
Prof. PhD Marius Corneliu Marinaş
Prof. PhD Cosmin Ştefan Marinescu
Prof. PhD Anca Gabriela Molănescu
Prof. PhD. univ. dr. Mihaela Hrisanta Mosora (Dobre)
Prof. PhD Aura Gabriela Socol
Prof. PhD Cristian Socol
Prof. PhD Marta Christina Suciu
Prof. PhD Andreea Claudia Şerban
Prof. PhD George Laurenţiu Şerban-Oprescu
Prof. PhD Liana Badea
Prof. PhD Mina Fanea Ivanovici
Assoc. prof. PhD Alexandru Dumitru Bodislav
Assoc. prof. PhD Alina Ştefania Chenic (Creţu)
Assoc. prof. PhD Amalia Florina Cristescu
Assoc. prof. PhD Alexandra Frățilă (Adam)
Assoc. prof. PhD Laurențiu Gabriel Frâncu
Assoc. prof. PhD Slivia Elena Iacob
Assoc. prof. PhD Ioana Andrada Gavril (Moldovan)
Assoc. prof. PhD Alina Creţu
Assoc. prof. PhD Maria Monica Dobrescu
Assoc. prof. PhD Diana Hristache
Assoc. prof. PhD Dragoş Huru
Assoc. prof. PhD Nicolae Moroianu
Assoc. prof. PhD Liviu Cosmin Mosora

Assoc. prof. PhD Marius Cristian Pană
Assoc. prof. PhD Chiva Marilena Papuc
Assoc. prof. PhD Ioan Grigore Piroşcă
Assoc. prof. PhD Gabriel Ilie Staicu
Assoc. prof. PhD Mihaela Roberta Stanef-Puică
Assoc. prof. PhD Daniela Livia Traşcă
Assoc. prof. PhD Daniela Vîrjan
Assoc. prof. PhD Cristina Voicu
Lecturer PhD Andrei Hrebenciuc
Lecturer PhD Alina Magdalena Manole
Lecturer PhD Roxana Lucia Mihai
Lecturer PhD Irina Florentina Moulin
Lecturer PhD Liviu Cătălin Moraru
Lecturer PhD Anca Maria Paraschiv (Gherman)
Lecturer PhD Raluca Andreea Popa
Asist. PhD Georgiana Balaban
Asist. PhD George Marian Ştefan
Assoc. prof. PhD Sorin Nastasia – Southern Illinois University Edwardsville

Organizing Committee

Grigore Ioan Piroşcă PhD – Bucharest University of Economic Studies, Romania
Dragoş Huru PhD – Bucharest University of Economic Studies, Romania
Liana Badea PhD – Bucharest University of Economic Studies, Romania
Mihaela Roberta Stanef-Puică PhD – Bucharest University of Economic Studies, Romania
Silvia Elena Iacob PhD – Bucharest University of Economic Studies, Romania
Nicolae Moroianu PhD – Bucharest University of Economic Studies, Romania
Mirela Ionela Aceleanu PhD – Bucharest University of Economic Studies, Romania
Alexandru Bodislav, PhD – Bucharest University of Economic Studies, Romania
Dorin Tudora – CEO SC CONPET SA
Radu Budu – Founding member and President of ASEAC
Rares Mihai Nitu – Founding member and Vicepresident of ASEAC

Partners

Theoretical and Applied Economics
Volume XXIX, Special Issue/2022, Summer

Contents

Parallel session – Economics and Business

Parallel session – Economic Doctrines and Business Communication

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 7-16

Electric vehicle: problem or opportunity in the future?

Elena-Iulia CHITA
Bucharest University of Economic Studies, Romania
iulia_elena95@yahoo.com
Silvia DUMITRESCU-POPA
Bucharest University of Economic Studies, Romania
silviapopa997@gmail.com
Mihnea PANAIT
Bucharest University of Economic Studies, Romania
mihnea.panait08@gmail.com

Abstract. *The problem facing cities around the world Europe's climate change, pollution and noise emissions are vital. European and national government policies and objectives set increasingly stringent environmental standards, which are the responsibility of local and regional authorities. The transport sector is one of the biggest contributors to this problem, while the real and efficient functioning of cities is essential. Electro-mobility and electric vehicles provide a major opportunity to resolve the negative effects associated with internal combustion engines without constraining the vital role that vehicles play. Manufacturers, providers of mobility utilities and services, information and communication technology companies, and others are responding to these challenges with innovative models that reflect the need to look for the value chain to develop business models. In this sense, we can develop partnerships, and local authorities can play an active role and facilitate these relationships to support these business models.*

Keywords: problem, opportunity, investment, policies, sustainability.

JEL Classification: O33, Q51, R11.

Introduction

The car is, in essence, the biggest technological invention a man can own. As cars evolved, automotive engineers around the world continued to put more and more technology on them. Nowadays - are one of the most appreciated means of transport, due to the long list of advantages they offer. In addition to comfort and speed, cars often prove to be true collectibles in the garage of those who know how to appreciate this four-wheeled vehicle. Whoever buys a car today will probably use it for five to seven years, until new models appear. Updating the system will ensure new features and security features, as we are accustomed today from smartphones and laptops. The car of the future will be electrically powered, connected to the Internet and "smart" about automated driving. Last but not least, the various Share-Mobility platforms require additional software features.

On the other hand, vehicle sales continue to rise despite efforts to promote the use of greener means of transport. The planet needs it, but sometimes it is not possible to fulfill it. Vehicle pollution is dangerous and harmful to the atmosphere. In addition, CO_2 emissions reduce the quality of the air we breathe; and it will worsen the air our children breathe in the future. With this proposal we can teach our children about the importance of caring for the planet and not only that; we can teach them to use different types of public transportation, which will be useful when they need it.

Automotive industry and sustainability

Ecological economics is a field of economics that defines a set of concrete problems or challenges related to governing economic activity promoting human well-being, sustainability, and justice. Its roots can be traced back to the concerns of Thomas Malthus over the growing population and John Stuart Mill's desirability of a stationary state.

There are three interrelated goals that ecological economics stands for: *sustainable scale, fair distribution*, and *efficient allocation* of the resources. All three goals contribute to human well-being and sustainability. Distribution has many different impacts, not the least of which is its impact on social capital and on quality of life. (European Society for Ecological Economics)

Green energy stands for all the clean sources of power that are generated by using natural regenerable sources of energy available on the planet, mainly including biomass, solar power, wind power, hydropower, and geothermal energy (Bhowmik et al., 2017).

Europe has the fastest growth and the highest proportion in the utilization of green energy vehicles because of its slower economic development and stricter environmental protection systems. In recent years, the investigations of solar energy utilization (Lewis and Nocera, 2006), biomass conversion (Gallezot, 2012), CO_2 emissions (Qin et al., 2020), green building (Zhao et al., 2019), low carbon roadmap (Ma et al., 2020), and energy policy have developed rapidly. This development and progress was dictated by policies and regulations.

Popular vehicle fuels

Hydrogen powered vehicles are also called fuel-cell vehicles, and they run on hydrogen or ethanol. Hydrogen acts like gasoline and diesel, the only residues that result from combustion are water vapours.

The biggest obstacle to these cars is hydrogen itself. This is an element that is not found in the free state, but only in compounds. It can be extracted by thermochemical methods from natural gas, by thermolysis from biogas obtained by rotting waste or by electrolysis of water.

All are very expensive methods. The whole system of a hydrogen car is extremely expensive, and the installation involves some risks, given that hydrogen, in its pure state, is highly flammable.

These powertrains used in hydrogen vehicles, do not emit harmful gases to the atmosphere through any tailpipe, but it's very important to determine the amount of electricity that was consumpted (indirect GHG emissions source) of the following necessary processes:

- Charging the plug-in battery through an electric grid.
- Producing and pressurizing hydrogen to be stored in tanks. (Fernandez and Perez-Davila, 2022)

Hydrogen is not a new fuel used for transportation. Its use, however, has been more experimental throughout history.

Hydrogen was used only because it was a lighter gas than air. It was not until the 20th century that he used it for his immense energy power. Hydrogen was used for propulsion in 1937 when used to build a jet plane, HeS1. Then, when it was necessary to lift massive rockets into outer space.

A hydrogen car is a very complex system that is not cheap. There are only a few manufacturers that have ventured into a hydrogen series car product, and the clientele is more eccentric than greedy for green energy.

Lithium, "the coal of the 21st century"

Discovered in 1817 by the Swedish chemist Johan August Arfwedson, lithium is one of the three elements synthesised during the Big Bang along with hydrogen and helium.

Lithium and its compounds have several applications, such as heat-resistant glass and ceramics, lithium grease lubricants, flux additives for iron, steel and aluminium production, and the most used are lithium batteries and lithium-ion (known as Li-Ion) batteries. These uses consume more than three-quarters of lithium world production.

Li-ion batteries offer many benefits, such as good efficiency, reasonable life cycle, virtually no maintenance, low self-discharge, little or no memory effect. Li-ion batteries are still quite expensive and need a smart charger to avoid damaging individual cells, because Li-ion batteries can catch fire under certain conditions, as is sometimes the case with cell phone batteries or other devices. There are several types of Lithium-ion batteries, the most efficient and most secure being the Lithium-ion-polymer systems.

The main problem facing the production of lithium-ion batteries is the cost and access to lithium itself. Indeed, as lithium batteries are produced on an ever-increasing scale and for increasing capacities, the amount of lithium (and cobalt when used in the same cell) needed to meet demand is increasing. Already, more than 25% of the lithium produced worldwide is used for small batteries used in electronic devices such as laptops and mobile phones. Lithium demand for electric vehicles is even higher and if Lithium-ion batteries are widely used to store the energy produced in photovoltaic and wind power plants, obtaining this metal in sufficient quantity can become a significant problem.

Most of the production of Li, in the form of lithium carbonate (Li_2CO_3) comes from brine (30-50% cheaper and less polluting than from rocks, obtaining it from seawater is still too expensive to be commercially viable). More than 70% of the world's lithium-containing ore deposits are in South America: Chile (7.5 Million tons, 1500-2700 mg/liter), Bolivia (9 Million tons, 530 mg/liter) and Argentina (2.6 Million tons, 400-700 mg/liter) are the main producers of Li_2CO_3.

There is ongoing research on the development of lithium extraction technology from seawater at an acceptable cost.

John Goodenough is the Nobel Prize winner from 2019 in Chemistry for developing this technology for lithium to be used in batteries as we know today. He also called lithium the "coal of the 21st century" because in this rhythm of extraction there could be a rapid depletion of global resources.

Electric vehicle: advantage or disadvantage?

Any vehicle which is powered by an electric motor (either exclusively or assisted by an internal combustion engine) and which is fully or partially powered by a battery may be classified as an electric car. Although some variants are called "hybrids", still having some CO_2 emissions, these vehicles are, at least statistically, cleaner than the classic "ICE" (Internal Combustion Engine).

The history of electric vehicles (we will not call them cars yet) begins in 1828. The Hungarian inventor Ányos Jedlik is the one who made an electromagnetic device that he attached to a small vehicle. Four years later, the Scottish inventor Robert Anderson introduced the first electric carriage, a vehicle ready to change the perception of mankind in those years about transportation. An important moment on the road to the development of electric cars took place in 1859, when the French physicist Gaston Plane invented the rechargeable lead-acid battery.

In Europe, the first electric production car was made by the British Thomas Parker in 1884, and 6 years later, the Scotsman William Morrison introduced a similar vehicle in America. In the United States, the electric car is received with public interest, and historians say that at the beginning of the last century a third of the cars that operated across the ocean were electric.

The glory years of electric cars were at the beginning of the last century. But that's when a major transformation took place: Henry Ford developed mobile assembly lines designed for mass production and launched Model T, the most popular model of those years. The lower price and faster production were Ford's arguments in favour of cars with combustion engines. With the introduction of the electric starter and the fall in fuel prices, cars with internal combustion engines have become more and more attractive and have taken over the market.

The road network was growing more and more, and the public wanted cars that would run at a higher speed, have better autonomy and require as little time as possible for power. And all these requirements were already quickly listed in the list of cars with internal combustion engines. The public turned their attention to these cars, and the manufacturers listened to the market and put aside the cluttered files of electric vehicles. In the 1970's, manufacturers began experimenting with battery and electric motor technology again. Concepts and vehicles produced exclusively for tests or various campaigns appear, but no one really dares to focus on electrical technology. Although the last century seemed to end in an unhappy way for electric cars, the impetus comes from the giant General Motors.

In 1996, GM introduced the EV1, the first standard electric model of the new era. Developed from the beginning as an electric model (and not made on an existing technical platform), the EV1 was only available through a lease. Just over 1,000 units were produced, with assembly shut down in 1999.

Changing emissions standards, major investments in technology development and the company's concern for the environment were some of the important criteria that brought electric cars back to market.

What are the advantages and disadvantages of the electric car?

First of all, an electric or semi-electric motor will offer a financial advantage from the start because the fuel consumption will be substantially reduced. An electric car is also exempt from paying the annual tax, while a hybrid car benefits from its significant reductions.

Secondly, an electric car provides all the power you would reasonably need.

The third advantage is that electric cars can reduce the impact of pollution on the environment. Whether we are talking about pure or hybrid electrics, CO_2 emissions are very low compared to ICE engines. In the long run, this will materialize in cleaner air, and pollution-related diseases will be reduced or neutralized. Given the uncertainty of conventional engine legislation and traffic restrictions in many major cities around the world, an electric car seems to be the safest investment in the medium and long term.

Of course, in Romania the number of electric cars is very small, and this fact brings with it a series of disadvantages:

The infrastructure of charging stations is growing, the phenomenon of "range anxiety", not being as pronounced as in the past. However, the fast charging time is at least 30 minutes. Thus, a trip must be planned in advance and depending on the distance travelled, it must

take into account the vicinity of the loading facilities. Also, for some it can be quite annoying to park for 30-40 minutes, knowing how easy and fast it is to power a conventional vehicle.

Any consumer in the car will reduce its autonomy. The air conditioning system, heated seats and even the radio will directly reduce the percentage of the battery and, implicitly, the possible travel distance. It is also worth mentioning that although there are electric cars, the consumption in the urban environment will increase. Repeated starts and stops, cooling and heating of the passenger compartment, as well as parking in bar-to-bar traffic, will reduce the capacity of the battery. In the case of HEV or MHEV machines, these effects are less annoying due to the heat engine.

The purchase price of an electric car is still much higher than a car with a heat engine. Of course there are some exceptions, but in most cases we are talking about differences of over 10,000 euros in the case of identical models but with a different running gear (for example VW Golf vs VW e-Golf).

Prices, investments: past, present, future.

Electric cars are more and more present in our lives: they are intensely debated topics on social platforms, you can admire them in showrooms, when, until a few years ago, they were seen by the field of the future. The Romanian electric car market gathers in 2022 over 30 representatives: from small hatchbacks to large premium SUVs, from Dacia Spring to the luxurious BMW iX and Mercedes EQS.

Currently, there is an increase that is not only due to subsidies from the state, but also to the supply of builders.

The European authorities are allocating hundreds of millions of euros a year for the development of electric cars and the infrastructure needed to operate them.

There are already plans to ban the sale of new diesel and petrol vehicles by 2040, which will undoubtedly be a new chapter in the history of motor vehicles. In just a few decades, the internal combustion engine could disappear from the roads, replaced by battery-powered electric cars. One of the objectives is to limit the level of nitrogen oxides in the atmosphere, which is considered to be a major risk to public health.

The Romanian government has devised a program whose objective is the non-reimbursable financing from the Environmental Fund, granted in the form of scrapping premium, for the purchase of new, less polluting vehicles, in exchange for handing over used vehicles for scrapping. Its purpose is to improve the quality of the environment.

All these changes will put more emphasis on battery technology in the next few years, as carmakers try to develop electric vehicles with as long a range as possible.

As new players appear on the market, the industry continues on its path to innovation. If you take into account the investments in shares in the sector of electric car manufacturers, there are some aspects that are important to know:

- The political and economic context related to the global growth of green companies.
- Factors that determine the sale of electric cars.
- Market challenges.
- Potential investment risks.

However, there are some challenges that the market faces and that are good to know, whether you are thinking of buying an electric car, or you are considering the option of investing in shares of EV companies.

The costs

One of the main factors limiting the widespread adoption of EVs is costs. According to a report provided by Visual Capitalist, 63% of consumers say that the price of electric cars is currently below their budget, and the maximum amount they would be willing to give for an electric car is $ 36,000 (these data reflect the situation from the countries included in the survey: China, France, Germany, India, Japan, Norway, UK, USA).

Electric vehicle charging infrastructure

According to a McKinsey report, between $ 110 billion and $ 180 billion must be invested between 2020 and 2030 to meet the global need for electric charging stations.

In addition, to make charging stations more accessible, it is necessary that the efforts of several entities be brought together, from architects and designers to suppliers of electrical equipment.

Charging time

The speed of charging the electric vehicle is a factor that strongly influences the consumer's purchasing decision. The time required to charge an electric car varies from 30 minutes to 12 hours, depending on the size of the battery, but also on the speed of the charging point.

Car manufacturers are trying to find solutions for recharging batteries as quickly as possible. Fortunately, state-of-the-art systems are able to fully charge an electric vehicle in just 20 minutes, and they are slowly becoming available worldwide.

Investors eager to take advantage of the potential opportunities to increase the production of electric cars must keep in mind that investing in new technologies also presents risks. It is impossible to predict with absolute certainty which of the new developments will be successful and will provide returns to investors. But the potential is huge. Technology is usually a highly cyclical sector that is sensitive to business cycle ups and downs, which can lead to stock price volatility. Unpredictable regulatory changes can also pose a risk to companies.

Investors can invest directly by purchasing shares in companies that manufacture electric cars, such as those mentioned above, but there are other options and alternatives.

Plug Power (#PLUG) manufactures batteries with hydrogen fuel cells used in the electrical machinery industry and many other types of electronic equipment. These batteries can replace lead-acid batteries with lead-acid batteries. Plug Power batteries are also used outside the automotive industry, giving the company a large market.

Sociedad Quimica y Minera (#SQM) is a major supplier of lithium, an element used in many batteries that power electric cars, but also in the area of renewable energy or recycling. Investments in companies such as the ones mentioned above offer exposure to the potential growth of the electric car market, while maintaining various operations outside the automotive industry.

An alternative to the individual actions of companies producing electrical machines or components, which offer a further diversification of risk and portfolio is to choose an investment fund, such as ETFs that monitor the performance of a fund, an industry or even of a sub-sector.

An indirect way of exposing oneself to the growth of the electric car market is to consider funds for natural resources, which could benefit from the growing demand for metals used in the production of batteries for electric cars. Some of the best-known funds in the natural resources sector include FlexShares Global Upstream Natural Resources Index Fund ETF (#GUNR), SPDR S&P Global Natural Resources ETF (#GUN) or iShares North American Natural Resources ETF (#IGEUS), which can be monitored and traded directly from the MetaTrader 5 platform. For example, some of these funds may be held by companies involved in lithium exploration, which is a key element in the production of electric or copper car batteries. According to Reuters, the increase in the number of electric cars will increase the demand for lithium and copper up to 9 times in the next 10 years. Global X Lithium & Battery Tech ETF (#LIT) invests in the entire cycle, from metal mining and refining to battery production. The largest holdings of this fund are FMC Corporation, Avalon Rare Metals Incorporated and Rockwood.

The European Union's plan to increase the number of electric cars in the next decade requires investments of 80 billion euros in charging infrastructure. However, these investments would make a substantial contribution to the Community's efforts to reduce greenhouse gas emissions, given that less than one million such vehicles are currently on the continent's roads, powered by about 250 thousand charging points.

The European Union aims to have at least 30 million zero-emission vehicles on the road by 2030, and Eurelectric estimates that the number of points at which these cars can be loaded should, in turn, increase exponentially and reach the figure of 3 million.

In other words, the report of the European organization that brings together companies in the field and national electricity associations also shows that the expansion of public charging infrastructure would cost around 20 billion euros, and the remaining 60 would represent the costs for private stations. In Romania, according to the latest data set of the Association of European Car Manufacturers, the number of charging stations does not exceed 450.

The critical need to substantially accelerate the installation of power infrastructure in line with the adoption of electric vehicles will require large-scale collaboration between municipal authorities, national authorities, town planners, charging point operators, eMobility service providers, car manufacturers and system operators' distribution.

Last year's total investments in low-carbon energy have increased, including projects such as renewables, stationary energy storage, hydrogen production, EV charging, CCS, nuclear and sustainable materials. The most remarkable region that was the largest regarding the investment has been ASIA PACIFIC, followed by EMEA and AMER (as it is showing from the figures below). From the countries the most remarkable is China, the largest global emitter of greenhouse gasses. It benefits from significant amounts of wind energy, thanks to government subsidies to promote and increase the use of green energy.

Romania is one of a few countries that has a lower GHG emissions per capita in the European Union (EU), but it ranks among the first places when those same indicators are compared to the GDP size. The main sector that is causing air pollution still remains the energy sector, that is generating 30% of the total GHG emissions, including here wastewater and waste generation. It is to mention that the agricultural sector generates 17% of total GHG emissions, and the transport sector 16.6%, which is under the EU average. The high values of GHG emissions in the energy sector are determined by the energy production which is largely based on the usage of coal. Energy produced by coal is used by heavy industry and energy-intensive manufacturing.

Conclusions

The main driving force behind the change will be given by global climate change activists, with new requirements for carmakers to reduce CO_2 emissions. Responding to the challenges posed by climate change will be, on the one hand, rapid progress in the car market and, on the other hand, customers' use of new mobility models (e.g. car-sharing and mobile services). Simply, in the future, public demand for cars could look like this: more passengers to be transported with fewer cars, with minimal CO_2 emissions. Researchers believe that steel will continue to play an important role in this model as before.

Every year new gadgets and functions appear, for the already existing ones. The future is announced to be quite computerized, the role of man in the production processes will decrease significantly. Cars have been a center of interest for the population for some time, their usefulness placing them at the top of the hierarchy of necessities in a person's life. Their number, but also the performance and comfort offered by cars, are increasing. The demand for more and better in this field has pushed car manufacturers to develop the automated construction process and reduce the importance of human involvement, until the complete elimination from the production process.

The solution of electric vehicles is irreversible and is approaching with much faster steps. Green cars – this includes, in addition to EV and plug-in hybrid, hybrids of all kinds, extended range, Ethanol, LPG and CNG – have substantially "multiplied" to the detriment of cars with classic ICE propulsion. That diesel is in constant decline is nothing new, but for the first time, the market share of petrol has fallen below 50% in the EU! EV and Plug-in cars reached almost 10% and hybrids rose to almost 13%. At this rate, in 2021 all green cars will reach 30%, a share unimaginable even at the beginning of this year when the pandemic broke out in Europe. More and more countries are starting to make concrete plans to switch to electromobility.

For cars, SUVs, pick-ups and even LCVs – light commercial vehicles – the solution is clear, no need to look. All will be equipped with Li-Ion batteries, incorporating these new technologies as they become industrially feasible. The solution for city buses is also EV. Any other search is useless. The future of hydrogen in electromobility is perhaps less clear. If he has no chance in the future of cars, he could count on heavy trucks. They have to transport large quantities, over very long distances, with refuelling stops as short as possible. The EV solution cannot work.

References

Bhowmik, C., Bhowmik, S., Ray, A. and Pandey, K.M., 2017. Optimal green energy planning for sustainable development: a review. *Renew. Sustain. Energy Rev.* Vol. 71, pp. 796-813.

Denton, T., 2016, *Electric and Hybrid Vehicles*, Routledge, London.

Energy Transition Investment Trends, 2022. available at <https://assets.bbhub.io/professional/sites/24/Energy-Transition-Investment-Trends-Exec-Summary-2022.pdf>

Enge, P., 2021. *Electric Vehicle Engineering*, McGraw Hill, California.

Fernandez, R.A. and Perez-Davila, O., 2022. Fuel cell hybrid vehicles and their role in the decarbonisation of road transport, *Journal of Cleaner Production.* Vol. 342, No. 130902.

Gallezot, P., 2012. Conversion of biomass to selected chemical products*. Chem. Soc. Rev.*, Vol. 41 (4), pp. 1538-1558.

Hanačeka, K., Roya, B., Avilaa, S. and Kallisa, G., 2020. Ecological economics and degrowth: Proposing a future research agenda from the margins, *Ecological Economics,* Vol. 169, No. 106495.

Hojnik, J., Ruzzier, M., Fabri, S. and Klopcic, Alenka Lena, 2021. What you give is what you get: Willingness to pay for green energy, *Renewable Energy,* Vol. 174, pp. 733-746.

Johnston, Ch., 2020. *The Arrival of the Electric Car*, Amazon, Washington.

Lewis, N.S. and Nocera, D.G., 2006. Powering the planet: Chemical challenges in solar energy utilization, Proceedings of the National Academy of Sciences (PNAS), Vol. 103, p. 43.

Melgar-Melgar, R.E. and Hall, C.A.S., 2020. Why ecological economics needs to return to its roots: The biophysical foundation of socio-economic systems, *Ecological Economics,* Vol. 169, No. 106567.

Pandzic, H., 2021. *Integration of Electric Vehicles and Battery Storage Systems*, Hardcover, MDPI AG, Zagreb.

Tan, H., Li, J., He, M., Li, J., Dan Zhi, F., Qin and Zhang, C., 2021. Global evolution of research on green energy and environmental technologies: A bibliometric study, *Journal of Environmental Management,* Vol. 297, No. 113382.

Zhao, J., Jiang, Q., Dong, X. and Dong, K., 2021. Assessing energy poverty and its effect on CO_2 emissions: the case of China. *Energy Econ.,* Vol. 97, pp. 105-191.

Zhao, X., Zuo, J., Wu, G. and Huang, C., 2019. A bibliometric review of green building research 2000-2016. *Architect. Sci. Rev.,* Vol. 62, pp. 74-88.

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 17-29

Predicting the future of the green economy: current vision and challenges

Emilia JERCAN
Bucharest University of Economic Studies, Romania
emilia.jercan@gmail.com
Teodora NACU
Bucharest University of Economic Studies, Romania
nacuteodora21@stud.ase.ro

Abstract. *Nowadays, the transition to a green economy is one of the latest tendencies for both researchers and practitioners, especially after the financial crisis started in 2008. Green economy has been seen as an alternative option for growth and progress that can bring an increase in income and initiate economic development. This paper focuses on the impact of the green economy's vision on peer-review literature and observes its evolution over the past two years. This review attempts to analyze, and compare studies, predicting the green economy's evolution. The empirical evidence of this paper offers implications for students, policymakers and future researchers.*

Keywords: green economy, sustainable development, economic crisis, prediction, sustainability.

JEL Classification: Q56, F63, H12, C53, Q01.

Introduction

It is generally accepted that climate change and environmental threats are real challenges for our century. Until recent decades and the coming to light of the green economy and the other concepts associated with it – sustainability, green growth, etc., the global economy was often functioning as the natural resources were infinite (Scott, 2016). The past decades and particularly the unrivaled economic advance registered in the twentieth century, have made scientists acknowledge that the excessive exploitation of natural resources might endanger the future of several generations (Csigéné Nagypal et al., 2015, pp. 207-210). Considering the wave of global changes that included challenges such as the growing urbanization process, human consumption increases or the constant decrease in natural resources (Zhironkin and Cehlar, 2022, pp. 1-2), the world community shaped political and legal initiatives able to design what is now identified as the green economy.

The green economy has received a lot of attention in recent years, and it is considered an emerging paradigm for the majority of the developed countries. This popularity is mainly due to the concept's aspiration: improving the environment in tandem with economic growth, as it reconciles two topics that have been regarded mainly as opposites: preserving and improving the environment without this being at the expense of the economy (Grudziński and Sulich, 2018, p. 364). Therefore, it is evident that the demanding process of transitioning to a green economy is closely connected with the re-examination of unsustainable consumption and production patterns, certainly to establish future development opportunities. In this regard, the adoption of the 2030 Agenda for Sustainable Development took place, and Goal 12 of the Agenda emphasizes the need for sustainable consumption, production, and the promotion of efficient resources and energy (United Nations).

Revising the effects that the green economy has nowadays, it is clear that it has been a significant part of the global economy in recent years; after reviewing estimates of total international investments in clean energy in 2021, it appears to have reached $755 billion, which according to Bloomberg New Energy Finance, registered a jump of 27% from a year earlier (Mathis, 2022).

Nevertheless, contrasting with the employment of green economy in policies, the concept of green economy has a lengthier history in the academic world. It was initially used by famous economists Pearce, Markandya, and Barber (1989, p. 77), who advocated that environment and economy undoubtedly interact. The notion of green economy has been expanded and was defined by the UNEP in 2011 as something that leads to "well-being and social equity, while significantly reducing environmental risks and ecological scarcities" (UNEP, 2011). UNEP's definition clarifies the devotion to the social side of sustainable development, together with the commitment to resisting climate change with low carbon dependence, consequently incorporating spheres of focus outside the traditional economic area.

Thenceforth, green economy has become a topic of interest for policy makers (Davies, 2013; Kasztelan, 2017; Wang, 2022), researchers, politicians, as it is seen as one-way countries can use to ensure the future of their citizens. The concept has evolved into a larger

policy framework which led to the organizing in 2012 of the United Nations Conference on Sustainable Development (Rio+20), a major milestone for the green economy worldwide whose main focus was the green economy. 191 UN member-states gathered and according to many authors, successfully turned the term sustainable development into a globally recognized concept, as they consider that the green economy, the main element of our research, has been widespread since the 2012 UN Conference (D'Amato et al., 2017, pp. 2-16). However, even though it was initially considered a success, there are still authors arguing that the event in Rio did not obtain the expected results as it did not manage to place the policies of the green economy at the center of the international discourse and its outcome document, *The future we want*, failed to lay out a coherent roadmap (Clémençon, 2012).

Nonetheless, from the point of view of decision-makers regarding economic policies, the green economy is developing today to be a spring of new growth and jobs while also assisting the accumulation of wealth. According to Bonsinetto and Falco, regionally, a green economy is seen as both a challenge and an opportunity to change the model of economic growth by shifting towards a low-carbon economy, which can contribute to structural economic improvements and is expected to have positive effects – increased employment or gross domestic product (Bonsinetto and Falco, 2013, p. 124).

With this article, we want to identify how the concept of GE is currently evolving in academic literature and elucidate its definitions and concepts. This paper focuses on defining green economy and explaining present challenges and efforts to measure the impact registered by it. The article is composed of three main sections, including a literature review – covering the existing research on the green economy topic, methodology and results of our study that aims to contribute to the debate on the green economy, and also to raise a few issues of concern for the future of green economy in 2022 and beyond.

Literature review

As mentioned in the *Introduction*, the term green economy was initially coined in 1989 by D. Pearce, A. Markandya and E.B. Barbier in the report titled *Blueprint for a green economy* which focused on supporting the UK's Department for the Environment to elaborate on the idea of sustainable development (Pearce et al., 1989, p. 77). The document goes over the primary principles of environmental economics and highlights the significance of sustaining a requisite level of natural resources while mentioning anticipatory environmental policies. In a time of financial and social difficulties, the notion of the *green economy* was proposed to address those obstacles and help achieve several goals. This made it a potentially powerful, economically and socially unifying concept, which is supported in practice by many governments, companies, and citizens.

The after-effects of the financial crisis in 2008-2009 were a perfect reason for the green economy's international growth. "The combined forces of global economic recession humanly induced environmental change and stark social inequalities have led to international calls for a radical transformation of current development practices and transitions towards a green economy" (Davies 2013, p. 1285). According to Davies, it

originated from the effects of the global recession, adverse changes in the environment resulting from human impact, and great social inequality (Davies, 2013, p. 1286). Further, in 2011 the UN Environment Programme report identified that the green economy initiates the engine of economic growth and declared that a green-based economy could be of use to create jobs and enhance social equity (UNEP, 2011), focusing on the positive outcome it may have on the labor market.

Methods to implement green economy include new energy uses, government supports, rural infrastructure development, and green technology (Lee, C. et al., 2022). Governments should support sustainable business practices and research to achieve the highest results in terms of sustainability as well (Moreno-Mondéjar et al., 2021, p. 4), and multiple states are growing and developing green economy strategies, policies, and programs on a national scale. For example, former President Barack Obama aimed that 25% of energy in the US will be produced from renewable sources by the year 2025 (Isbell, 2009).

The European interest in the green economy is also actively increasing (Bina and LaCamera, 2011, p. 2). In the European Union context, the European Commission (EC) has designed a set of policy initiatives, the so-called *European Green Deal*, that has the purpose to transform the EU into a modern and efficient economy with zero emissions of greenhouse gases by 2050. According to Moreno-Mondejar et al., this initiative will promote the transition toward a circular economy (CE) (Moreno-Mondéjar et al., 2021, p. 6). This idea behind circular economy was developed during the 1980s by rethinking the system of an industrial process. Despite the linear economy, circular economy actors act with no net effects on the environment by redesigning the life cycle of the process with minimal input and output waste. The necessity for converting to a green economy has accordingly been globally recognized. It is widely consented that a green economy implicates preserving the environment by utilizing renewable resources, reducing energy and resource use, and expanding green production and markets (Zhironkin and Cehlar, 2022, p. 1).

Most advocates for the green economy consider that the economy is a segment of the environment and therefore endorse the thought that there must be an untroubled relation between the people and the environment in order for each of their requirements to be fulfilled. This is one of the reasons why there has also been an increased interest in measuring and evaluating the progression of the green economy over the past years, relying on different sets of indicators. Therefore, one of this paper's major aims is to predict the publications about the concept of GE in academic literature.

The United Nations Environment Programme is one of the organizations that proposed its own set of indicators to evaluate the progress of the GE. It includes three sections of indicators (UNEP, 2011, p. 11):

- Indicators for environmental issues and targets.
- Indicators for green economy policy interventions.
- Indicators for green economy policy impacts on well-being and equity.

A green economy is also considered as a vehicle to deliver sustainable development rather than a destination in itself. Accordingly, indicators are useful measures in the context of

making green economy policies aimed at achieving sustainable development. Governments may choose environmental, economic or social issues as an entry point to adopting a green economy approach. For UNEP, however, it is natural to start from an environmental perspective (UNEP, 2011, p. 9).

According to the UNEP in its research on *Measuring Progress towards an Inclusive Green Economy* (2011), in the green economy field, a significant policy instrument is considered the shift in investment towards green activities, encouraged by other conditions such as pricing policy or fiscal reform. "Under fiscal policy, for example, indicators could show changes in subsidy levels for fossil fuels, water and fisheries" (UNEP, 2011, p. 11). However, multiple scholars argue that it is very challenging to create a unique and comprehensive set of indicators capable of monitoring and evaluating the progress of the green economy, especially because of the complexity of the concept and its multiple dimensions. Another issue could also appear from the lack of data (insufficient data) for specific indicators, leading to a reflection of the facts not entirely accurate.

Furthermore, a similar and close approach to the one of the green economy is known as green growth, which is centered on the idea that national output (GDP) can be increased with the help of conserving natural resources and decreasing the pressure on the environment (Hickel and Kallis, 2020, p. 1). In an article from 2018, Gissin et al. state that the green economy has the power and ability to ensure growth in GDP while also increasing income per capita and employment. However, according to the authors, for the transition to be possible, 2% of the world's GDP is required to be invested in ten key sectors in 2012-2050: "agriculture, housing and communal services, power economy, fishing industry, forestry, manufacturing industry, tourism, transportation, waste disposal and recycling, water resources management" (Gissin et al., 2018, p. 157).

According to the OECD, green growth "is about fostering economic growth and development while ensuring that the natural assets continue to provide the resources and the environmental services on which our well-being relies" (OECD, 2011). It is later added that in order to achieve this, it must catalyze investment and innovation, which will "underpin sustained growth and give rise to new economic opportunities" (OECD, 2011). For a long time, „green growth' only referred to the growth of the eco-industry; however, in accordance with Jänicke, the term is currently used for the growth of the entire economy. "Green Growth now affects not only the quality of growth, but of production a whole. In this case, growth results from the investment in the upgrading of the entire production system to environmental and resource-saving processes and products" (Jänicke, 2012, p. 3).

One of the emerging outcomes has been a "green growth" strategy, which seems more likely to succeed as a central climate mitigation approach, insofar as it can more easily be aligned with aspirations across national divides. Against the backdrop of the financial and sovereign debt crises, there are great hopes that green innovation and industrial engagement, triggered by innovative policies, can save the climate at the same time as boosting sluggish economies (Martinelli and Midttun, 2012, p. 1).

When referring to the relation between green growth, green economy, and sustainable development, Kasztelan states that "economic growth which contributes to rational utilization of natural capital, prevents and reduces pollution, and creates chances to improve the overall social welfare by building a green economy, and finally makes it possible to enter on the path towards sustainable development" (Kasztelan, 2017, p. 497). The following definitions also exemplify the link between the concepts mentioned above.

Table 1. *Definitions of green growth*

Organization	Definition
OECD	"Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies" (2011).
World Bank	"Growth that is efficient in its use of natural resources, clean in that it minimises pollution and environmental impacts, and resilient in that it accounts for natural hazards and the role of environmental management and natural capital in preventing physical disasters. And this growth needs to be inclusive" (2012).
GGGI	"Green growth is the new revolutionary development paradigm that sustains economic growth while at the same time ensuring climatic and environmental sustainability. It focuses on addressing the root causes of these challenges while ensuring the creation of the necessary channels for resource distribution and access to basic commodities for the impoverished" (2012).

Source: Author's own selection.

All these definitions emphasize the idea that a green economy is a concept that embraces and includes various implications concerning growth, well-being or risk moderation in the utilization of natural resources, while achieving a balance between economic, ecological, and social goals. According to Bogovic and Grdic (2020, p. 6), the overall literature focusing on the green economy, "its theoretical framework and applicable policies, shows that is a very complex and not fully methodologically developed model", one of the reasons being that green economy can be linked to different economic theories. For example, it can be related to both environmental economics and ecological economics, which present a series of differences in practice.

Environmental economics is closely related to cleaner production and resource efficiency, whereas ecological economics relies on concepts such as industrial ecology (or circular economy). Waste hierarchy can be related to both, depending on the extent to which it is implemented (downcycling versus upcycling). All these concepts are based on practical approaches or solutions to achieve environmental, economic and social benefits. In addition, in order to measure the effects of these solutions, different assessment tools such as lifecycle assessment can be used (Bogovic and Grdic, 2020, p. 6).

Although many authors favor the green economy and growth as an essential model for transforming the present global economy, some studies and papers show a critical view of these concepts. For example, Brand shares that "The concept of a green economy is, like sustainable development, rather an oxymoron which intends to bundle different, partly contradictory, interests and strategies, and gives them a certain legitimacy and coherence" (Brand, 2012, p. 29).

Further, to describe and explain our predictions for the future of the green economy, our article focuses on the methodological side, including the materials and methods used to conduct this research.

Methodology

This paper is a methodological literature review that analyses the progress of the concept of green economy in Scopus database. The methodology chosen for this research is a three-step process:

1. The first step consists of searching the presence of the word GE in academic journals, collecting data in Excel and visualizing them with a programming language called Python.
2. The second step lies in mapping the 2020 and 2021 results of point (1) and constructing summative Histograms to see how the concept of the GE evolved during the last two years.
3. The last step is based on simulating and predicting a cumulative existence of the concept of the GE in academic journals in 2022, starting from the 2012-2021 period, thanks to predictive statistical models and Python's functions.

A prediction means demonstrating something that will happen in the future. Therefore, we would like to predict how often the word GE appears in academic journals and how this field of economy is evolving in today's research.

We can use predictions with uncertainty over future outcomes. Predictions represent future results with a probability of them happening. Our prediction is considering the data from the 2012-2021 period, using two of the most common models in time series: the Autoregressive (AR) and the Moving Average (MA) models.

The AR model takes previous observations (from 2012 to 2021) as an input to the regression equation to predict values of 2022. On the other side, the MA model predicts how 2022 observations are the mean of every past observation (2012-2021).

We chose the Scopus database because it contains more publications than the Web of Science, and it is a more suitable tool for the analysis.

Results and discussions

Before starting with the analysis, we used some criteria to select journals. First of all, we searched in the Scopus database, for English articles from 2012 to 2022 and we specified that the research must contain: TITLE (green W/ economy). This code indicates that we are searching for journals' titles that include the words green economy. After finding the cumulative results per year, we collected them thanks to some Python commands shown in Figure 1.

Figure 1. *Python commands to import data*

```
import pandas as pd

all_data = pd.read_excel("all_data.xlsx")

all_data
```

Source: Author's own creation.

Import pandas command represents the package used, and all_data stands for the variable constructed by extracting the collected data in an Excel file. Figure 2 summarize these data:

Figure 2. *Number of publications containing the words green economy in their Title during 2012-2022*

YEAR	NO. OF PUBLICATIONS
2012-12-31	31
2013-12-31	37
2014-12-31	43
2015-12-31	50
2016-12-31	67
2017-12-31	48
2018-12-31	32
2019-12-31	46
2020-12-31	49
2021-12-31	77
2022-03-18	22

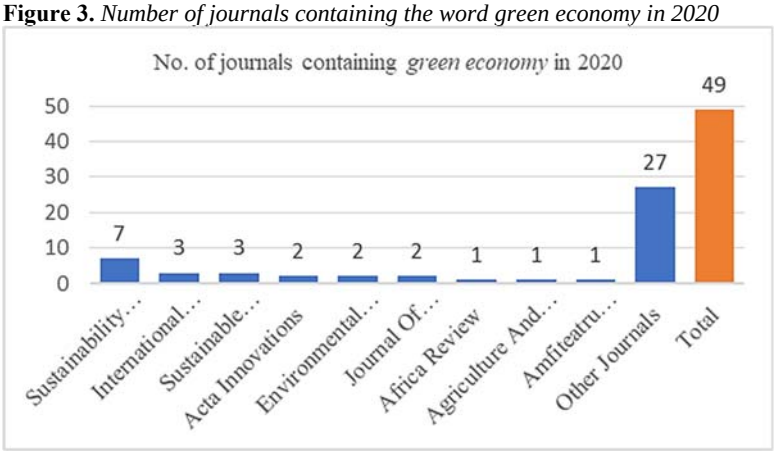
Source: Author's own creation.

It is relevant to mention that, for the 2022 year, we collected data until the 18th of March, the day of data extraction, but we do not use them for the research since the aim is to predict 2022 results.

The second step of this analysis consists of giving a closer perspective on what data look like; we discarded useless information and kept essential ones, such as the name of the Journals and the no. of publications. Therefore, Figures 2 and 3 summarize 2020 and 2021 outputs. The first ten columns contain the extensive name of the Journals; starting from the 7th and 8th columns of the Histograms, we observed that only one publication occurs per Journal, so we summarized the last column as "Other Journals".

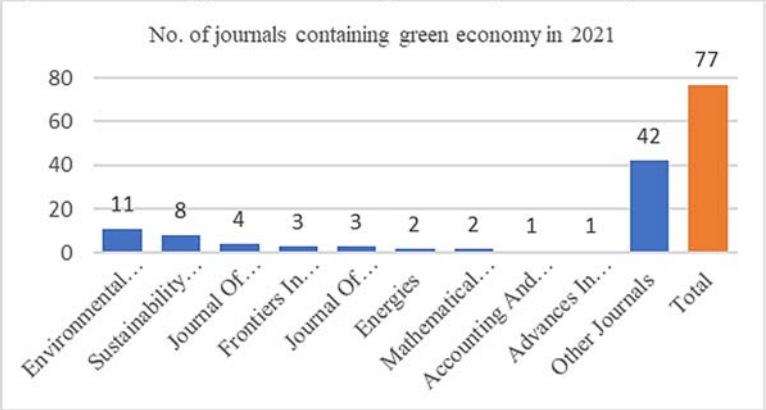
Below are the figures:

Figure 3. *Number of journals containing the word green economy in 2020*



Source: Author's own creation.

Figure 4. *Number of journals containing the word green economy in 2021*



Source: Author's own creation.

The results indicate that in 2020, there were 49 publications containing the word green economy and +28 in 2021. The top three journals with the highest number of publications regarding the word green economy for 2020 and 2021 were Sustainability Switzerland, the Environmental Science and Pollution Research and the Journal of Cleaner Production. As 2022 is not over, we must predict how many publications could occur this year. Therefore, as a first prediction, we use the AR model. An autoregressive AR model is a statistical model that predicts future values based on past ones, e.g. predicting stock prices based on their previous performance or the number of passengers on planes based on past bookings. In an AR model, the current value of the series, Xt is explained by a linear combination of previous p values, e.g. Xt−1, X t−2, …, X t−p, together with a random error in the same series.

Therefore, we are selecting data but this time, we do not import them from an Excel file, we just indicate the total number of publications during the past 10 years, as seen in Figure 2, excluding 2022. Figure 5 summarizes the just mentioned commands.

Figure 5. *Defining data for the AR prediction*

```
import pandas as pd
from statsmodels.tsa.ar_model import AutoReg
data = [31,37,43,50,67,48,32,46,49,77]
```

```
import pandas as pd
```

```
data
```

```
[31, 37, 43, 50, 67, 48, 32, 46, 49, 77]
```

Source: Author's own creation.

After identifying our values, we start with the prediction. The AR model is defined by recalling the data and putting lags=1, which means that the forecast depends on the last value. The y-predicted will indicate that we want to predict the next three values (10,12), considering that the total number of occurrences in our dataset are: [37, 37, 43…77]. Figure 6 summarized the just mentioned commands:

Figure 6. *The results of the AR model*

```
ARmodel = AutoReg(data, lags=1)
ARmodel_fit = ARmodel.fit()

ypredicted = ARmodel_fit.predict(10,12)

print(ypredicted)
```

```
[62.66972898 56.98567339 54.73111115]
```

Source: Author's own creation

Hence, based on the AR model our predicted value is 62,67 (the first results indicated from the above output). We obtained the same value as Figure 6, also using the FORECAST function of Excel. The FORECAST function predicts future values based on existing ones along with a linear trend. It is possible to see its results and the formula used in Figure 7:

Figure 7. *The FORECAST function in Excel*

B12 =FORECAST(A12;B2:B11;A2:A11)

	A	B	C	D	E
1	YEAR	NO. OF PUBLICATIONS			
2	2012	31			
3	2013	37			
4	2014	43			
5	2015	50			
6	2016	67			
7	2017	48			
8	2018	32			
9	2019	46			
10	2020	49			
11	2021	77			
12	2022	62,67			

Source: Author's own creation.

In Figure 7, cell A12 represents the x value of the prediction; the cells from B2 to B11 are the known_ys, or the dependent range of data, the so-called y values; and values from A2 to A11 are the kown_xs, or the independent data the so-called x values.

Lastly, we calculate the MA model which states that the resulting observation is the mean of every past occurrence. A finite MA model has to be stationary because the observation is just a weighted moving average over past estimated errors. Consequently, this model is suitable for data that has no trend.

In the next observation, when calling the ARMA model we indicate that the order is equal to (0,1), as we put the AR model equal to 0 and the MA model equal to 1 because we do not want to calculate the ARMA model, but just the MA. We see that the output from this model is just a bit different from the AR model, with a 65.79 score, as indicated in Figure 8.

Figure 8. *The results of the MA model*

```
from statsmodels.tsa.arima_model import ARMA

MAmodel = ARMA(data, order=(0,1))
MAmodel_fit = MAmodel.fit(disp=False)

ypredicted = MAmodel_fit.predict(10,11)
print(ypredicted)
```

```
[65.79183448 48.99355135]
```

Source: Author's own creation.

All the predictions indicated so far give a forecast of between 63 and 66 publications in 2022. We would then expect that compared to 2021, for 2022 these publications will slightly decrease but remain above 60. Many external factors could influence the growth or fall in the number of publications.

Periods of economic growth also correspond to a greater dedication to research and discovery of alternative economic systems. Periods of economic crisis such as 2018 may have influenced the output of publications about GE. The EU interest in GE is actively increasing, as the EC has designed the European Green Deal, which will transform the EU into a modern and efficient economy in the next 30 years.

As seen in Figure 2, we had a boom in publications regarding GE during 2021 when the need to find alternative and sustainable economies was increasingly needed.

Our findings provide results on how the green economy concept is becoming crucial for today's society and research.

Conclusions

Joint with environmental advantages, the social and economic benefits of the green economy are growing worldwide, providing real opportunities from an economic, social and environmental perspective. Commitment to a green economy supposes opportunities for systems to adapt to a model that optimizes the use of resources, reducing waste generation but also enhancing green investments, employment and economic approaches (Moreno-Mondéjar et al., 2021, p. 8).

This paper has aimed to define the green economy and explain its present challenges. Moreover, it has measured the impact registered by it in academic publications to see how relevant has become the study of this topic. This approach had the following advantages: the study of the concept of GE is actual, intuitive and information is available from multiple sources. Moreover, a prediction about future publications can estimate results and variables. The model quantifies improvements, where information and prediction both represent the factual elements of achieving results. The weaknesses when doing the prediction regard externalities or any unpredictable variable of the analysis. Moreover, doing the research only from one perspective, it cannot be always exhaustive. That is the reason why we wanted to provide both qualitative and quantitative analysis. This literature review combined with prediction models is only a start for giving ideas and improvements to those who wish to focus on this topic.

Lastly, it is important to mention that this study focuses only on some parts of the concept of GE. However, it is challenging for governments, academics or institutes to collect, analyse and define unique studies or regulations about GE since it's a broad subject.

Our findings have found implications for understanding this field of economy and for giving sustainable inputs. Joint with environmental advantages, the economic and social benefits of GE are growing in the EU context and provide important opportunities in a more competitive, sustainable and efficient way (Meza-Ruiz, I. D. et al., 2017, p.8). The GE is not a goal for governments, academics or economies, better than that, it is more a way of being, a way of living an economic social life.

References

D'Amato, D., Droste, N., Allen, B., Kettunen, M., Lähtinen, K., Korhonen, J., Leskinen, P., Matthies, B.D. and Toppinen, A. 2017. Green, circular, bio economy: A comparative analysis of sustainability avenues. *Journal of Cleaner Production,* Vol. 168, pp. 716-734.

Bina, O. and LaCamera, F. 2011. Promise and Shortcomings of a Green Turn in Recent Policy Responses to the "Double Crisis". *Ecological Economics,* 70, 2308-2316.

Bogovic, D., N., Drezgic, S. and Cegar, S. 2016. Green Economy as a Development Model of Eastern Croatia. Conference: 5th International Scientific Symposium Economy of Eastern Croatia – Vision and Growth, at: Osijek, Vol. 5.

Bonsinetto, F. and Falco, E. 2013. Analysing Italian regional patterns in green economy and climate change. Can Italy leverage on Europe 2020 strategy to face sustainable growth challenges? Bucharest, *Journal of Urban and Regional Analysis,* Vol. 5, Issue 2, 123-142.

Brand, U. 2012. The Next Oxymoron? No Lessons Learned from Failures of Implementing Sustainable Development. GAIA – Ecological Perspectives for Science and Society, 21, pp. 28-32.

Clémençon, R. 2012. Welcome to the Anthropocene: Rio+20 and the meaning of sustainable development. *The Journal of Environment & Development Volume: a review of international policy,* Vol. 21, pp. 311-338, California: Thousand Oaks.

Csigéné Nagypál, N., Görög, G., Harazin, P. and Péterné Baranyi, R. 2015. Future Generations and Sustainable Consumption, *Economics and Sociology,* Vol. 8, No. 4, pp. 207-224.

Davies, A.R. 2013. Cleantech clusters: Transformational assemblages for a just, green economy or just business as usual? *Global Environmental Change* 23, pp. 1285-1295.

Gissin, V.I., Mekhantseva, K.F., Putilin, T.I. and Surzhikov, M.A. 2018. Green Economy: Emerging National Models, Estimations, Trends in EU and CIS. *European Research Studies Journal,* Vol. 21, p. 156.

Grudziński, A. and Sulich, A. 2018. Green European integration. Proceedings of the 4th International Conference on European Integration. Ostrava, Czech Republic, pp. 364-371.

Hickel, J. and Kallis, G. 2019. Is Green Growth Possible?, *New Political Economy,* DOI: 10.1080/13563467.2019.1598964

Isbell, P. 2009. A Preliminary View on Obama's Future Energy Policy. Available at: <https://www.realinstitutoelcano.org/en/work-document/a-preliminary-view-of-obamas-future-energy-policy-wp/> [Accessed 20 March 2022].

Jänicke, M. 2012. Green growth: From a growing eco-industry to economic sustainability. *Energy Policy,* Vol. 48, Issue C, pp. 13-21.

Kasztelan, A. 2017. Green Growth, Green Economy and Sustainable Development: Terminological and Relational Discourse. *Prague Economic Paper* 26, pp. 487-499.

Lee, C.C., Wang, C.W. and Ho, S.J. 2022. The dimension of green economy: Culture viewpoint. *Economic Analysis and Policy,* Vol. 74, pp. 122-138.

Martinelli, A. and Midttun, A., 2012. Introduction: towards green growth and multilevel governance. *Energy Policy,* pp. 1-4.

Mathis, W., 2022. Energy Transition Drew Record $755 Billion of Investment in 2021. In Bloomberg. Available at: <bloomberg.com/news/articles/2022-01-27/energy-transition-drew-record-755-billion-of-investment-in-2021> [Accessed 20 March 2022].

Meza-Ruiz, I.D., Rocha-Lona, L., Soto-Flores, M. del R., Garza-Reyes, J.A., Kumar, V. and Lopez-Torres, G.C. 2017. Measuring Business Sustainability Maturity-levels and Best Practices, *Procedia Manufacturing,* Vol. 11, pp. 751-759.

Moreno-Mondéjar, L., Triguero, A. and Cuerva, C.M., 2021. Exploring the association between circular economy strategies and green jobs in European companies. *Journal of Environmental Management,* Vol. 297, p. 113437.

OECD, 2011. What is green growth and how can it help deliver sustainable development? Available at: <https://www.oecd.org/index.htm> [Accessed on 15 March 2022].

Pearce, D.W., Markandya, A. and Barber, E.B. 1989. *Blueprint for a green economy.* London: Earthscan.

Scott, M. 2016. We've been treating the planet as if its resources are infinite – but they're not. Available at: <https://www.forbes.com/sites/mikescott/2016/10/21/weve-been-treating-the-planet-as-if-its-resources-were-infinite-but-theyre-not/> [Accessed on 20 March 2022].

United Nations Environment Programme. 2011. Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication. Available at: <sustainabledevelopment. un.org/content/documents/126GER_synthesis_en.pdf> [Accessed on 15 March 2022).

Zhironkin, S. and Cehlar, M., 2022. Green Economy and Sustainable Development: The Outlook. *Energies,* 15, p. 1167.

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 30-37

A circular-spiral economy. More suitable for the transition to the green economy

Alexandru TRIFU
University "Petre Andrei" of Iași, Romania
trifu.alex@gmail.com
Oana Mihaela VESTALE (AMĂRIUCĂI)
University "Petre Andrei" of Iași, Romania
oana_mia@yahoo.com

Abstract. *The circular economy, synthetically speaking, is a mode of production and consumption including as features repairing, refurbishing, re-using and recycling of goods/products. In this manner, the life of goods is extended and, above all, value is added. At the same time, life and work conditions will be at a higher qualitative level.*
As methodology we used the data from media or specialized journals, information from entrepreneurs who started transformation of the production/services.
We synthesize all the information in order to highlight the importance and the necessity of this type of economy in progress, under the form of a spiral.

Keywords: circular-spiral economy, transition, value added, innovative actions.

JEL Classification: F63, F64.

1. The circular economy

The beginning of introducing the term of *Circular Economy* (CE, on short) in the common language is linked to the American economist Kenneth E. Boulding (Sulewski et al., 2021), who wrote and published in 1966 his emblematic work entitled "The Economics of the Coming Spaceship Earth", in which the author presented a vision of the economy as a circulation system of raw materials limited by environmental conditions, available resources, and possibilities of waste assimilation. Nevertheless, currently, the concept of CE "represents a viable option for countries, governments, academia, and society to transform the linear and semi-circular materials and energy flows into circular flows and obtains better sustainable benefits" (Saavedra et al., 2018, pp. 1514-1522).

Furthermore, according to the Ellen MacArthur Foundation (www.archive.ellenmacarthur foundation.org), a circular economy is a systemic approach to economic development designed to benefit businesses, society and the environment. It's a system in opposition with the linear model "take-make-waste" and it is regenerative and improving the workplace within firms, the living standards and preserving the environment Thus, the circular economy is expected to be the optimal way to sustainable development, by decoupling production from finite resources, especially fossil fuels.

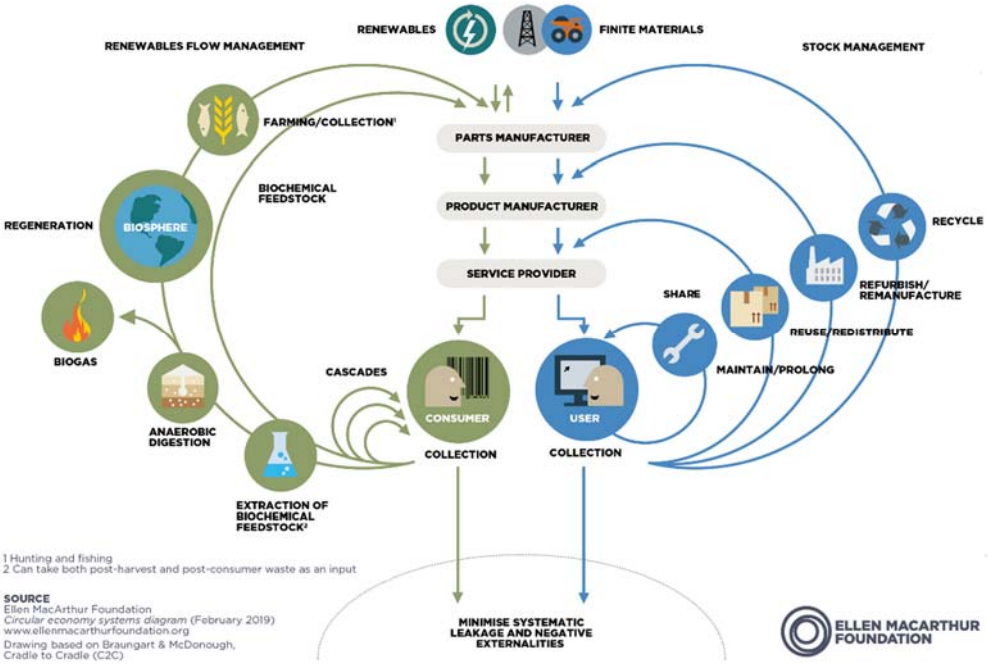
The circular economy concept is based on applied situations such as "design out waste", "build resilience through diversity" and "rely on energy from renewable sources". The basis of the production processes in the circular economy is an approach to the product life cycle, referred to as "from cradle to cradle" (C2C), constituting an extension of the eco-efficiency approach dominant in the analysis "from cradle to grave", which covers all stages of the life cycle, from the extraction of materials to the end of life of the products (www.sempergreenwall.com/faq/. The goal of the C2C approach is to ensure (or improve) eco-efficiency at all stages of the product life cycle and to ensure that at the end of the product life cycle, the materials from which the product was made can be reused and recycled. What is more, the implementation of the C2C paradigm seeks to reduce the negative impacts, which is a distinguishing feature of other approaches in the organization of production systems based on eco-efficiency, as well as to stimulate and optimize positive impacts (McDonough and Braungart, 2002).

Thus, the circular economy is considered restorative and regenerative and, above all, working at all scales, from big to small businesses, from organizations to society and individuals, both globally and locally.

In the spirit of "cradle to cradle", C2C is not only about recycling products. There needs to be a positive cycle that makes sure that more value is created: upcycling. Meaning that doing things "less bad" is not good enough. You need to take that extra step to achieve the ultimate goal: to make a positive contribution to nature, humanity and the economy. In short, being eco-effective, rather than eco-efficient.

It's exactly the core meaning of spiral development, better products/services, better actions towards environment and life.

The Ellen MacArthur Foundation tried to capture the essence of the circular economy in the diagram below, which is somewhat understandably nicknamed the "butterfly diagram". The diagram tries to capture the flow of materials, nutrients, components, and products, whilst adding an element of financial value. It builds on several schools of thought, but is perhaps most recognisably influenced by cradle to cradle's two material cycles.



Above, we already presented the core of our paper's idea, that is the continuing the life cycle of goods, on a higher qualitative manner, T1 is become T0 for the next cycle, exactly the meaning of the syntagma "cradle to cradle".

We consider that four principles are the base of the circular economy (www.archive.ellenmacarthurfoundation.org):

a. Designing out the waste and pollution.
b. Keep the materials and instruments in use.
c. Regenerate and revigorate natural systems.
d. Adding value to human activities and to life.

We have spoken about one base-term for circular economy, such as "design out waste". More specific, a circular economy reveals and designs out the negative impact of intensive industrial activities to human health and natural system. The damages, because we are talking about negative effects, include the release of greenhouse gases and so-called hazardous substances, the general air pollution, but also of ground, water, as well as structural waste as the pollution and traffic congestion in the urban agglomerations.

Impact of the green economy on consumers

The most noticeable impacts on everyday lives will include rising energy bills, job losses in high-emission industries, changes in what people eat, and increasing outgoings to end our dependence on fossil fuels to heat homes and travel (Broom, 2022)

Transitioning the energy sector to zero carbon and beefing up electricity grids to cope with an expected doubling of global demand by 2050 will push up bills by 25% between 2020 and 2040.

Even when the necessary changes have been made, electricity prices will still be 20% higher by 2050, although technological innovations may help to soften the price rises. Costs could be significantly higher if producers fail to build flexible and reliable low-cost power grids.

Although moving away from fossil fuels will cost 185 million jobs, the green economy will create 200 million new roles by 2050, including eight million in renewable power, hydrogen and biofuels.

Consumers will face the cost of replacing home heating systems and cars that run on fossil fuels, and will have to change their diets to avoid high-emission foods such as meat. However, the total costs of owning and running an electric vehicle will be lower than those for a petrol or diesel vehicle in most parts of the world by 2025, reports (such as McKinsey) say.

High-emission industries – which today account for 20% of global GDP – will be most affected by the transition, the report predicts. Coal production will be almost halted by 2050, while oil and gas production will more than halve. There will also be a 30% rise in the cost of producing steel, while cement-making will become 45% more expensive by 2050.

We are aware the fact that all this huge effort to implement the new, green, economy is expensive, even if 2030 or 2050. Based on the forecast and calculations, the period of transition to the green economy, which we will detail in the next section of the paper, basically means the following (Broom, 2022):

a. Getting to net zero by 2050 *will cost an extra $3.5 trillion a year* (our emphasize), according to a new study by McKinsey.
b. It is necessary for a structural transformation of the entire economic and social system, which of course, will cost.
c. Entrepreneurs and CEOs to support effectively this profound action of re-structuring, re-furbishing, re-cycling goods if they really think that this green economy is an opportunity for a higher qualitative and healthy life and activity. By the consequence, it is the danger of losing a large number of jobs, but at the same time they open up possibilities for job diversification.

2. The transition period to the green economy

In the first place, we intend to present analysis done in 2011 by two researchers from Grantham Research Institute for Climate Change and Environment regarding the forecast, at the time, of the modality of transition to the green economy (Bowen and Fankauser, 2011).

Thus, at that time, this topic was embraced by many researchers and analysts, because the green growth, that is the qualitative and structural necessary development of the world, abandons the approach on a narrow focus on carbon especially emission reduction in the favour of a broader openness strands of economics.

Renewable energy developments like solar and wind farms are important in the transition away from fossil fuels, but they often require large amounts of resources, including big swaths of land. In these cases, it's critical that the land is acquired through a fair process that respects the rights of marginalized communities such as poor or indigenous communities.

It's also important to ensure that renewable energy creates quality, accessible jobs, especially since large developments are often built in areas with relatively low-skilled workforces. Plus, many countries with high renewable energy potential have insufficient social safety nets and workplace protections.

As Info in this respect, the actions during the transition period could create 18 million jobs. On the other side, 6 million jobs in the actual coal-powered electricity or other industries using fossil fuels could disappear by 2030, the first landmark in in this long-term strategy for a green and clean economy and environment.

Politicians around the globe have been keen to state their commitment to net-zero emissions, and now a new report tells us exactly how much this transition will cost.

Consultancy firm McKinsey says total global spending by governments, businesses and individuals on energy and land-use systems will need to rise by $3.5 trillion a year, every year, if we are to have any chance of getting to net-zero in 2050 (Broom, 2022).

That's a 60% increase on today's level of investment and is equivalent to half of global corporate profits, a quarter of world tax revenue and 7% of household spending. A further $1 trillion would also need to be reallocated from high-emission to low-carbon assets.

The report lays out six characteristics of the transition to a green economy, starting with the point that it will affect all industries. And it says seven energy and land-use systems create all the world's greenhouse gas emissions.

The cost of the shift to zero emissions will be "significant", the report says. Most of this will occur earlier in the transition, but it will fall unevenly on developing nations and fossil fuel producers, creating risks of disruptions to energy supply and price hikes. But there will also be new opportunities in a low-carbon world, the report adds.

By abandoning the linear model of consumption, we all together are stepping towards a greener future. A circular economy is one that is sustainable in the true sense of the word;

our waste is transformed into a valuable resource and a source of abundance. In a circular economy, economic activity has benefits beyond the material, and can actually lead to positive societal and environmental outcomes.

3. Methodology

We used observation and bibliographic research, based on information from papers, books, opinions of specialists and entrepreneurs, even from our experience in higher education. All this information, along with the examples in the respect, leads to the *synthesis* of measures to be taken in order to achieve sooner a green economy and, therefore, a new quality of life and work.

4. Facts for the transition to a green and clean economy

The first example is from services domain, that is from of one of the most known and active flying carrier company: Wizz Air.

Very interesting reasons presented by the CEO of the company, Váradi Jozseph (www.wizzair.com, 2022):

a. A passenger travelling with Wizz Air will have a CO_2 footprint of only 57.2 grams per km on average (pre-COVID period). If every airline would be as efficient as Wizz Air, European CO2 emissions from aviation activities would be reduced by 34%.
b. As much as possible, the planes won't fly half-empty to avoid unnecessary pollution.
c. Also, as much as possible to operate direct routes. In this cases the normal or minimum fuel consumption (not extra burn with additional activities).
d. The use of world-class engines for recent aircrafts for the existence of low emissions.
e. The use of a modern fleet amongst European airlines competitors, with more than 50 planes.
f. None of the direct flights of Wizz Air have no direct train alternative under four hours.

That's why, living and acting in present with revolutionary ideas and solutions, we prepare the steps for a better inclusion of new technologies and IT processes into the diverse domains of our lives.

The second and more important example is that one of *composting the waste*, an important method of today Management of Waste, because it's about the huge wastes of towns (municipal administrative unit).

It is a method of treating municipal solid waste is composting, a biological process in which the organic portion of refuse is allowed to decompose under carefully controlled conditions. Microbes metabolize the organic waste material and reduce its volume by as much as 50 percent. The stabilized product is called compost or humus. It resembles potting soil in texture and odour and may be used as a soil conditioner or mulch (Dimpfl and Moran, www.britannica.com).

Composting offers a method of processing and recycling both garbage and sewage sludgein one operation. As more stringent environmental rules and siting constraints limit the use of solid-waste incineration and landfill options, the application of composting is likely to increase. The steps involved in the process include sorting and separating, size reduction, and digestion of the refuse.

Not only municipal waste is important, but also household waste/home composting, food especially. Home composting is an effective and efficient way to dramatically reduce your waste stream at home, while doing your part to reduce your carbon footprint. By making compost, you are creating a valuable soil amendment that it can be used to benefit the landscape, the soil, boost plant growth and sequester carbon, as much as possible.

For example, 1 million tons of organic waste generated by food and hospitality sectors could be diverted from landfill in Australia only (where the fertile soils are not in a large scale). And this operation of composting such a huge amount of organic waste equals with more 6 (six) Opera House in Sydney (Team Compost Connect, 2021).

Currently, a third of all food produced globally each year is thrown away. In monetary terms, this amounts to a staggering one trillion US dollars and would be enough to feed the estimated 10% of the world's population that go hungry each year. Therefore, we are interested in stopping food waste, but especially when throwing the food waste in landfills, where the dangers are multiple, starting with methane emission, one of the most dangerous greenhouse gases.

A suggestive practice example is offered by Compostal Ltd. from Hungary, with an experience of more than two decades and which treats more than 400.000 metric tons of waste every year (www.compostal.eu).

The Technology allows efficient treatment of municipal solid waste (MSW) prior to landfilling. Mechanical biological treatment (MBT) is usually designed to recover materials for one or more purposes and to stabilise the organic fraction of the residual waste. Another purpose of MBT is to break down the material for further processing (e.g. preparation of solid waste fuels).

The output from MBT plants is greatly reduced in weight and when adequately stabilised its emissions to air (e.g. of odour and methane) compared with the untreated material could be reduced by approximately 90-98% when landfilled.

Conclusions

We are not far from where we were previously, but the political will, innovation, the positive thinking, the lifestyle, i.e. the determinants/connections have to be mandatory for the new mainstream.

The above-presented examples and solutions lead to the general positive assessment of the impact of these techniques/methods to the environment.

First of all, it is necessary that these ideas, solutions to be understood, applied and generalised at the national economy level, region level (such as European Union), or even at the world level.

In this enterprise, it will combine the private initiative of entrepreneurs with the public policies. These policies have to be clear, transparent, credible and within the framework of governance. If we are talking about green growth, that represents exactly the new approach in the world and the spirit of the commitments taken at COP 26 from Glasgow, autumn 2021.

It is needed of a collective action, with the political will as a propeller.

We support this idea that it's about a combination between the concept of shift and that one of spin: it's about a circular-spiral economy, the development of collection services and helping businesses to clean up the waste streams means closing *the loop* on the food waste cycle, as one of the main direction. The loop drives to a superior level of business/economic activities.

References

Bowen, A. and Fankhauser, S., 2011. Green growth-paradigm shift or just spin?, Climate and Development Knowledge Network, www.cdkn.orgstory/, retrieved March 2nd, 2022.

Broom, D., 2022. What's the price for a green economy? An extra $ 3.5 trillion a year, <www.weforum.org/agenda/2022/>, [retrieved February 18th, 2022].

Cheong, F., 2019. Kenneth E. Boulding (1966), The Economics of the Coming Spaceship Earth: A Review, <www.linkedin.com/pulse/kenneth-e-boulding-1966-economics-coming-spaceship-earth-cheong/>, [retrieved February 12th, 2022].

McDonough, W. and Braungart, M., 2002. *Cradle to Cradle. Remaking the Way We May Things,* North Point Press, New York.

Saavedra, D.R., 2018. Theoretical contribution of industrial ecology to circular economy, *Journal of cleaner production*, Vol. 170, pp. 1513-1522, <www.pubag.nal.usda.gov/catalog>, [retrieved February 15th, 2022].

Sulewski et al., 2021. Home Bio-Waste Composting for the Circular Economy, *Energies Journals,* Vol. 14, Issue 19, <www.mdpi.com>, [retrieved February 20th, 2022].

Team Compost Connect, 2021. Compost Connect & Circular Economy, <www.compost connect.org/circular-economy/>, [retrieved February 28th, 2022].

*** Easily scalable, battle tested, industrial composting technology, <www.compostal.eu>, [retrieved March 2nd, 2022].

*** The circular economy in detail, <www.archive.ellenmacarthurfoundation.org/explore/>, [retrieved February 17th, 2022].

*** What is Cradle to Cradle? Sempergreen Wall, <www.sempergreenwall.com/faq/>, [retrieved February 20th, 2022].

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 38-52

The Eastern European crisis and its impact on the European green deal. Analysis of the impact on the Romanian fertilizer sector

Nicolae MOROIANU
Bucharest University of Economic Studies, Romania
nicolae.moroianu@economie.ase.ro
Silvia Elena IACOB
Bucharest University of Economic Studies, Romania
silvia.iacob@economie.ase.ro
Alexandra CONSTANTIN
Bucharest University of Economic Studies, Romania
constantin7alexandra21@stud.ase.ro

Abstract. *The main aim of this paper is to investigate the economic impact of the recent European crisis generated by the Russian invasion in Ukraine on the implementation of the European Green Deal in terms of cost effectiveness. In order to achieve the zero pollution target for a toxic-free environment and a healthy and environmentally friendly food system, European countries must urgently adopt sustainable standards and implement new green business models. Therefore, regulators and policymakers must focus on the key role of the fertilizer industry in both creating a more sustainable agricultural production, as well as delivering a zero emission economy. The research is based on cost-effectiveness analysis of the implementation of EGD's ambitions in the chemical sector of fertilizer under the current European framework, but also on the analysis of the evolution of the Romanian fertilizer industry in terms of convergence to the circular economy. The results obtained during the research confirm that the transition to a green economy has a strong impact on costs.*

Keywords: green economy, European Green Deal, carbon-neutral economy, sustainable development, renewable energy sources, energy modernization.

JEL Classification: E23, F18, F69.

1. Introduction

The first two decades of our century have marked humankind's battle with a multiple series of *black swans* (Taleb, 2010) from the 2008's global financial collapse, to the COVID-19 pandemic that burst in 2020 and kept us in isolation and lockdown, or the most recent political crisis which emerged at the beginning of 2022 in the Eastern Europe as a Russian troops invasion in Ukraine, but soon turned out to be a military war of forced administrative occupation.

Despite the severe consequences of all the above-mentioned crises, the climate change crisis is the only one that has the potential to threaten the future of humanity on Earth. The destructive effects of climate change can now be seen all over the world: from shortages in food and water to decreased biodiversity, from air pollution to mortalities from heat waves, from increasingly intense forest fires to rising human displacement (Jakobsson, 2021).

In order to set the stage for Green Globalization 2.0, strong solidarity must be shown in supporting a global coherent and clear political economy response that is resilient, sustainable, and ethically and morally defensible (Mackintosh, 2022). As a result, the transition to a circular economy has become a priority of international interest with the purpose of the creation of closed-loop systems of material flows and the 3R concept-reduction, reuse and recycling of resources (Geng and Doberstein, 2008).

Since the commitments made under the Kyoto Protocol (UNFCCC, 2008), the European Green Deal's strategy is by far the most comprehensive and ambitious plan to accomplish carbon neutrality and to disrupt the economic growth and resource use. The EGD's (European Green Deal) main goals emphasize its role in creating a sustainable food system within Europe by introducing and implementing sustainable agriculture that can help strengthen food security in developing countries, as well as strengthen soil and plant carbon sinks globally (EIB, 2020).

As part of the European Green Deal, the European Commission developed the Farm to Fork strategy, which argues that there is an urgent need to reduce dependency on pesticides and antimicrobials, reduce excess fertilization (especially nitrogen and phosphorus), increase organic farming, improve animal welfare and reverse biodiversity loss (European Commission, 2020a).

Therefore, the F2F Strategy focuses on transforming the food system in Europe, but also on setting standards for food production worldwide (Fetting, 2020) in the urgent need to achieve a circular economy. In particular, the F2F Strategy focuses on the following areas: sustainable value chains; ensuring sustainable production; food security; stimulating sustainable food processing, wholesale, retail, hospitality and food services practices; promoting sustainable food consumption and a shift to healthy diets; reducing food loss and waste; combatting food fraud along the food supply chain (Fetting, 2020).

With the intention to provide financial instruments that mobilize sustainable development, until 2030 almost €500 billion from the EU Budget will be allocated through the EGD Investment Plan in these four key investment areas: sustainable infrastructure; research, innovation and digitisation; small and medium sized enterprises; social investment and skills (European Commission, 2020).

Moreover, climate-smart agriculture approaches (FAO, 2010) meant to increase productivity and resilience, reduce greenhouse gas emissions (FAO, 2011) and enhance achievement of national food security (FAO, 2016) and development goals (FAO, 2011a) are often linked to sustainable intensification practices, but worldwide adoption rates remain low or sub-optimal (FAO, 2017).

The ongoing war will only aggravate species loss, habitat destruction, pollution, the spread of invasive species, and the climate change crisis, forcing an accelerated overexploitation of Earth's resources, which constitutes a threat to humanity's survival. As a result of growing concerns about achieving sustainable development goals through the formation of a circular economy, an essential step to be adopted worldwide is the transition to renewable energy sources (Olabi, 2019 and Donia et al., 2018).

2. Building a sustainable future: overview of theoretical debates

The economic literature highlighting the crosscutting challenge for countries' economies and societies that climate change requires has been extensive in the last decade. At an international level, the concept of circular economy has been acknowledged to be the only solution to address the climate crisis by reshaping all the key sectoral systems: transport, buildings, power, industry, agriculture, forestry, finance (Geels and Schot, 2010). Besides building an industrial economy that is restorative or regenerative by intention and design (Ellen MacArthur Foundation, 2013), the circular economy focuses on the closing-the-loop philosophy by offering practical solutions for promoting entrepreneurial sustainability, economic growth, environmental resilience, and a better quality of life for all (Achillas et al., 2013). Thus, the circular economy has become an umbrella concept that encompasses different principles that have been around for a long time (e.g. industrial ecology, biomimicry and cradle-to-cradle) (Ceschin and Gaziulusoy, 2016).

First of all, by promoting the adoption of closing-the-loop production patterns within an economic system, circular economy aims to increase the efficiency of resource use, to achieve a better balance and harmony between economy, environment and society (Ghisellini et al., 2016). Ghisellini et al. (2016) suggest that nothing must be regarded as a waste, since everything can become a resource with a residual value that can be reintroduced and exploited within the same or a different supply chain. As a result, closing-the-loop can be applied not only to raw materials, but also to human resources, services, logistics, energy, water etc.

Secondly, applying climate crisis economics solutions is the main tool which must be globally implemented with the purpose of shifting the climate transition. Furthermore, the recent COVID-19 pandemic has demonstrated that our climate change goals can only be achieved if the net-zero goals and glidepath are supported and underpinned by the individual actions of citizens across the globe (Baskin, 2020). Therefore, the climate crisis economics represents a mix of economic and political economy policies and solutions needed to address climate change and accelerate the urgent and overdue transition to net zero (Mackintosh, 2022).

Additionally, the adoption of climate crisis economics englobes the circular economy with the purpose of overcoming societies' inherent resistance to change and to effectively eliminate GHG (greenhouse gas) emissions. Although the vast majority of studies (Ellen MacArthur Foundation, 2013 and Prendeville et al., 2014) have been conducted on this topic mainly centered on environmental and political aspects (Birat, 2015), many authors also focused on the economic and business perspective (Ghisellini et al., 2016 and Prendeville et al., 2014). Authors agree on the importance of reforming the agricultural sector by implementing new sustainable techniques in order to lower GHG emissions by conducting a war on carbon and carbon price. For instance, GHG reductions could be achieved if farmers managed fertilizer use better by avoiding overuse, runoff, and nitrous oxide production (Beerling et al., 2020). There are also many other alternative techniques with environmental GHG dividends: cover crop planting, no-till techniques, silvopasture, and alley cropping.

Nonetheless, even though the agricultural sector is not the only factor contributing to climate change by GHG emissions, it is the main cause of N_2O and CH_4 emissions and also highly vulnerable to climate change, which is threatening crop yields in many parts of the world (Ray et al., 2012). To help address this challenge, the concept of Integrated Nutrient Management (INM) is based on using all available sources of N inputs (organic, inorganic or biological). Although INM is considered a sustainable approach offering a number of potential cropping system benefits, there is limited research on the effects of this management strategy on air quality and climate change, particularly N_2O emissions (Graham et al., 2017).

One other concept closely related to sustainable intensification (SI) is climate smart agriculture, which shares many objectives and guiding principles with green economy and sustainable development approaches, but also includes a prioritization of food security and the desire to preserve natural resources (Campbell et al., 2014). On one hand, the agricultural sector is responsible for a significant share of global gas emissions, including through methane emissions from livestock, nitrous oxide from fertilizer use, and land use change (Uitto et al., 2017). Conventional farming, for instance, mostly uses pesticides and fertilizers to maximize the yield of a particular crop or set of crops, which are typically genetically modified (Moudry et al., 2020).

Moreover, conservation agriculture generally relies on the large-scale use of agrochemicals, with a reduction of energy efficiency and an increase in environmental impact, which proves to be really challenging if compared to integrated farming systems, where the application of agrochemicals is limited, but still allowed (Peruzzi et al., 2020). On the other hand, organic farming is based on rational use of natural resources, crop rotation, production of intermediate crops allowing the binding of nitrogen from the air, animal fertilizers, green fertilization and compost, biotic control of pests, and varieties more resistant to diseases and pests (Moudry et al., 2020).

As recent history showed us, not every green transition can positively reform and increase agricultural production. For example, the green revolution in the 1960s also had many adverse effects on the environment (Pingali, 2012), including soil acidification and pollution of waterways through export of mineral fertilizers not taken up by plants (Gora

and Beatty, 2011, and Mora et al., 2021). Yet, the negative effects of our societies' consumerism contribute approximately half of all food production-related greenhouse gas emissions caused by cattle, palm oil and rice crops (Uitto et al., 2017). At the same time, GHG emissions are growing instead of falling, and global trade is stalled by tensions between what used to be strong trading partners (Negi et al., 2020).

Still, while species loss, habitat destruction, pollution, the spread of invasive species, and climate change reflect the overexploitation of Earth's resources (IPBES, 2018), the evolving war between Russia and Ukraine, supported by its NATO allies, brings into question the problem of starvation used as a tactic of war.

3. Methodology

This chapter aims to present the cost-effectiveness analysis of the implementation of the green ambitions of the 2030 and 2050 EU plans in the fertilizer sector to deliver a zero emission economy. The research is based on cost-effectiveness assessment of mitigation options between different economic sectors, as well as the mitigation potential of technical practices in agriculture, using the marginal abatement cost curves (MACC) method.

Even though the MACC approach only takes into account the mitigation potential and costs, this appraisal allows administrative organs to develop policies and redirect investments in key areas prioritized according to their environmental impact. Because a marginal abatement curve shows the additional costs of reducing the last unit of carbon emissions, it evaluates the relationship between the potential GHG reductions from a low key policy option and its unit abatement cost.

This macroeconomic model of analysis applied at the level of the entire economy analyzes three different scenarios for the Romanian economy until 2050 using sectoral modeling for six interconnected sectors: water, agriculture, forestry, energy, transport and urban.

Firstly, the reference scenario or business-as-usual (BAU) explores the current economic growth and policy trends for Romania until 2050, without taking into consideration the urgent need for climate change actions and adaptation to the circular economy model. Yet, the BAU scenario only serves as reference for the green scenarios because it includes the GHG emissions reduction and renewable energy resources implemented by the Romanian economy in terms of the 2020 European Union Recovery Plan.

Secondly, the Green Scenario is generated by Romania's target to meet the European Green Deal's objectives of reducing greenhouse gas emissions by 55% until 2030 compared to 1990. Referring strictly to the agricultural sector, the main policy objectives are pesticide reduction by 50% and a fertilizer reduction by 20%. All the green actions firmly formulated by the European Commission represent a set of ambitious investments and policies, but also very useful if we were to achieve a net zero emission and shift climate change. The Green Scenario was developed due to the Paris Agreement Plan for the 28 member countries to build an European economy which limits global warming to 1.5°C.

Thirdly, the Super Green scenario represents the European guideline for 2050, integrating economic and climate solutions to maintain a long-term temperature increase of 1.5°C, but also to achieve net zero emissions by shifting energy use to renewables by 90% until 2040. Compared to the 1990 level, the greenhouse gas emissions must be reduced by 80%. The Super Green Scenario looks much more expensive than the Green Scenario and quite impossible to attain in times of war and humanitarian crisis.

In 2019, Romania counted 19.4 million inhabitants and almost six tone of CO_2 from GHG emissions for each individual person. Overall, Romania summed up more than 115 $MtCO_2e$ in 2021, according to the World Bank database. While agricultural land covers more than 60% and forests 28% of its surface, Romania hasn't obtained much progress in greenhouse gas emissions removals through land use, land-use change and forestry. Romania also stands on the fifth place in the European hierarchy of Member States often seen as having a carbon-intensive economy in terms of GDP, due to their industries' resilience in decarbonization.

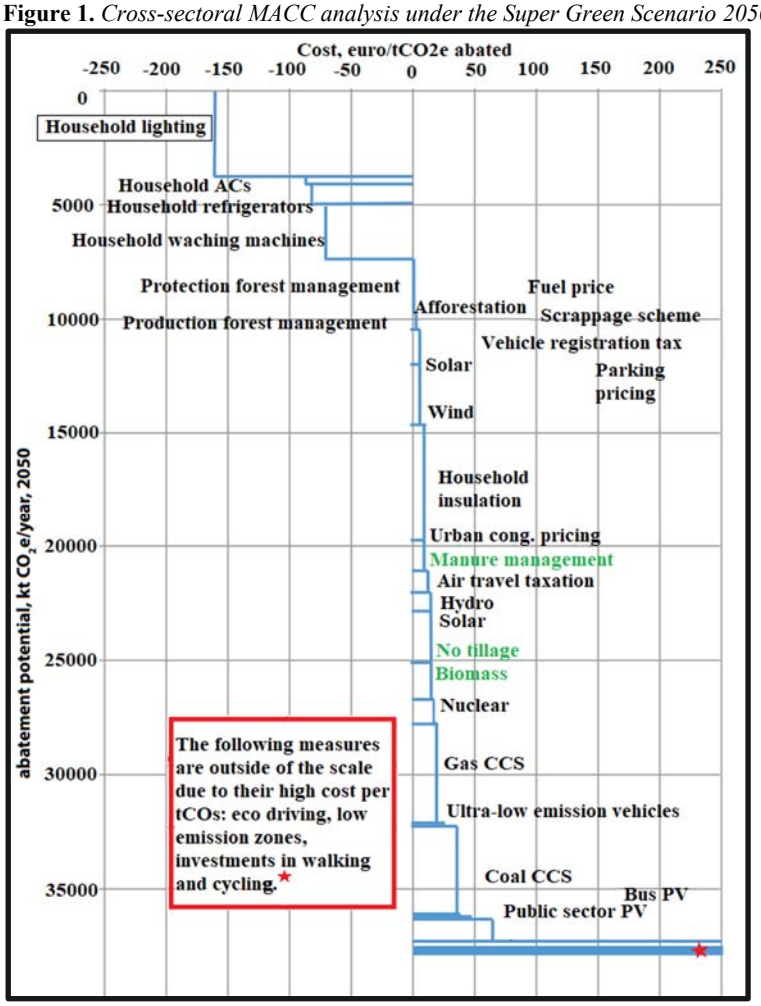
The MACC analysis was conducted using data from multiple sources (World Bank, Eurostat, and Romania's National Institute of Statistics databases) to offer a cross-sectoral perspective of the benefits and costs of the implementation of green abatement measures in five sectors: agriculture and forestry, power supply, energy efficiency, transport. In order to assess the green technologies of each sector in terms of potential abatement and cost of innovation/technology per unit of abatement, bottom-up Excel-based analysis was realized.

All these green measures applied in the five key sectors have the potential to reduce GHG emissions by 38 $MtCO_2e$ by year 2050, with the supply in energy recording the highest abatement share of 45% of total. A global insight also shows that agricultural measures are very cost efficient due to their mid-range abatement share per measure. For instance, no-tillage techniques, manure management or reducing the number of works are some of the best examples of green actions which benefit from a relatively low cost of implementation. These also represent mitigation measures since they lead to the reduction of greenhouse gas emissions.

Besides the above-mentioned agricultural green actions, the reduction of emissions caused by agriculture could be achieved by using proper equipment for storage and manure, renewable energy resources, as well as energy efficiency measures. In addition to the modernization of farms, there also has to be implemented a set of good farming practices, such as: pesticide reduction by 50%, fertilizer reduction by 20% until 2030 compared to 1990, and organic farming, which all proved to be linked to GHG emissions.

Figure 1 presents the cross-sectoral MACC analysis under the Super Green Scenario 2050 and evaluates the potential abatement of kt CO_2 in terms of cost. The green measures of mitigation are suggestively colored green, for an easier identification of our main concern: the agricultural sector. Consequently, the abatement cost of manure management rises at 20 euro/t CO_2e abated and offers a potential abatement of 21000 kt CO_2e/year, whereas no tillage measures are more expensive with a price of 30 euro per unit abated but a better abatement potential of approximatively 25000 kt CO_2e/year.

Figure 1. *Cross-sectoral MACC analysis under the Super Green Scenario 2050*



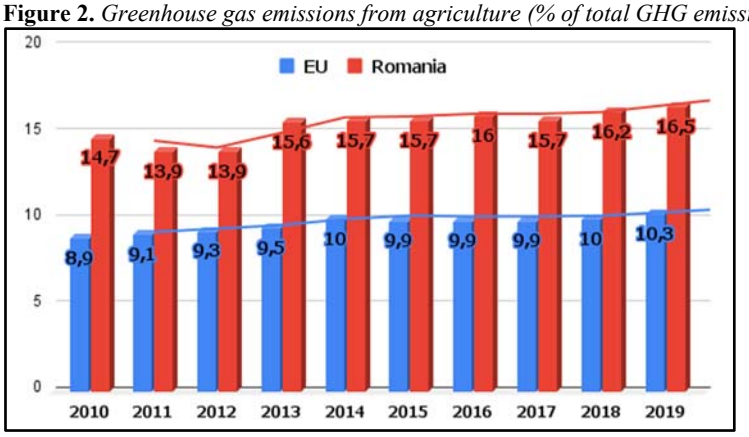
Source: Authors' modeling using World Bank and Eurostat data.

Compared to the European Union level in terms of average GHG emissions produced by agriculture, Romania has not scored much improvement since 2010 to present time. As a result, the agricultural sector is responsible for almost 17% of the total GHG emissions, which is above the average level of 10.3% achieved by the Member States of the EU.

Even though Romania's agricultural GHG emissions are 7% higher than the EU average level, both Romania and EU marked a constant and slow increase of GHG emissions from 2012 to 2019, caused by the multiplication of economic activities with intensive carbon emissions. As shown in Figure 2, the fertilizer industry plays an important role in the reduction of greenhouse gas emissions caused by the agricultural sector.

Furthermore, the fertilizer industry is directly responsible not only for the share of GHG emissions, but also for the food industry which is expected to grow in demand by 98% by 2050, even if the available agricultural land might diminish or lose its nutritional value if not treated accordingly.

Figure 2. *Greenhouse gas emissions from agriculture (% of total GHG emissions from 2010 to 2019)*

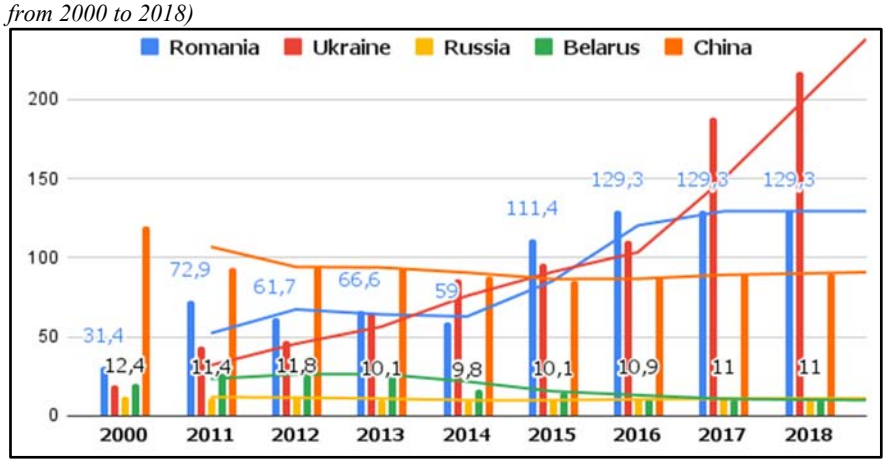


Source: Authors' construction using Eurostat data.

Because the increasing amount of food globally produced generates an enormous amount of waste, agriculture is the only actor able to improve the initiatives and technologies from the fertilizer sector and develop organic farming, as well as less resource-intensive techniques that make crops more sustainable and more productive.

Since 2015, Romania became more dependent on imports of fertilizers because the internal fertilizer production remained lower than the demand for fertilizers (Figure 3). For instance, a share of 66% of fertilizer consumption in 2013 should be interpreted as a 34% excess in fertilizer production traded in exports, whereas the current level of 129% share in fertilizer consumption represents a 29% share of imports of fertilizers.

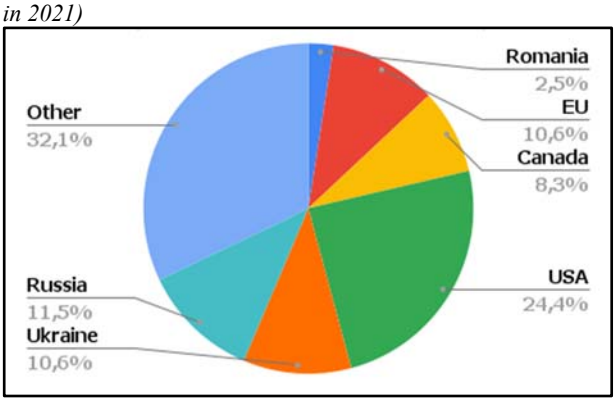
Figure 3. *Fertilizer consumption of Romania, Ukraine, Russia, Belarus and China (% of fertilizer production from 2000 to 2018)*



Source: Authors' construction using World Bank data.

The fertilizer industry is directly correlated to the potential for grains' production. In 2021, more than 10% of world's total grains production was assured by the Ukrainians (Figure 4), an amount equal to the total amount of grains produced by the 28 Member States of the EU. In addition, Romania kept its position among the most productive European countries with a 2.5% exports share of the world grains production.

Figure 4. *Exports share of Romania, Ukraine, Russia, USA, Canada and EU (% of world grains production in 2021)*

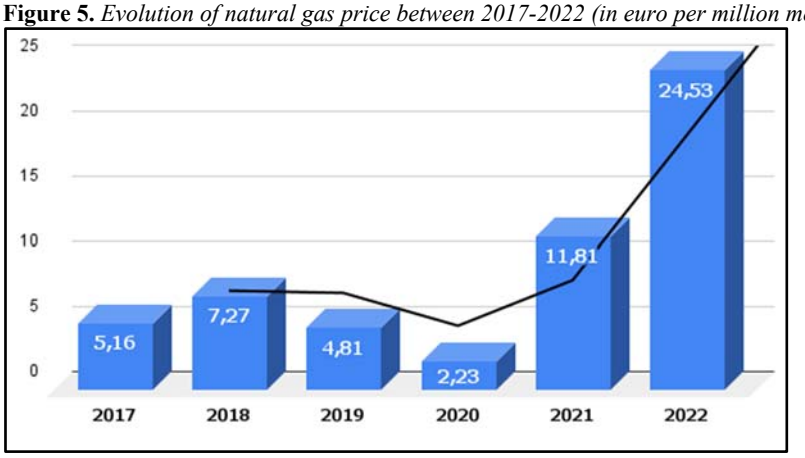


Source: Authors' construction using International Grains Council data.

Because Russia's consumption of fertilizers only represents 11% of their total production (Figure 3), the difference was mainly consumed by the European countries that used to import ammonia, urea or potash from the Russians. Currently, the Russian ammonia pipeline that transported it right down into the Black Sea is shut off and prospects for a reconciliation are furthest than ever.

Similarly, the market of urea will be affected by the sanctions imposed on Russia, who used to export 14% of the global ammonia export market. In the short term, the fertilizer industry already shows signs of concerns with an explosion of fertilizer prices. Moreover, Russian gas is no longer being delivered to the European Union, which is why the natural gas price has more than doubled since 2021 as year of reference (Figure 5).

Figure 5. *Evolution of natural gas price between 2017-2022 (in euro per million metric British thermal unit)*



Source: Authors' construction using World Bank database.

All around the world, fertilizers prices are inelastic in the short term and directly affected by any change suffered by the market. Natural gas is used by the fertilizer industry in high quantities, making the resulting fertilizer prices too expensive for distributors and farmers. No business can afford a superior production price than the demand is willing to pay. The negative effects of soaring gas prices expand throughout society: householdings being

unable to pay their gigantic gas bill, people suffering from the cold because they have no possibility to sustain the price increase, businesses closing their activity and employees losing their jobs etc.

Table 1. *Example of production costs for urea*

	2017	2022	Growth rate
Natural gas price (euro/mmBtu)	3,63	24	561,16%
Gas consumption (mmBtu/t ammonia)	36	36	-
Gas COST (euro)	130,68	864	561,16%
Production Costs (euro)	26	26	-
Cost of ammonia	156,68	890	468,04%
Ammonia use for conversion to urea	0,58 t ammonia/t urea	0,58 t ammonia/t urea	-
Ammonia cost for urea	90,82	516	468,18%
Process gas (euro/t urea)	12,3	95	672,36%
Other production costs (euro/t urea)	14	54	285,71%
Total Cost for urea (euro/t)	117,12	665	467,79%

Source: Authors' construction using Yara International reports.

An overview of the example of production costs for urea (Table 1) brings a close insight to the total production cost formula used by fertilizer producers. The comparative analysis of the production costs for urea in 2017 with those supported by the fertilizer producers in 2022 highlights the impact of the increase of natural gas price on the final price of fertilizers that raises concerns over the profitability of this industry.

In Europe, natural gas price was below 4 euro per million metric British thermal units in 2017, and sank to 2.5 euro/mmBtu in 2020 when the pandemic shut down economies all over the globe and kept societies under lockdown. One year forward, economies were revitalized as people from every corner of the world were vaccinated against the COVID-19, so natural gas price has begun to climb a very steeply inclined slope, hitting a maximum of 24 euro/mmBtu in March 2022 (Table 1).

Romania's fertilizer industry is one of the most important industries in Eastern Europe. Azomureş of Targu Mureş is a key element of the fertilizer supply chain ensuring food security with its annual production capacity exceeding 1.8 million tons (urea and melamine), 70% of them bought by local farms. As a consequence of the continuous natural gas price inflation, Azomureş made the announcement of shutting down production in December 2021 (Azomureş, 2022).

Unfortunately, carbon certificates which are indispensable for climate change purposes, have a negative impact for the businesses in the fertilizer industry by generating a superior production cost and resulting in a premium selling price. In contrast to their price of 30 euro per ton CO_2 at the beginning of 2021, carbon certificates cost more than 80 euro/ton CO_2 this year.

4. Conclusions

This research paper shows that under current geopolitical circumstances none of the MACC scenarios could be achieved. On the contrary, climate change related problems concerning species loss, soil degradation, air and marine pollution, or even hazardous weather conditions seem meaningless compared to the potential use of nuclear weapons by the Russian government.

Altogether, the European Union should help and offer guidelines to United Nations members in implementing a World Carbon Organization (Mackintosh, 2022) having the role of reducing volatility in carbon certificate prices and promoting the war on carbon. Only by creating new international forces can we achieve the goal of decarbonization by 2050. In its plan to achieve carbon neutrality, Azomureş proposes storing CO_2 emissions in underground storages from where methane gas has been extracted over the years and which can now store significant amounts of emissions (Azomureş, 2021), one type of action that could be implemented worldwide.

Additionally, there are also other measures that can be widely applied by farmers. Such is the case of treating the cropland with rock dust (Beerling et al., 2020), which enables a chemical reaction in the soil that has the effect of locking CO_2 into the soil, and eventually reducing the global GHG emissions.

Furthermore, studies show that new fertilizer practices can be used with the aim to reduce the N loss (Incrocci et al., 2021), as well as new farming systems (no- tillage) that maximize the benefits of cover crops and resource efficiency in organic farming (Peruzzi et al., 2020). On the other hand, these techniques require weed management and nutrient availability that can badly affect the crops performance.

Overall, the increase of electricity, natural gas and raw materials generated a very negative impact on the Romanian fertilizer industry. This led to one of the biggest national fertilizer companies' announcement to close down production due to potential final prices impossible to be afforded by distributors and farmers. Thus, the spring agricultural season will be affected not only by the drought, but also by the supply of fertilizers, then spinning its impact on the summer crops.

For this reason, the European Union must lead the journey of economic and military solidarity towards the pathway to climate change, but also towards unity in a democratic and peaceful paradigm. The Eastern European crisis will slowly affect the rest of the world, with globalization being the force of propagation throughout societies and economies, hence the desperate need of ending World War III before it truly started.

References

Azomureş, 2021. *Azomureş proposes to the authorities and the national economic environment solutions for reducing CO_2 emissions into the atmosphere*. [press release] 16 September 2021. Available at: <https://www.azomures.com/wp-content/uploads/2021/09/Comunicat-de-presa-solutii-de-stocare-CO2-septembrie-2021.pdf> [Accessed 12 February 2022].

Azomureş, 2022. *Romania's Food Security. Preventive measures on avoiding a potential crisis*. [press release] 11 March 2022. Available at: <https://www.azomures.com/wp-content/uploads/2022/03/Comunicat-de-presa-masa-rotunda-securitate-alimentara-martie-2022.pdf> [Accessed 12 February 2022].

Baskin, K., 2020. Four lessons from COVID- 19 to help fight climate change. *MIT Sloan School of Management*, [online] Available at: <https://mitsloan.mit.edu/ideas-made-to-matter/4-lessons-covid-19-to-help-fight-climate-change> [Accessed 19 February 2022].

Beerling, D.J., Kantzas, E.P., Lomas, M.R., Wade, P., Eufrasio, R.M., Renforth, P. et al., 2020. Potential for large-scale CO_2 removal via enhanced rock weathering with croplands. *Nature*, [online] Available at: <https://www.researchgate.net/publication/342802195_Potential_for_large-scale_CO2_removal_via_enhanced_rock_weathering_with_croplands> [Accessed 19 February 2022].

Birat, J.-P., 2015. Life-cycle assessment, resource efficiency and recycling. *Metallurgical Research & Technology*, [e-journal] 112. Abstract only. Available through: EDP Sciences Library website <https://doi.org/10.1051/metal/2015009> [Accessed 19 February 2022].

Campbell, B.M., Thornton, P., Zougmoré, R., van Asten, P. and Lipper, L., 2014. Sustainable Intensification: What is its Role in Climate Smart Agriculture?. *Sustainability*, [e-journal] 8, pp. 39-43. Available through: ScienceDirect Library website <https://doi.org/10.1016/j.cosust.2014.07.002> [Accessed 20 February 2022].

Ceschin, F. and Gaziulusoy, I., 2016. Evolution of design for sustainability: from product design to design for system innovations and transition. *Design Studies*, [e-journal] 47, pp. 118-163. Available through: ScienceDirect Library website <https://doi.org/10.1016/j.destud.2016.09.002> [Accessed 20 February 2022].

Crippa, M., Solazzo, E., Guizzardi, D., Tubiello, F.N. and Leip, A., 2022. Climate goals require food systems emission inventories. *Nature Food*. Available at: doi:10.1038/s43016-021-00450-2

Donia, E., Mineo, A. and Sgroi, F., 2018. A methodological approach for assessing business investments in renewable resources from a circular economy perspective. *Land Use Policy*, [e-journal] 76, pp. 823-827. Available through: ScienceDirect Library website <https://doi.org/10.1016/j.landusepol.2018.03.017> [Accessed 19 February 2022].

Ellen MacArthur Foundation, 2013. *Towards the circular economy: economic and business rationale for an accelerated transition*, Vol. 1, [pdf] Ellen MacArthur Foundation. Available at: <https://emf.thirdlight.com/link/x8ay372a3r11-k6775n/@/preview/1?o> [Accessed 19 February 2022].

EIB, 2020. *EIB Group Climate Bank Roadmap 2021-2025.* [pdf] Luxembourg: European Investment Bank. Available at: <https://www.eib.org/attachments/thematic/eib_group_climate_bank_roadmap_en.pdf> [Accessed 12 February 2022].

European Commission, 2020. *Overview of Sustainable Finance*. [online] Brussels: European Commission. Available at: <https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/overview-sustainable-finance_en> [Accessed 1 February 2022].

European Commission, 2020a. *Farm to fork strategy*. [online] Brussels: European Commission. Available at: <https://ec.europa.eu/food/horizontal-topics/farm-fork-strategy_ro#documents> [Accessed 12 February 2022].

FAO, 2010. *Climate-Smart Agriculture: Policies, Practices and Financing for Food Security, Adaptation and Mitigation*. [online] FAO, Rome. Available at: <https://www.fao.org/3/i1881e/i1881e00.pdf> [Accessed 12 February 2022].

FAO, 2011. *Climate Change Mitigation Finance for Smallholder Agriculture: A guide book to harvesting soil carbon sequestration benefits*. [online] Food and Agriculture Organization of the United Nations. Available at: <http://www.fao.org/docrep/015/i2485e/i2485e00.pdf> [Accessed 12 February 2022].

FAO, 2011a. *Climate Smart Agriculture: A Synthesis of Empirical Evidence of Food Security and Mitigation Benefits from Improved Cropland Management, Mitigation of Climate Change in Agriculture.* [online] Food and Agriculture Organization of the United Nations. Available at: <https://www.fao.org/3/i2574e/i2574e00.pdf> [Accessed 12 February 2022].

FAO, 2016. *Climate change Agriculture and Food Security*. [online] State of Food and Agriculture Report, FAO Rome. Available at: <http://www.fao.org/3/a-i6030e.pdf> [Accessed 12 February 2022].

FAO, 2017. *Climate Smart Agriculture Sourcebook- second edition*. [online] Food and Agriculture Organization of the United Nations. Available at: <https://www.fao.org/climate-smart-agriculture-sourcebook/concept/module-a2-adaptation-mitigation/chapter-a2-2/en/> [Accessed 12 February 2022].

Fertilizers Europe, 2021. *Overview 2019/20*. [online] Brussels: Fertilizers Europe. Available at:<https://www.fertilizerseurope.com/wp-content/uploads/2020/06/web-AR-201920_32-pager-final-spread.pdf> [Accessed 12 February 2022].

Fetting, C., 2020. *The European Green Deal*. [online] Vienna: ESDN Office. Available at: <https://www.esdn.eu/fileadmin/ESDN_Reports/ESDN_Report_2_2020.pdf> [Accessed 12 February 2022].

Geels, F.W. and Schot, J., 2010. *The dynamics of transitions: A socio-technical perspective. Transitions to sustainable development: New directions in the study of long term transformative change.* [e-book] New York and London: Routledge, pp. 11–104. Available at: ResearchGate.net<https://www.researchgate.net/publication/273697987_The_Dynamics_of_Transitions_A_Socio-Technical_Perspective> [Accessed 4 March 2022].

Geng, Y. and Doberstein, B., 2008. Developing the circular economy in China: challenges and opportunities for achieving 'leapfrog development'. *International Journal of Sustainable Development & World Ecology*, [online] Available at: <https://www.academia.edu/6461980/Developing_the_circular_economy_in_China_Challenges_and_opportunities_for_achieving_leapfrog_development> [Accessed 4 March 2022].

Ghisellini, P., Cialani, C. and Ulgiati, S., 2016. A review on circular economy: The expected transition to a balanced interplay of environmental and economic systems. *Journal of Cleaner Production*, [e-journal] 114, pp. 11-32. Available through: ScienceDirect Library website: <https://doi.org/10.1016/j.jclepro.2015.09.007> [Accessed 19 February 2022].

Good, A.G. and Beatty, P.H., 2011. Fertilizing Nature: A Tragedy of Excess in the Commons. *PLoS Biology*, [e-journal] 9, 8. <https://doi.org/10.1371/journal.pbio.1001124>.

Graham, R.F., Wortman, S.E. and Pittelkow, C.M., 2017. Comparison of Organic and Integrated Nutrient Management Strategies for Reducing Soil N_2O Emissions. *Agronomy & Horticulture - Faculty Publications*, [online] Available at: <https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=2050&context=agronomyfacpub> [Accessed 19 February 2022].

Incrocci, L., Maggini, R., Cei, T., Carmassi, G., Botrini, L., Filippi, F., Clemens, R., Terrones, C. and Pardossi, A., 2021. Innovative Controlled-Release Polyurethane-Coated Urea Could Reduce N Leaching in Tomato Crop in Comparison to Conventional and Stabilized Fertilizers. *Agronomy,* [online] 10, 7-23. Available at: <https://www.researchgate.net/publication/347797629_Innovative_Controlled-Release_Polyurethane-Coated_Urea_Could_Reduce_N_Leaching_in_Tomato_Crop_in_Comparison_to_Conventional_and_Stabilized_Fertilizers> [Accessed 19 February 2022].

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), 2018. *The assessment report on land degradation and restoration*. [pdf] Bonn: IPBES. Available at: <https://ipbes.net/sites/default/files/2018_ldr_full_report_book_v4_pages.pdf> [Accessed 19 February 2022].

International Grains Council, 2022. *International Grain Market Report*. [online] Available at: <https://www.igc.int/en/gmr_summary.aspx#> [Accessed 17 March 2022].

IRENA, 2020. *The post-COVID recovery: An agenda for resilience, development and equality*. [pdf] Abu Dhabi: International Renewable Energy Agency. Available at: <https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jun/IRENA_Post-COVID_Recovery_2020.pdf> [Accessed 12 February 2022].

Jakobsson, E., 2021. Political Attention in a Creeping Crisis: The Case of Climate Change and Migration. *Understanding the Creeping Crisis*, [e-journal] 8, 131-148. Available at: Directory of Open Access Books website <https://library.oapen.org/handle/20.500.12657/48682> [Accessed 19 February 2022].

Mackintosh, S.P.M., 2022. *Climate Crisis Economics*. [e-book] New York: Routledge. Available at: Directory of Open Access Books website <https://directory.doabooks.org/handle/20.500.12854/78657> [Accessed 18 February 2022].

Mora, M.D.L.L., Cartes, P., Núñez, P., Salazar, M. and Demanet, R., 2021. Movement of n0(3)-n and nh4-n in an andisol and its influence on ryegrass production in a short term study (2007). *Revista de la Ciencia del Suelo y Nutrición Vegetal*, [online] 7, pp. 46-64. Available at: <https://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0718-27912007000200005&lng=en&nrm=iso&tlng=en> [Accessed 18 February 2022].

Moudrý, J., Mendes, K.F., Bernas, J., da Silva, T.R. and de Sousa, R.N., 2020. *Multifunctionality and Impacts of Organic and Conventional Agriculture*. [e-book] London: IntechOpen. Available at: Directory of Open Access Books website <https://mts.intechopen.com/storage/books/6988/authors_book/authors_book.pdf> [Accessed 18 February 2022].

Negi, A., Pérez-Pineda, J.A. and Blankenbach, J., 2020. *Sustainability Standards and Global Governance. Experiences of Emerging Economies*. [e-book] Bonn: Springer. Available at: Springer Links Library website <https://link.springer.com/content/pdf/10.1007%2F978-981-15-3473-7.pdf> [Accessed 18 February 2022].

Olabi, A.G., 2019. Circular economy and renewable energy. *Energy*, [e-journal] 181, pp. 450-454. Available through: ScienceDirect Library website <https://doi.org/10.1016/j.energy.2019.05.196> [Accessed 18 February 2022].

Peruzzi, A., Frasconi, C. and Antichi, D., 2020. Smart Management of Conservative, Organic and Integrated Agriculture. *Agronomy*, [online] Preface, IX-X. Available at: <https://dlib.hust.edu.vn/bitstream/HUST/18964/1/OER000001534.pdf> [Accessed 19 February 2022].

Pingali, P.L., 2012. Green revolution: Impacts, limits, and the path ahead. *The Proceedings of the National Academy of Sciences*, [online] 109, pp. 12-302. Available at: <https://www.academia.edu/9991638/Green_Revolution_Impacts_limits_and_the_path_ahead> [Accessed 20 February 2022].

Prendeville, S., Sanders, C., Sherry, J. and Costa, F., 2014. *Circular Economy: Is it Enough?* [online] Ecodesign Center. Available at: <https://www.researchgate.net/publication/301779162_Circular_Economy_Is_it_Enough> [Accessed 20 February 2022].

Ray, D.K., Ramankutty, N., Mueller, N.D., West, P.C. and Foley, J.A., 2012. Recent patterns of crop yield growth and stagnation. *Nature Communication*, [e-journal] 3, 1293. <http://dx.doi.org/10.1038/ncomms2296>

Taleb, N.N., 2010. *Black Swan: The Impact of the Highly Improbable.* 2nd edition. Bucharest: Curtea Veche Publishing. Prologue, 24.

Uitto, Juha I., Puri, Jyotsna and van den Berg, Rob D., eds. 2017. *Evaluating Climate Change Action for Sustainable Development*. Foreword. [e-book] Cham: Springer Nature. Available at: Directory of Open Access Books website <https://directory.doabooks.org/handle/20.500.12854/31467> [Accessed 20 March 2022].

UNFCCC, 2008. *Kyoto Protocol Reference Manual on Accounting of Emissions and Assigned Amount United Nations Framework Convention on Climate Change*. [pdf] United Nations Framework Convention on Climate Change. Available at: <https://unfccc.int/resource/docs/publications/08_unfccc_kp_ref_manual.pdf> [Accessed 10 February 2022].

World Bank, 2018. *Fertilizer consumption*. [online] The World Bank Group. Available at: <https://data.worldbank.org/indicator/AG.CON.FERT.PT.ZS?view=chart> [Accessed 10 February 2022].

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 53-59

The smart transformation of cities – a possible solution for the transition to a green economy

Anca DACHIN
Bucharest University of Economic Studies, Romania
daniela.dachin@economie.ase.ro

Abstract. *Urbanization has become a global phenomenon, and the concentration of economic and social activities in urban centers has generated more economic development, but has also become a cause of imbalance between human activity and the natural environment. The negative effects of urban agglomeration have put pressure on communities to find creative solutions to evolve into new forms of organization and functioning. The transformation of cities into smart cities is a trend that aligns with the EU's new goals of moving to the green economy. The Covid-19 pandemic has accelerated the transition to a smart city development pattern. The paper focuses on the analysis of the ranking of European smart cities according to the specific criteria and highlights efforts of Romanian cities to enter this path of development.*

Keywords: urbanization, Green Deal, smart city, capital city, smart projects.

JEL Classification: R11, R58.

Introduction

Urbanization has become a megatrend in the world. The United Nations estimates that 70% of the world's population will live in cities, while the number of cities with more than 1 million inhabitants is growing (Swiaczny 2019), especially in the less developed regions of the world, which is a challenge for achieving the sustainable development goals (SDGs).

The concentration of activity in urban centers has led to their transformation into poles of economic growth with high impact on regional development. On the other hand, the negative effects of urban agglomerations are a threat to the health of the planet, not just locally. Within the European Union, the Green Deal is a fight against pollution, but also a fight for fairness and equality (European Commission 2019). The Green Deal is seen as a 'policy mix' innovation (Bloomfield and Steward, 2020). A large part of the Green Deal strategy directly or indirectly targets cities: reducing pollution, recycling, building and renovating in a sustainable way, accelerating the transition to smart mobility, etc. On the basis of a resolution, the European Parliament proposed to make 2022 the European Year of Greener Cities, while the EU action plan towards zero pollution (European Commission, 2021). The action of supporting zero pollution refers to identifying key urban greening and innovation to prevent pollution, including indoors.

This new strategic direction of development has created pressure on communities to find creative solutions to evolve into new forms of organization and functioning. To meet the requirements, cities, especially in developed countries, are moving towards a new model called *smart city*. The term has become increasingly popular, but still does not benefit from an accurate and generally recognized definition. The term has evolved from "sustainable city" to "digital city" and since 2009 "smart city" (Eremia et al., 2017). According to the European Commission "A smart city is a place where traditional networks and services are made more efficient with the use of digital solutions for the benefit of its inhabitants and business". The concept of smart city covers a wide range of issues such as: smart economy, smart mobility, smart environment, smart people, smart living and smart governance. All can be improved with the help of digitalization and sustained innovation. Every city seeks to find local development solutions, and inscribing their actions on the path of smart development becomes a goal. The Covid-19 pandemic has accelerated the transition to a smart city development pattern.

The paper focuses the ranking of European cities according to specific smart city and progress assessment of Romanian cities to enter this path of development. To highlight the situation in Romania, the main data come from the company Vegacomp Consulting and the Romanian Association for Smart City. The research method consists in descriptive statistical analysis and qualitative observations, which allow to outline current trends.

1. Smart city ranking in Europe

The transformation of European cities into smart cities began more than 15 years ago, for example in Barcelona or Copenhagen, on the basis of measures to reduce energy consumption and carbon dioxide emissions, waste management, etc. Meanwhile, the

specific objectives of modern urban development have diversified, and the use of digital technologies has become indispensable. According to SCO Smart City Observatory, Singapore University of Technology and Design, many cities around the world follow this directive and can be evaluated on the basis of a Smart City Index. The first place in the world is the city of Singapore, followed by many European cities. Figure 1 and Figure 2 present the rank of European cities based on the 2020 evaluations, using categories, among which the best ranked category is AA, and the lowest ranked is CCC. In Europe, Helsinki was the best in 2020, followed by category A and BBB cities located in the north and center of the continent.

Figure 1. *European cities evaluated with AA, A and BBB, 2020*

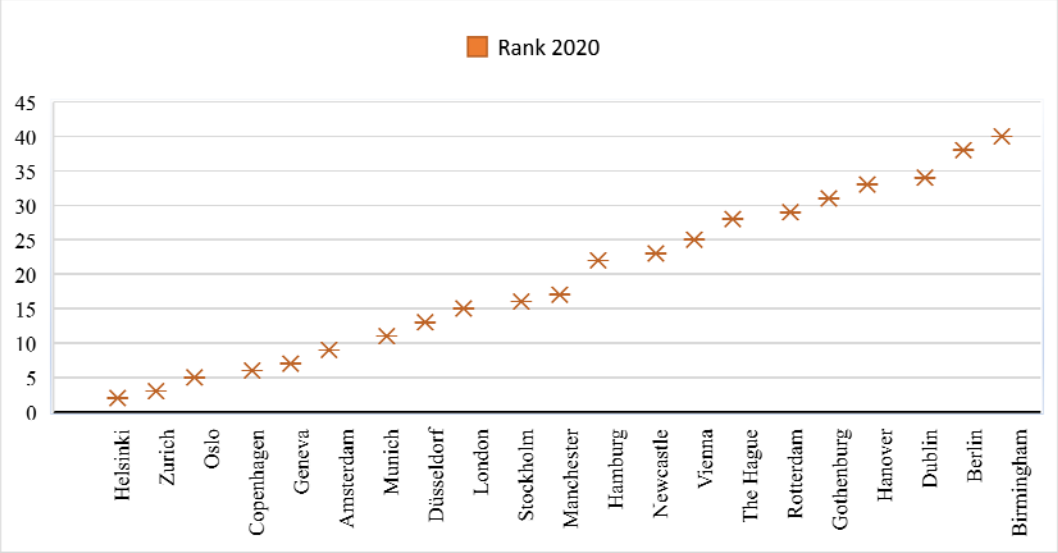
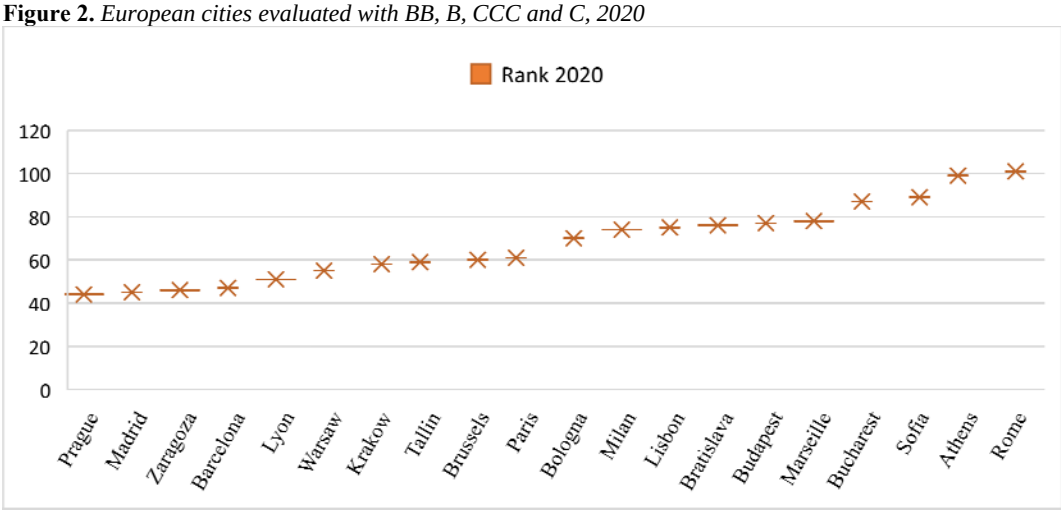


Figure 2. *European cities evaluated with BB, B, CCC and C, 2020*



Source: IMD Competitiveness Center, SCO Smart City Observatory, Singapore University of Technology and Design, https://www.imd.org/smart-city-observatory/smart-city-index/

Although not all cities in this ranking meet the specific smart city criteria, they are still taken into account because they make some efforts in this direction. We notice that in Figure 2 there are several cities from Central and Eastern Europe, including Bucharest in the CCC category. Comparing the situation from 2020 with the previous one, it can be seen that new cities can appear in the list, sometimes well positioned, and others may decrease in the ranking, sometimes significantly. However, the top group remains, despite some permutations within it.

Table 1 presents a comparison of Bucharest with other Central and Eastern European cities, as well as with Helsinki as the top smart city in Europe in 2020. These cities have a relatively comparable population, but different ranking in the world.

Table 1. *Background characteristics of cities in 2018 and smart city ranking in 2020*

	Bucharest	Sofia	Budapest	Warsaw	Helsinki
Population (persons)	1,868,000	1,226,000	1,714,000	1,722,000	1,180,000
HDI	0.816	0.816	0.845	0.872	0.925
Life expectancy at birth	75.9	74.9	76.7	78.5	81.7
Expected years of schooling	14.3	14.8	15.1	16.4	19.3
Mean years of schooling	11.0	11.8	11.9	12.3	12.4
GNI per capita (PPP $)	23,906	19,646	27,144	27,626	41,779
Smart city rank in 2020 (out of 109 in the world)	87	89	77	55	2
Smart city rating in 2020	CC	CC	CCC	B	AA

Source: IMD Competitiveness Center, SCO Smart City Observatory, Singapore University of Technology and Design, https://www.imd.org/smart-city-observatory/smart-city-index/

Data reveal that the achievements in the smart city direction are closely correlated with the level of human development, the level of education and economic resources.

2. Progress of Romanian cities on the path of smart development

Capital cities concentrate important resources and usually have a special economic dynamic. In the countries of the Eastern European Union, the capital metropolitan regions had in the period 2001-2019 annual average % change on the previous year of GDP per capita of 4.1% compared to 3.6 in total, concentrating even more labor force (European Commission 2021). The city of Bucharest is in line with this trend, being the only region in Romania that has exceeded the EU27 average in GDP per capita (in PPS). Even in these conditions, the aspiration to become smart was less obvious in Bucharest until 2021, according to available data (Vegacomp Consulting 2020), instead it manifested itself in other cities, some of them being small in size.

Table 2 shows the number of smart projects that support the development of smart cities in Romania, by main areas considered representative for this evolution. Among the first cities to focus on such projects was the city of Alba Iulia, as well as Cluj Napoca. The city of Bucharest, with its six sectors, each of comparable size to other large cities in the country, has launched projects throughout the city and by sector. Sector 4 seems to be the most dynamic from this point of view.

Table 2. *Top cities in Romania having projects for smart city development, in 2021*

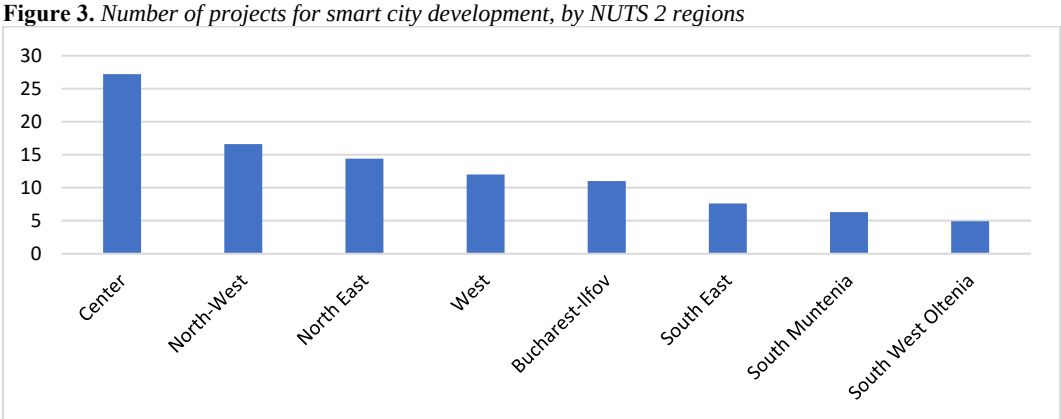
City	Total number of projects	Smart Economy	Smart Mobility	Smart Environment	Smart People	Smart Living	Smart Governance
Alba Iulia	106	24	17	8	8	24	25
Cluj Napoca	58	3	21	5	3	12	11
Timișoara	26	5	9	1	1	6	4
Arad	29	2	7	2	6	3	9
Iași	56	4	17	13	2	10	10
Brașov	18	1	7	1	1	2	6
Bucuresti	39	1	14	2	0	11	11
București Sector 4	35	2	10	1	1	10	11
Oradea	26	1	9	1	0	10	5
Sibiu	27	5	10	3	0	3	6
Piatra Neamț	15	1	5	2	0	5	2
Botosani	15	3	2	0	1	5	4
Deva	15	0	4	1	0	8	2
Hunedoara	15	0	2	1	0	7	5

Source: Vegacomp Consulting, *Radiografia smart city în România*, 5th edition, June 2021.

In addition to the cities mentioned in table 2, there are others that have launched far fewer projects, maybe even just one. Although the number of projects is not the most relevant indicator, it still reflects the interest of communities in urban modernization that is foreshadowing in the 21st century.

The regional distribution at NUTS2 level of smart projects in 2021 shows us that the greatest interest was shown by the cities in the regions Center, North-West and North-East (Figure 3), which have a greater determination in the direction of smart modernization.

Figure 3. *Number of projects for smart city development, by NUTS 2 regions*

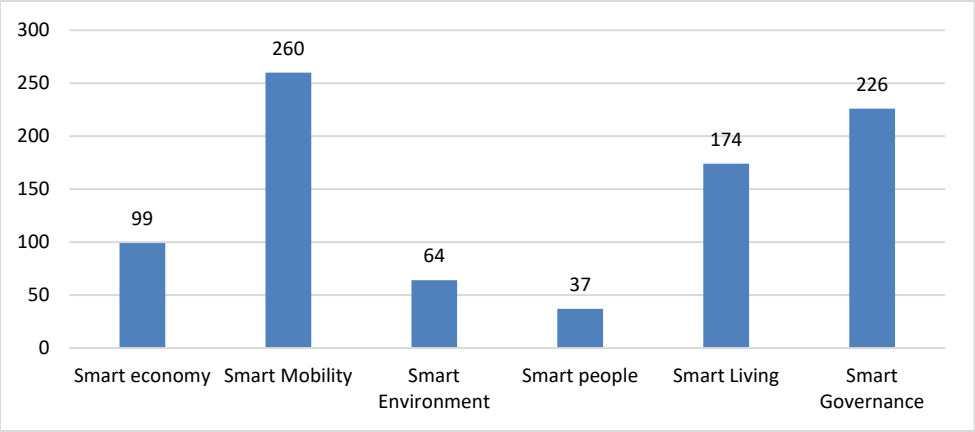


Center	North West	North-East	West
Alba Iulia	Cluj Napoca	Iasi	Arad
Sibiu	Oradea	Piatra Neamt	Timisoara
Brasov	Baia Mare	Botosani	Deva
Avrig	Bistrita		Hunedoara

Source: own representation based on data from Vegacomp Consulting, *Radiografia smart city în România*, 5th edition, June 2021.

Including all the cities in Romania that had viable projects in 2021, regardless of their number, it can be seen that they are mainly oriented towards smart mobility, smart governance and smart living (Figure 4).

Figure 4. *Number of projects for smart city development, by category, June 2021*



Source: own calculations based on data from Vegacomp Consulting, *Radiografia smart city în România*, 5th edition, June 2021.

The Romanian Association for Smart City systematically provides information through periodic reports, which highlight both the projects in various stages of implementation and the concrete plans of urban communities. A qualitative analysis of the project orientation shows that at present they aim primarily at the following improvements (selection):

Smart mobility:

- acquisitions of electric vehicles for public transport;
- reorganization of parking lots and optimization with the help of smart applications;
- bicycle tracks and bike sharing systems;
- smart ticketing systems for public transport;
- establishing pedestrian areas in the city.

Smart governance:

- smart applications for communication between citizens and the mayor's office;
- smart ticketing management system and control of own passenger traffic;
- open data platforms at the mayor's office level;
- participatory reporting and budgeting platform;
- applications for online payment of taxes and fees;
- elaboration of the Smart City strategy.

Smart living:

- new public lighting system through computerized remote management;
- support for organizing cultural events;
- new general urban plan to bring life to neighborhoods;
- rehabilitation of old buildings and their transformation into cultural centers;
- arranging theme parks, including with internet access and video surveillance;
- introduction of intelligent urban furniture with video monitoring systems;
- through the graffiti technique, the trams that run in the city to receive a modern and attractive; appearance, through which to artistically promote the image of the city.

3. Conclusions

Achieving the objectives of the European Green Deal involves many actions, to which urban communities can contribute, especially since they concentrate more than half of the population. The chance to move faster towards the green economy increases as urban communities mobilize to adopt a new path of development embodied today in the smart city model.

In the European hierarchy of smart cities, only one Romanian city is mentioned, respectively Bucharest, the country's capital. Although it does not meet the characteristics of a smart city, it had a high GDP/inhabitant dynamic in the last two decades, just like other capitals. The comparison with other Central and Eastern European cities reveals that the achievements in the smart city direction are in close correlation with the level of human development, the level of education and the economic resources.

In Romania, in 2021, the highest number of projects is concentrated in Bucharest, but there are several other cities, of different sizes, that make development efforts in the direction of smart city, and the number of those who develop projects in this regard increases from one year to another. The territorial distribution of the projects shows us that the development trend of the cities towards the smart model is more accentuated in the regions Center, North West, North East and West. Most projects are oriented towards the fields of smart mobility, smart governance and smart living, but there is no uniformity of objectives and implementation methods.

References

Bloomfield, J. and Steward, F., 2020. The Politics of the Green New Deal. *The Political Quarterly*, Vol. 09, No. 18, pp. 770-779. doi: <https://doi.org/10.1111/1467-923X.12917>.

Eremia, M., Toma, L. and Sanduleac, M., 2017. The Smart City Concept in the 21st Century. *Procedia Engineering*, pp. 12-19.

European Commission. 2021. Cohesion in Europe towards 2050. Eighth Report on Economic, Social and Territorial Cohesion. Luxembourg: Publications Office of the European Union.

European Commission. 2021. Pathway to a Healthy Planet for All. EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil'. Communication from the Commission, Brussels. <https://ec.europa.eu/environment/pdf/zero-pollution-action-plan/communication_en.pdf>

European Commission, 2019. The European Green Deal. Communication from the Commission.

Swiaczny, F., 2019. Demographic megatrends and global population growth. Population Division, UNDESA, United Nations, New York. <https://www.un.org/en/development/desa/population/events/pdf/expert/30/presentations/Monday/Session2/Frank_Swiaczny_UNDESA_PowerPoint_EGM%20CPD53.pdf>

Vegacomp Consulting, 2021. *Radiografia smart city in Romania,* 5th edition. Steinbeis Romania. <https://steinbeis-romania.com/wp-content/uploads/2020/06/raport-radiografie-smart-city-romania-iunie-2020_final-1.pdf>

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 60-69

Green economy – A priority for population health

Daniela VÎRJAN
Bucharest University of Economic Studies, Romania
daniela.virjan@economie.ase.ro
Vlad-Valentin VÎRJAN
Bucharest University of Economic Studies, Romania
vlad.virjan18@stud.ase.ro

Abstract. *The green economy is a solution to a healthy and sustainable life. The green economy must support long-term economic progress and be in harmony with the planetary ecosystem. But the functioning and support of the green economy will depend on how we change our attitude towards the environment and nature, towards consumption, production and irrational exploitation. Thus, we witness a unprecedented situation: increase in greenhouse gas emissions, increase in dioxide burning of fossil fuels, depletion of the ozone layer, air pollution by emissions gas, gasoline and chemical solutions, melting glaciers that will release methane into the atmosphere, the average temperature of the planet has increased by 0.8◦C etc. All these consequences have devastating effects and irreversible on everything that is alive on Planet Earth and especially on life and health human. Stop! We are sounding the alarm, things can no longer continue at the same pace, growth whose benefit, if the effects turn like a boomerang against humanity?*

Keywords: green economy, population health, ecosystem, ecological crisis, economic crisis.

JEL Classification: I1, Q2, Q5.

1. Introduction

If a few decades ago there was talk of capital accumulation, economic growth, industrialization, progress, diversification, abundance, now we are wondering, economic growth for whose benefit, if its negative effects turn like a boomerang against us, humanity, of all that is alive, through pollution, depletion of resources, poverty and social polarization, pandemic, war, etc. Although we live in the most prosperous period of mankind, today we often talk about crises, economic crisis, social crisis, medical crisis, military-geopolitical crisis, with access to the most sophisticated technologies, information and knowledge. Unfortunately, we are not happier, more fulfilled or happier, but on the contrary we are more and more dissatisfied, ungrateful for everything that nature offers us, more selfish, more greedy, depressed, aggressive, etc. I say learn from nature, from trees, from mountains and hills, and history has shown us that nature remains, man disappears. Is the green economy the solution to all current problems and crises? Yes, it is a solution, but the green economy does not solve all the problems of humanity, we must change our way of thinking, behaving and acting and not put individual, private interests in the first place, but think at community level, aiming at the interests of the whole community and why not on a planetary level, because certain effects have no boundaries and are spreading at a very high rate throughout humanity (for example, pollution).

The green economy involves rationalization, restriction and avoidance of waste, consumption as much less resources, raw materials and materials per unit of product, recycling, and reuse, increase the durability of the products and the possibility for them to decompose into easily recyclable parts. The green economy involves innovation, adaptation and consistent production with the natural environment, that is, to produce more with less, because more does not mean and better.

The green economy is the economy of the future, it is the economy that works on the principle of wind-powered boats, it is a solution for protecting the environment and the planet earth. It emphasizes the principle of reducing, reusing, recycling, promoting ecological technologies and managing waste, pollutants and fuels. The green economy has become a concern for all states in the world, realizing that natural resources are exhaustible and some unmanageable, and that people's needs are boundless. Comfort has become a priority, ignoring the fact that more does not mean even better, and the quality of life should make us think about future generations, the impact of irrational actions on the environment and the health of the whole living.

2. The objectives of the European Green Pact in promoting the green economy

In 2019, the European Union concluded the European Green Pact, and the Member States set out to take steps to move beyond the current model of growth, which we need to produce more in order to have more growth, and to produce more. We need to consume more and more natural resources, which unfortunately are limited to the potential of planet earth. The European Green Pact has the following objectives: to reduce emissions by at least 55% by 2030 and to achieve zero net greenhouse gas emissions by 2050; economic growth should be dissociated from the use of resources and no one should be left behind (European Commission, 2019).

The European Green Pact will improve the well-being and health of Europeans by supporting: fresh air, clean water, healthy soils and biodiversity; renovated and energy-efficient buildings, affordable healthy food, the development of public transport, clean energy production and state-of-the-art innovative and economical technologies, products with a longer lifespan that can be repaired, recycled and reused, jobs where to develop new skills suitable for the transition to the green economy, etc.

The European Green Pact aims to transform the European Union into a modern, competitive and resource-efficient economy, being considered a lifeline for the exit from the COVID 19 pandemic, will be financed with a quarter of the investments € 1,800 billion from the NextGenerationEU Recovery Plan, as well as funding from the EU's seven-year budget (European Commission, 2019).

3. Environmental health – our health

Our health is linked to the quality of the environment and the state of natural resources, clean air and water, fertile land to produce vegetables, greens, healthy fruits, energy produced by green technologies and using alternative resources. Green infrastructure plays an important role in regulating the climate, absorbing dust and preventing floods.

Pollution means the contamination of the environment, water, air, soil, and in addition there are other types such as noise pollution caused by urban and taffy overcrowding and thermal pollution, biological pollution created by microbiological contamination, chemical pollution caused by products natural, organic, mineral and synthetic substances existing in nature. We will address in turn the most important aspects of the environment that can affect our health and life on earth: air, water, soil, noise, food, etc.

Air quality has a significant impact on public health (European Commission, 2019a). Exposure to a range of air pollutants can cause a number of diseases such as chronic obstructive pulmonary disease, tracheal cancer, bronchial and lung cancers, asthma and respiratory infections. Air pollution also has an impact on labour productivity because it decreases the degree of concentration and attention, increases the degree of fatigue and reduces the body's functions. The European Union sets health-based standards and targets for a range of air pollutants (European Commission, 2021a) and yet in the 27 Member States, 307,000 premature deaths have resulted from exposure to fine particles, if the WHO guidelines on fine particulate air quality would have been respected, then the number of deaths would have decreased by 72% in 2019 compared to 2005 (European Commission, 2021b).

The European National Environment Agency annually submits assessments of emissions and concentrations of air pollutants into the air and their impact on health and the environment. The Glasgow Climate Pact, the UN Framework Convention on Climate Change (UNFCCC, 2021), emphasizes the adaptation of climate measures and policies in line with finding and disseminating the latest knowledge and technologies that strengthen resilience and vulnerability to climate change.

The effects of polluted air are obvious, they affect our entire human system, from skin diseases to cancer. Acid rain pollutes both water and air, and releases large amounts of sulfur dioxide or nitrogen monoxide into the atmosphere, which affect the mucous membranes, have a pungent odour and a sour taste. The greenhouse effect results from the accumulation of large amounts of carbon dioxide in the air layer forming a blanket that will have the effect of global warming and that in time will cause the glaciers to melt. According to a 2007 study, 22% of global greenhouse gas emissions come from agriculture, industry and transportation, and cattle breeding is responsible for 80% of greenhouse gas emissions (DNEWS, 2007).

A large part of the carbon emissions come from the transport sector and in particular road transport. Road transport in the following areas has become a problem both in terms of air pollution and in terms of personal and collective costs. We understand that every individual has the right to mobility, that is, the right to move from point A to point Z, but we must understand that if everyone travels with their personal car, fuel consumption increases, but also congestion, air pollution and noise pollution, and this is not effective because it means consumption, time, money, energy, nerves, etc.

Even if the fuel costs are higher, many people want to stay in the comfort zone, i.e. they prefer to use the personal property car that has five seats, even but leaves alone, only to be in comfort, but comfort costs but also pollutes. We need to find solutions such as the use of alternative means, such as bicycles, scooters, public transport, walking, and investing in the green economy can help us move out of a growth-obsessed economy into a circular and green economy.

In order to highlight the pollution of the environment by the automotive sector, we made a survey in which, for three minutes, we recorded the traffic of cars from the Roman Square to the University, measuring: how many cars passed per hour, what types of cars and how many people they were in every car, I mention I didn't take taxis into account. The number of cars was 195 in 180 minutes, resulting in a car flow of 1.08 cars/second, and an estimated 3,900 cars per hour, including the following brands: Volkswagen (28%), Toyota (19%), Dacia (18%), Hyundai (12%) Ford (8%), Renault (5%), Mercedes (4%), BMW (4%), Gip (2%), brands that have a high consumption between 8-10%. Comfort is the criterion that prevails, so in 75% of the cars there was only one person, in this case the driver, in 18% of the cars there were 2 people; in 5% three people and 2% four people. Obviously, a correct estimate requires several measurements, on several arteries and at different time intervals, but it is enough to realize that if we extrapolate this experiment at national level we would probably be scared of the results obtained and Let us not be surprised that Bucharest ranks 263rd out of 323 European cities in terms of air quality, and Sweden, Finland and Portugal are in the first places with the cleanest air (News, 2021). It is clear that we need to change our attitude towards the environment and find alternative means to protect the environment, but if we look at statistics, the registration of new cars in Romania increased in 2021 by 44.56% compared to 2020, reaching a volume of 16,129 units (Digi24, 2021), and the most preferred brands were: Dacia, Toyota. Volkswagen, Hyundai, Ford, Renault, Suzuki, Mercedes, BMW.

The European Commission (2019) proposes ambitious targets for reducing CO2 emissions from new cars and vans as follows: a 55% reduction in car emissions in 2030; 50% reduction in truck emissions by 2030; zero emissions from new cars by 2035. On the polluter pays principle, road transport will be covered by emissions trading and this will encourage the use of cleaner fuels and reinvestment in cleaner and greener technologies.

One solution to reduce CO2 emissions from cars would be to invest in the development of infrastructure for the use of alternative means of transport such as bicycles and scooters, and such projects have emerged in Bucharest, for example I`Velo company de bike - sharing. The problem is the infrastructure, there are tracks arranged in the center of Bucharest, but there are many other areas where these tracks do not appear or are often blocked by cars. Another problem is the legislation that does not encourage the use of alternative means or discourage the consumption of fuel, for example there are countries where if you have a car that consumes, taxes and duties are higher, insurance is more expensive and entry into the city center is prohibited.

Another solution for reducing and storing carbon is the forest, and the European Commission through The Green Pact proposes a regulation aimed at stopping deforestation and forest degradation, Given that between 1990 and 2020, the world lost 420 million hectares forest, the main factor being the expansion of agricultural land in order to produce materials and raw materials (Euroactiv, 2019). This year, Romania created the legal framework through which undertakes to carry out afforestation and reforestation works by 2023 on an area of 25,000 hectares, and in the period 2024-2026 on an area of over 31,000, and to stimulate this action, a premium of EUR 456/year/hectare shall be granted for a period of 20 years (FI, 6.04.2022).

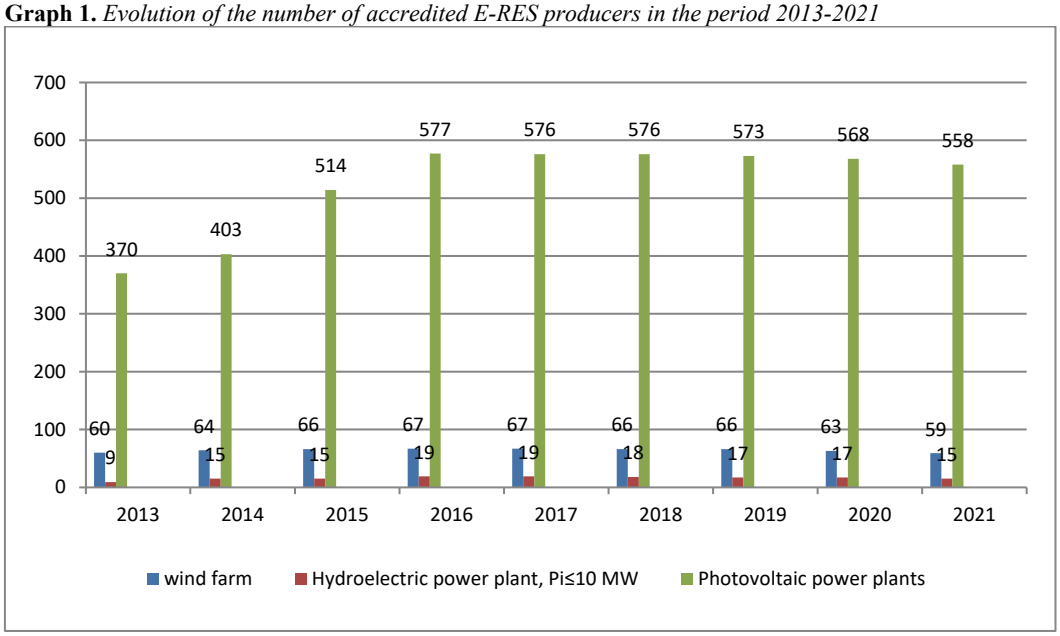
Another project would be urban greening by planting a tree city, according to law no. 24/2007 on the regulation and administration of green spaces in the built-up area of the localities. The city tree lives between 200-300 years and can provide food for all living organisms, the category of ornamental trees includes: lime, chestnut, birch, oak, acacia and maple. The role of trees is to absorb dust and car noise, which is why in the big cities even on the most insignificant streets there are important alignments to absorb pollution and prevent flooding. Urban greenery is a real curtain, but it must be thought of depending on the relief, air, currents because climate change means that not every plant is possible anchor, and on the other hand it can host a number of geese and animals that can put us endangered health (see plane tiger, which causes skin problems).

Water quality is determined by a number of organoleptic, physical, chemical, biological, etc., and its pollution is another cause of the deterioration of the health of beings are you coming. Water has a role of sanogenesis because 75% of the planet and our body is respectively the water. Water quality is influenced by human activities, either directly or indirectly, for example: industry from the discharge and storage of rotten organic waste, toxic substances, oil, oil, nitrates, detergents, agricultural pesticides, nitrates, insecticides, herbicides, radioactive substances and chemical pollutants, household waste, city sewage, etc. Polluted water can lead to the disease of any living organism and even death once ingested.

Toxic substances can cause a number of health problems such as: rash, allergies and inflammation of the sense organs, respiratory infections, hormonal disorders, cancer, hepatitis, brain disorders because it is the first organ to feed on water, etc. In order to reduce water pollution, all actors in economic and social life need to be involved involves striving to pollute less and find alternative solutions. Manufacturers to efficiently manage the waste and toxic substances it discharges into the environment environmentally and obviously each of us can contribute through our actions to protection water: household oil should not be thrown in the sink or toilet as well as napkins wet and other objects, the rational use of detergents in laundry and dishwashing, we throw garbage and plastic in lakes, running water or in nature, use containers and biodegradable bags etc.

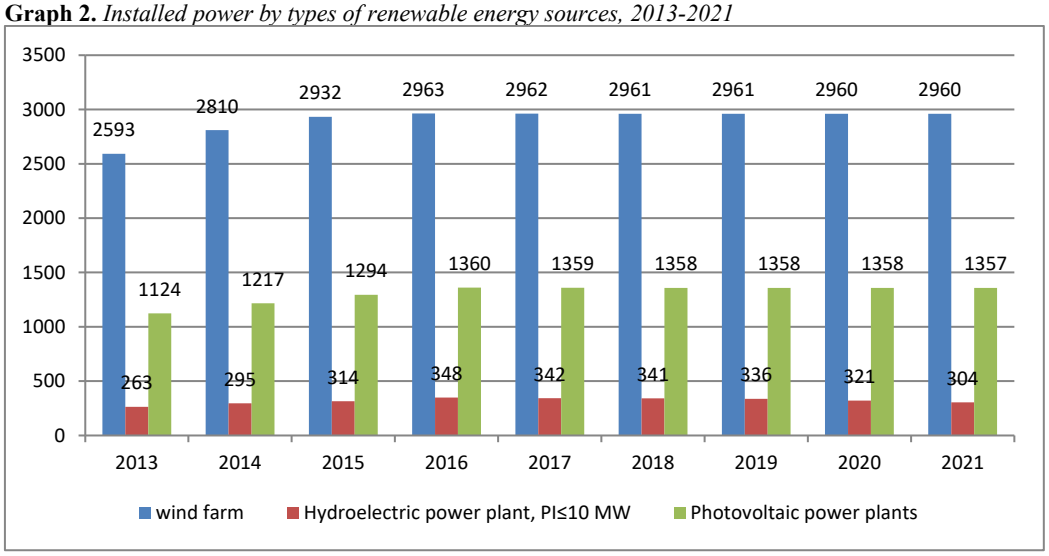
For the promotion and use of energy from renewable sources, the European Parliament adopted Directive 2009/28/EC, and Romania transposed this directive by Law 220/2008 on the establishment of the system for promoting the production of E-RES (electricity from renewable energy sources) by granting a large number of CVs (green certificates) and which has undergone many other changes and regulations. The number of accredited E-RES producers at the end of 2021 was 746, 32 less than initially accredited, as can be seen in Chart 1, the number of accredited producers increased the most for photovoltaic plants, then for wind farms and on the last place for hydroelectric power plants with an installed capacity ≤10 MW. In graph 2 we can see that the installed capacity was much higher in the case of wind farms, with more than 54% compared to photovoltaic plants and about 90% compared to hydroelectric plants with an installed capacity ≤10 MW.

Graph 1. *Evolution of the number of accredited E-RES producers in the period 2013-2021*



Source: Data provided by the 2021 Overcompensation Report, available online at file:/C:/Users/danielav/Downloads/Raport_supracompensare_2021.pdf, accessed 3.03.2022.

Graph 2. *Installed power by types of renewable energy sources, 2013-2021*



Source: Data provided by the 2021 Overcompensation Report, available online at file: /C:/Users/danielav/Downloads/Raport_supracompensare_2021.pdf, accessed 3.03.2022

Another solution to produce green energy would be to become prosumers. Prosumator can be domestic consumption, and the surplus energy will be transferred to the national grid, as a large battery from which other consumers can be powered. For the installation of photovoltaic panels we need to meet some eligibility conditions, after which the state allocates an amount of 20,000 lei, and the beneficiary must bear 2,000 lei for a 3 kW kit with inverter. The installation of photovoltaic panels on the roof of all economic agents would be an important source of electricity production, but there are a number of financial problems, the state pays at the end of the project, but not on time. There are accredited companies and installers that ensure the installation of photovoltaic panels, but they are outdated, they have queues and the biggest problem is insufficient funds, an installation costs around 5,000 euros, money that the company must have at initially, because the recovery will be done later, or if a company makes 50 installations, it will need 250,000 euros, money that it should borrow from banking or non-banking financial institutions, but even here the conditions are discouraging.

The costs of installing photovoltaic panels are high, and the money has to come from somewhere, because inverters, photovoltaics, power cords and more, plus the people who work have to be paid, it takes hundreds of thousands of euros stuck in installations. The system needs to be set in motion with money, a bank is needed to provide a state guarantee line, but everyone is waiting for the Environmental Fund. We need to be aware of the benefits: to become energy independent, that is, to become prosumers; contribute to the reduction of carbon dioxide in the atmosphere; we receive money for excess energy and return it to a national grid; lower costs for electricity, the equivalent of 3kw equals 750 lei/year, the advantage is that it is consumed from what is produced, because if you buy energy the purchase price is 2,000 lei/year; electricity is produced for locations that are not connected to the national electricity grid; reduces air, water and soil pollution.

Administered to the Environment Funds (AFM, 5.04.2022) launched the Program on greening the areas affected by waste – Clean Romania, the amount allocated is 27 million lei, and the financial is granted in the amount of 100% of the total eligible value of the project. Another solution would be to attract funds and investments to develop and obtain loans for the construction of green homes that generate energy using solar panels, but unfortunately the initial cost is much too high and the vast majority do not fall with the income to obtain green funding. Soil quality plays an important role in our lives because it is the main factor in the production of agri-food goods, so necessary for the health of organisms of all kinds. Soil degrades through exposure and irrational use. The main source of pollution is industrial waste, which comes from the exploitation of natural resources (coal, oil, ores, oil, phosphates, etc.) and from the processing industries (cellulose, paper, sugar, textiles, medicines, glass, cement, tanneries, distilleries), municipal waste, plastics, metal cans, fibers, paper, rubber, household appliances, abandoned cars, etc.), sewage waste, agricultural practices (pesticides, herbicides, fertilizers), farm residues (manure from stables, debris), biological pollution (parasites, bacteria, viruses) etc. Pathogens reach the soil and then the products we consume and they enter our body producing negative effects on health through ingestion, respiration and absorption into the skin.

In order to reduce the negative effects of soil pollution, we must take responsibility both individually and at Community level. Actions: efficient and separate recycling (glass, paper, metal, plastic); to have collection and recycling points for electronic and household appliances (refrigerators, washing machines, food processors, batteries, etc.); to convert certain wastes into natural fertilizer through compost; try to use goods that are biodegradable and from which we can get fertilizer for plants (leftovers from fruits, vegetables, bread, eggshells, straw, leaves, twigs, ash from the stove, etc.); clothing and footwear collection points, on the one hand to recover some of the raw material (linen, cotton, silk) and on the other hand to redistribute them to disadvantaged sections of the population, etc.

4. Conclusions

The green economy is a solution for the future of mankind, but it is not a process that happens overnight, it is a process in which we must all engage, and to move from one economy based on consumerism and polluting production needs support, guidance, guidance and monitoring. Many companies want to invest in the green economy but they do faces a number of problems, such as: legislation, normative acts are not clearly formulated and very often we need emergency ordinances to establish procedures or ways to be able to benefit in a concrete way; financing the green economy is a problem major for all economic agents, be they consumers or producers, because the change old technologies and technological processes with the green, renewable ones, must be set in motion with money, it takes a bank to provide a state-guaranteed line of financing, or it would be It is good to set up a bank called the "Green Economy Bank" and to support financially all companies that want to change their technological lines, the model of business and production and issue green bonds capable of generating benefits for both issuers as well as for investors; Refurbishment is an expensive and complicated process

long-term will generate jobs, but the workforce must be retrained to acquire new skills and last but not least education, change of lifestyle and way of life how we relate to the environment. Education plays an important role in this regard the transition from a resource-based economy to a use-based green economy natural elements to produce less polluting and renewable goods and services. We do not have to wait for the government, the Environment Agency and other entities to do something, if each in his household would try to find alternatives to produce green energy and protecting the environment would be great. How good it would be to have solar panels that produce us the energy we need, to recycle garbage, to make compost, to arrange ourselves flower garden where bees come to pollinate, drive a green car, we buy local products that have an organic footprint, we buy as much as we need and no more a lot to make stocks and then throw them away without using them, to take care of your health our physical, mental and spiritual health, and this can only be done in a clean environment, airy and healthy.

References

Dobrescu, E.M., 2009. *Renewable energies. Economic, social and ecological efficiency,* Sigma Publishing House, Bucharest.

Hare, W.L., 2009. State of the World - About Global Warming, The Worldwatch Institute, Technical Publishing House, Bucharest.

Muntean, I.O., 2018. *Ecology and environmental protection,* Emia Publishing House, Deva.

Savin, J.L. and Moomaw, W.R., 2009. *State of the World - Global Warming 2009,* The Worldwatch Institute, Technical Publishing House, Bucharest.

AFM, 2022. available online at: <https://www.afm.ro/sisteme_fotovoltaice.php>, [accessed 10.03.2022].

AFM, 5.04.2022. available online at: <https://www.afm.ro/main/programe/curatam_romania/2022/comunicat_presa-lansare_program_curatam_romania-2022_04_05.pdf>, [accessed 2.03.2022].

Digi24, 2021. available online at: <https://www.digi24.ro/stiri/sci-tech/auto/ce-masini-prefera-romanii-topul-celor-mai-cumparate-marci-de- cars-1654771>, [accessed 19.02.2022].

DNEWS, 2007. available online at: <https://www.descopera.ro/dnews/931809-carnea-de-vita-si-incalzirea-globala>, [accessed 12.02.2022].

Euroactiv, 2019. available online at: <https://www.euractiv.ro/eu-elections-2019/pactul-verde-european-comisia-adopta-noi-propuneri-menite-sa-stopeze-defrisarile-26278>, [accessed 24.01.2022].

European Commission, 2019a. available online at: <https://data.europa.eu/data/datasets/s2239_92_1_497_eng?locale=en>, [accessed 14.02.2022].

European Commission, 2019. available online at: <https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en>, [accessed 4.02.2022].

European Commission, 2021a. available online at: <https://www.eea.europa.eu/publications/assessing-air-quality-through-citizen-science>, [accessed 6.03.2022].

European Commission, 2021b. available online at: <https://www.eea.europa.eu//publications/air-quality-in-europe-202>, [accessed 23.03.2022].

FI, 6.04.2022. available online at: <https://financialintelligence.ro/pana-la-sfarsitul-anului-2023-romania-isi-propune-sa-realizeze-lucrari-de-impaduriri-si-reforestation-on-a-surface-of-25-000-hectares>, [accessed 6.04.2022].

News, 2021. available online at: <https://www.news.ro/social/clasament-al-agentiei-europene-de-mediu-bucurestiul-pe-locul-263-din-323-de-european-cities-in-air-quality-cities-in-sweden-and-portugal-cities-have-the-cleanest-air-1922400517002021060820248972>, [accessed 18.02.2022].

UNFCCC, 2021. available online at: <https://unfccc.int/conference/glasgow-climate-change-conference-october-november-2021>, [accessed 2.02.2022].

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 70-80

ERP systems real support for a green economy

Roxana Dana IGNA
Bucharest University of Economic Studies, Romania
Roxana.igna95@yahoo.ro

Abstract. *This paper aims to prove the real support of an Enterprise Resource Planning (ERP) system in the economic environment. In addition, this type of system can offer many benefits to an organization from an administrative and management point of view and can also be considered ecological. Most of the time, in the classical economy and administration, at least in Romania, the consumption of administrative resources is high. More and more organizations are moving toward maximizing the efficiency of their resources and improving energy and waste management policies and practices. Most of them try to present an image of economics performance, especially an ecological one. Environmental influences, energy shortages and resource consumption, can influence the way a society produces, consumes, and uses products, services, and technology. The sustainable ERP system can help the organization in its "greening" efforts. This system can be organized according to the specifics of a company, and besides the fact that it can manage several interfaces in a single database, providing secure access from any connected device, it can also help reduce consumption and support company initiatives in sustainability and innovation. Therefore, qualitative research was carried out, using interview as a tool. In the first part, there are theoretical aspects related to ERP systems and how they can help the world economy. In the second part of the paper, a case study is carried out through which the vision of the respondents who work on the Romanian market on the topic in question is analyzed and interpreted. The answers obtained were the basis for demonstrating the real benefits of such a system, especially in terms of management, time efficiency, and economy.*

Keywords: Enterprise Resource Planning, green economy, performance, qualitative research.

JEL Classification: M40, P40, Q55, Q56, Q57.

Introduction

In recent years, many companies have been focusing on greening their work by streamlining resources and energy. In addition, any organization tries to adapt such ecological methods while maintaining its economic performance. Unfortunately, in Romania, the level of bureaucracy is very high. The consumption of bureaucratic resources is felt in almost every institution. Therefore, efforts have been made to shift activities that require physical support (physical consumption of resources, especially paper) to electronic support.

An ERP system is a software package that can be implemented in any company to provide organizational integration of data on a single database. It can include various modules such as sales, human resources, and finance production that can be customized according to the needs of each organization (Haddara and Moen, 2017). This paper is structured in two parts. The first part presents theoretical aspects, the revision of the literature related to the ERP system in the economic environment and of course, the greening at the level of organizations. The ERP system is presented as an innovative solution for improving operations, streamlining activities and greening at the administrative level. It can also be considered a sustainable system that allows organizations consolidate and centralize all sustainability-related business activities and operations into a single system in order to able to manage and monitor its sustainability performance (Chofreh et al., 2018). Then in the second part of the paper, the practical part is detailed, namely a case study based on the analysis and interpretation of an interview. Thus, the main results of the research are presented and a reflection on the results is provided. Finally, the data are concluded, the limitations are presented, the contributions to the literature and the practical implications of this research.

Literature review

Aspects about Enterprise Resource Planning

Enterprise resource planning (ERP) systems enable organizations to reduce costs, share data/ information, and improve business process management by seamless integration and coordination of processes and functions. Certainly, ERP systems are superior to the previous systems of management, production, accounting, etc. (Elragal et al., 2013). In addition, ERP systems are process-focused and designed to improve key operations, such as finance, accounting, human resources, purchase, production, and sales. In ERP systems, these key operations are called modules. Each company can fully purchase its ERP package or just a few individual modules depending on the specifics of the activity. After implementing an ERP system, organizations will change a lot socially and technologically (Hustad et al., 2016).

In many industries, having an Enterprise Resource Planning has become a standard. Most manufacturing companies have implemented an ERP system. This system is a software package that can be deployed within an organization to provide data integration, including various modules that can be accessed on a single database. It can be customized according

to the needs of the organization (Haddara and Moen, 2017). This type of system involves high standards of quality and environment and can be flexible to the demand of managers according to current market conditions (Verdouw et al., 2015).

Green economy with the help of an ERP system

More companies are trying to maximize their resources efficiency and enhancing the energy and waste management policies. Environmental influences, such as global climate change, water, electricity, minerals, various sources and other factors, can influence the way a company produces, uses, and consumes products, services, and technology (Sarkis et al., 2013). Sustainable development is considered a mandatory requirement that meets the current concerns of a society, recognizing its future ability to meet its own needs (Brundtland, 1897).

Modern societies consider this a major concern, and corporations are interested in their own level of social responsibility, and they should try to achieve their production operationally, rationally, and ecologically (Andersen and Skjoett-Larsen, 2009). These goals can be called "green innovations" for organizations that create or implement new products, processes, methods, organizational structures, which can make significant and institutional arrangements that lead to environmental commitments compared to other harmful alternatives. Eco-innovation activities are largely driven by existing demand in the field. In fact, they can be generated due to technological progress that brings competitive advantages (Testa and Iraldo, 2010).

Management of the green supply chain is considered the goal of efforts that support resources and reduce emissions in production and distribution processes. These efforts have the potential to significantly develop environmental performance, corporate image, and competitive advantage. Environmental efforts are efficiency-oriented and represent the way that most companies fit into this form of adaptation. They generate quick gains through cost savings. To implement green information, systems are needed to support activity and the competitive advantages (Yang et al., 2018).

Methodology

The research method used was qualitative and was done in Romania, Bucharest. This was based on an interview that addressed the topic in question. According to the specifics of the research, the analysis tried to achieve all the objectives mentioned in the paper. The perspective of the respondents and how interested they are in the subject in question was also followed. The interview consisted of 10 questions that addressed both the general perspective of the respondents and the personal perspective on the subject in question. Their choice was strategic, they know what an ERP system entails and also how important it is for any organization to help and protect the environment. Also, their experience in the economic field was taken into account, so that the answers received directly influence the research. The respondents represent people with higher education in the economic field who have a minimum of 5 years' experience in the labor market. In addition, they were chosen also in terms of the fact that they have worked with an ERP system before and know

the functionalities of such software. At the moment there are many people who work in the economic field and know the labor market quite well but have not yet had the opportunity to fully experience or understand the functionalities of such a system. The interview was conducted between January 2022 and March 15, 2022. It was held in Bucharest and the place of the interview was chosen by mutual agreement with each respondent. The average interview time with each respondent was about 30 minutes. Respondents agreed to the use of the responses received in the current research.

Results and discussions

The respondents who participated in this research were: Micu Alexandra – auditor, Radu Alina – authorized accountant, Ghiță Anca – financial director, Andrei Florina – financial director, and Iacob Ionuț – manager. On the answers received, I was able to present and analyze their exact perspective on the topic in question. The questions asked were the same for each respondent.

The first question of the interview was: How important are economic and ecological thinking at the organizational level?

Micu Alexandra: I believe that economic and strategic thinking is essential in any field of activity. Regarding Romanian ecological thinking, I could say that we are not the most active and directly involved people. Yes, indeed there are many organizations that deal with the recycling of packaging and bulky items according to the environmental regulations in force. That is because if they did not do it, they would risk fines. But in terms of the ecological thinking of each individual, perhaps there should be ecological education applicable even from primary school.

Radu Alina: Any company has the obligation to deal with the individual strategy regarding the organizational economy. Of course, depending on the specifics of each company, there are certain mandatory legal provisions that require waste collection and recycling. Large companies, or rather, strategic players on the market most of the time, encourage and support the protection of the environment. Not all of them, because certain companies pollute quite a lot of the environment through the activity performed, but I am already entering into another discussion.

Ghiță Anca: We all have this vision, but maybe only a few apply it. The Romanian system may not fully encourage the protection of the environment, but certain cadences can be noticed. However, certain organizations promote and encourage this thinking. Here, depending on the individual interest and benefits of each one.

Andrei Florina: I believe that economic and ecological thinking is essential in any field of activity. Whether we are talking about an organization that deals with the sale of products or we are talking about providing services, in any field, we should think carefully, strategically, and at the same time protect the environment that surrounds us.

Iacob Ionuț: Our company thinks this way, efficiently and economically. We are doing a lot of work on the economy and greening. We collaborate with 3 companies that deal with

waste collection and recycling. Monthly, we contribute to the state and pay the mandatory environmental contribution. I can say completely that society has everything that is environmentally friendly.

Second question: How important is it that each individual, employee, or manager contributes to the efficiency of tasks by saving material resources?

Micu Alexandra: I was just saying that earlier. It is very important, but it is often completely missing from Romanians. If each individual showed an interest in protecting the surrounding environment, maybe today the cities would not be so polluted. I think it is all about education. At the moment, I do not know how many employees are thinking directly about saving material resources. Most likely, most of them only think about their consumption.

Radu Alina: Management has the greatest influence. If managers impose such ecological behavior on employees, which could also target certain sanctions, they will certainly comply. It is hard for an individual to think about the economics of resources at work when it is not imposed on you. Yes, maybe a few have this thinking, but there are very few.

Ghiță Anca: It depends on the work tasks. I do not believe that any activity necessarily involves the consumption of material resources. There are certain tasks that do not involve this direct consumption. I believe that each individual can find a balance, in terms of daily activity and excessive consumption of material resources.

Andrei Florina: Any manager has the obligation to know exactly his activities and employees. As he knows exactly what the activity of each employee involves, as well as what material consumptions it involves, he can organize himself in such a way as to achieve everything in an efficient and effective way.

Iacob Ionuț: Personally, I can say that every day I face this and I always look for performance. I know quite well what the activity of the individuals under my command involves and how well trained they are. In terms of material resource consumption, yes, in any activity there is consumption. You cannot produce something new if you don't consume. However, we always limit ourselves to responsible and calculated consumption, which can generate the same economic benefits.

Third question: How important is it to benefit from an automated and integrated system that can optimize tasks and save resources?

Micu Alexandra: A good system is a key factor in any activity. The more advanced and automated the system is, the more material mistakes can be avoided. Now, it depends on what kind of system. A system that can help man, not one that replaces man. In any activity, man has a key role to play. Integrated systems, yes, are really essential for companies that produce, but also sell stocks. Such a system even helps to organize strategically and unnecessarily consume materials.

Radu Alina: It is very important, but nevertheless, this type of system involves certain costs. It depends on each activity. Most of the time, this system is recommended for large and medium-sized companies because it involves high costs. It is likely that for a small

company it would not be so advantageous because although it is possible to save material resources, it is very likely to significantly increase the consumption of financial resources.

Ghiță Anca: From a financial point of view, yes, the working system is essential for an exact organization and total control over the activity. The interest of each company is to sell and do so at the lowest possible cost. Now, it depends on each employee and each task they have. A different system is considered a solution to manage internal activity.

Andrei Florina: Yes, it is important. However, the individual who operates it must possess the necessary understanding and use. When we talk about any kind of system, it is very advisable to come up with instructions, training from the producing companies in the right use at maximum level. If the workforce does not have the necessary knowledge of understanding and management of such a system and does not know exactly how to operate it, or how to work in it, optimizing tasks would not be possible.

Iacob Ionuț: Our company owns such an intelligent system. And it really optimizes the tasks electronically and with its help we save quite a lot of material resources, compared to the classic system that we had previously and which forces us to physically manage a good part of the activities. Of course, that is what is happening now, but at first it was quite difficult for us to move from a classic system to such an integrated system. It involved certain costs and extra work on my part and on the employees to learn how to work optimally. Changing a system really meant upgrading the activity. Initially, yes, it involved quite a lot of costs, but at the moment I would not be able to see the management of the activity so efficiently. A properly implemented system even adds value to a company.

Fourth question: How much does it matter to use an integrated ERP system in any organization?

Micu Alexandra: It matters. The more advanced the system, the more human mistakes can be spotted. These systems have been and are still an efficient and strategic solution for any company. Yes, I work in such a system and I perform audit missions. Audited companies often operate in an ERP system. It is much safer and there is much greater control over the accuracy of the data submitted, and therefore the audit risks are lower. And that is what I am interested in.

Radu Alina: ERP systems are essential and are among the top operating systems in Romania. However, from an accounting point of view, it depends on what activity you do. You have a smaller, smaller activity, you do not need such a system. As I said before, these advanced systems involve very high costs. You have a great job that requires much more extensive management, yes, this system is a key factor. An accounting system can cope quite well with the financial requirements of a small company or for a microenterprise.

Ghiță Anca: It definitely matters. Especially since this system manages the internal activity of a company more efficiently. From the point of view of control and management, it deserves all the praise. From the point of view of the operation on my part, it has a minus. Yes, I work in this system, I have control over the financial activity, now to say that I have become accustomed to the steps I have to go through in order to obtain certain relationships.

However, the operation seems quite difficult to me. You have to be very careful not to skip certain steps and give many clicks to get what you want.

Andrei Florina: You give a penny but you stand in front (laughs). I am so familiar with this system that I don't even remember the era without not having or working in an ERP. In my daily work, it matters.

Iacob Ionuț: Like I said, our company uses this intelligent ERP system. And this really adds value to our activity. The benefits that this software brings are multiple. They can have complete control over the activity from anywhere. The database is documented in real time, and they can access any information electronically. Using such a system can really represent a major change for any company.

Fifth question: How automated can work tasks be with an ERP system?

Micu Alexandra: Most tasks are quite automated. Of course, it depends on each ERP package. However, in the vast majority of cases, the work tasks are strategic and automated.

Radu Alina: They are automated depending on how much money you have for this automation. The more one invests in an ERP system, the more automated the workloads can be. Now it depends on what any company is after. Work tasks can also be performed directly by employees.

Ghiță Anca: It depends on the task of the work. In general, yes, the system takes over the usual tasks that are carried out consistently and accurately. For more advanced tasks, the user establishes the selection and execution criteria, and depending on these, the system can operate and process the information.

Andrei Florina: They are pretty automated. Not so automated as to effectively replace an employee, but it helps quite a lot in the daily activity of the company.

Iacob Ionuț: Automatization of tasks was another key factor that was the basis for the decision to implement such a system in our company. Before implementation, many operations took much longer. Our company works with stocks, almost like never before we had a transparent of them. Until we got a situation exactly theirs, we waited even a few days. Since the ERP was implemented, the stock situation has improved considerably. I have real-time access to absolutely everything that enters and leaves the company.

Sixth question: How much does such a system help in saving working time? Is it more accessible to process in a system or physically execute a task?

Micu Alexandra: It is easier and easier to operate a system than performing the same physical task. Yes, the working time/operation is another important factor in the daily work activity. I think the ERP system saves a certain amount of time in terms of task operation.

Radu Alina: Yes, most likely this system helps save work time. And this is also possible at a specific cost. It depends a lot on what your goals are as an organization. It is easier to process in a system than to operate manually; now it depends on how much you are willing to invest in an ERP.

Ghiță Anca: Of course, it is easier to process electronically and not to perform physically. Related to ERP, yes, you do some tasks faster, but you also give quite a few clicks and select many criteria to get a report. I wouldn't say that this system is the most advantageous in terms of operations and time saving.

Andrei Florina: Yes, definitely. I don't even remember that period of classical manual operation. Now everything is electronic, and it is much better that way. If we can consider it as time saving, yes, an electronic load requires reduced time.

Jacob Ionuț: Time is money. And for me, every moment matters. We are just operating anything physical, but almost entirely electronically. And this electronic way is much more advantageous and safer from all points of view.

Seventh question: Does this system ensure control over activities? Can you check and manage the activity of each individual with the help of an ERP?

Micu Alexandra: Definitely. That is why I appreciate it. With greater and safer control over activities and employees directly, audit risks are much lower. Therefore, a cleaner activity is well-controlled.

Radu Alina: Yes, of course, you can control all the aspects mentioned. But this control also involves costs. To delimit people who have access to the entire database, from those who have only partial, and from those that operate only on a certain segment. Additionally, having a history that can be verifiable anywhere and at any time involves substantial costs.

Ghiță Anca: Most managers want to have control over their employees and their activity. When it is decided to implement such a system, the decision underlying this decision is clearly influenced by the direct control that managers can have over the activity.

Andrei Florina: Yes, it provides internal control. Tasks can be much better managed, and the activity can be controlled in real time.

Iacob Ionuț: Yes, this system provides some control over activities. However, we cannot rely solely on one system. I periodically control and check the activity of the employees and not only. Verification and control of activities are essential. Anyone who has subordinated people is obliged to check their activity periodically. Everyone has to agree: yes, it is operated and worked properly.

Eighth question: Can an integrated and automated ERP system help a company reduce resource consumption? Especially the material ones (such as papers, documents, files, etc.)?

Micu Alexandra: Yes, we can say that an ERP system can reduce in one hour the consumption of resources, but not entirely. In terms of material stuff, yes, because it is all electronic and much easier.

Radu Alina: Once again, I mention that it depends a lot on what you want from the activity you carry out. Yes, an economy regarding physical acts can be provided by the ERP system. And this involves a cost, and most of the time the cost of the service is balanced or the

actual cost of those material resources. Depending on the lowest cost, the optimal summer for performing activities is chosen.

Ghiță Anca: Yes. The ERP system also benefits from the electronic archive. Therefore, the consumption of material resources is diminished.

Andrei Florina: Yes, I could say that you can save these material resources when you use an ERP system.

Jacob Ionuț: Yes, but even so the problem is not with the system, but with the individuals. We train the employees during the period in their daily activity, and they are expected to responsibly and extensively consume material resources. We also come up with the idea of protecting the environment and reducing all the time the costs on these usual consumables.

Ninth question: Can a system adapted to the needs of a company generate global performance?

Micu Alexandra: Yes, but in order to achieve this global performance, the management, the employees, and the system used have to work closely and efficiently.

Radu Alina: I cannot believe that a system can bring performance. Only the individual, through his work, can achieve these exceptional results.

Ghiță Anca: Yes, a system that meets the needs of a society definitely generates performance for it.

Andrei Florina: The more the system corresponds to the requirements of the society and its individuals, the more performance is ensured.

Iacob Ionuț: The system contributes to the performance of a company but not entirely. To achieve that performance, we need trained people who know exactly what they have to do and who know how to adapt to known and unforeseen situations. In business, you always need to know where you are and be able to adapt according to trends and market demands.

Last question: From a personal point of view, do you think that you are among those who contribute to protecting the environment even in the workplace?

Micu Alexandra: Yes. I support activities related to the protection of the environment and I really encourage others to do so. Once again, I mention that I am among those people who support the implementation of classes on the protection of the surrounding environment in schools.

Radu Alina: Definitely. I think each of us is responsible for doing that. Nature offers us everything, and we, in turn, have a duty to protect it, even in our daily work.

Ghiță Anca: Yes! Certain.

Andrei Florina: I don't know what to say if the workplace offers me this possibility to protect the environment, but from a personal point of view I have an economic and ecological thinking.

Iacob Ionuț: I prefer to let the facts speak for themselves. Our company is periodically directly involved in protecting the environment, and I personally take care that each activity is organized correctly, concretely, and accurately.

After this interview, I was able to realize that the approach to the topic had a strong impact on the respondents. After each interview, I thanked the respondents for their active participation and for their time. The reaction was relatively positive and somehow, they appreciated the fact that their opinion matters. Each response received was presented chronologically to the interview. Most of them were very attentive to the questions asked and somehow the answer was quite well nuanced, punctuated. In general, they recognize the importance of protecting the environment and that each individual owes it to himself to do so, even in the workplace. Then, because everyone knew what an ERP system entails, opinions varied. For the most part, they appreciated this type of system for the functionalities it has and the benefits it can offer to an organization. However, a respondent did not have such a positive opinion on the ERP system, directing it to be quite expensive and to be effective only for a part of the companies on the market. He even pointed out that yes, this system can reduce the consumption of material resources while increasing the consumption of financial resources. However, the general approach to the theme was considered positive and each had a positive and different opinion.

Conclusion

In conclusion, I can say that the ERP system can be considered a real support for a green economy. However, although this system meets the criteria regarding the protection of the environment, each individual has the obligation to take care of the place where he operates and where he lives. According to the study conducted, the respondents confirm the theoretical part and, indeed, the ERP system represents a multitude of benefits both for the organization and for the surrounding environment. This type of system brings long-term organizational benefits, but also requires a financial investment.

Although in Romania the consumption of materials resources is restored, economic and ecological thinking is a solution to reduce it. To achieve this, authorities should be constantly and directly involved in protecting the environment. Through various activities of protecting the environment, and of course through the highest possible fines for those who constantly pollute and do not find or avoid alternative solutions. At the moment in Romania there is the Environmental Guard or those from the environmental protection, but most of the time the activities of these are found only by fining the economic agents. And these fines often do not even represent an impediment for a company, and therefore the temptation is great to continue with the same polluting activities.

Of course, the study has certain limitations. The interview can be conducted with many more respondents, and other more negative opinions can be addressed. Also, research can be done in the field for a more advanced study that can present situations with both a positive and negative perspective on this topic.

References

Andersen, M. and Skjoett-Larsen, T., 2009. Corporate social responsibility in global supply chains. *Supply chain management: an international journal* 14 (2), pp. 75-86.

Brundtland, G.H., 1987. *Report of the world commission on environment and development: Our common future,* Oxford, UK.

Chofreh, A.G., Goni, F.A. and Klemeš, J.J., 2018. Sustainable enterprise resource planning systems implementation: A framework development. *Journal of Cleaner Production* 198, pp. 1345-1354.

Elragal, A. and Haddara, M., 2013. The impact of ERP partnership formation regulations on the failure of ERP implementations. *Procedia Technology.* 9, pp. 527-535.

Haddara, M. and Moen, H., 2017. User resistance in ERP implementations: A literature review. *Procedia Computer Science* 121, pp. 859-865.

Hustad, E., Haddara, M. and Kalvenes, B., 2016. ERP and Organizational Misfits: An ERP Customization Journey. *Procedia Computer Science,* 100, pp. 429-439.

Sarkis, J., Koo, C. and Watson, R.T., 2013. Green information systems & technologies–this generation and beyond: Introduction to the special issue. *Information Systems Frontiers* 15 (5), pp. 695-704.

Testa, F. and Iraldo, F., 2010. Shadows and lights of GSCM (Green Supply Chain Management): determinants and effects of these practices based on a multi-national study. *Journal of Cleaner Production* 18 (10-11), pp. 953-962.

Verdouw, C.N., Robbemond, R.M. and Wolfert, J., 2015. ERP in agriculture: Lessons learned from the Dutch horticulture. *Computers and Electronics in Agriculture* 114, pp. 125-133.

Yang et al., Z., 2018. Synergy between green supply chain management and green information systems on corporate sustainability: an informal alignment perspective. *Environment, Development and Sustainability,* pp. 1-22.

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 81-87

Towards a culture healthy environment and what organizations can do

Teodora ABRAMIUC (TODORAN)
Bucharest University of Economic Studies, Romania
teodora_todoran@yahoo.com

Abstract. *To change the organizational culture, means to understand what works well and what does no longer serve the business and the employees. Organizational culture resides in the practices, the values and beliefs as central and structural identity traits, supported by the visible human behaviors. The current paper is referring to some global recent studies that are trying to diagnose the culture of the organization and bringing the recommendations that can adjust the healthy culture practices. Post a relevant literature review of the topic, the methodology and data researched linked to a global survey of a multinational. The survey diagnoses the culture health and brings some valuable insights and results. Focusing on elements of positivity and equally much of behavioral risks, value creation and value protection, the organizations could consider adjusting towards a culture healthy environment. Such actions are sustained by identifying the motivators of the employees and proposing some action on getting into the "to be" state of the organization. Small steps can easily generate a high value impact, if addressing right triggers towards that change.*

Keywords: organizational culture, culture health, values, human behavior.

JEL Classification: L2, L84, L86, M14, M59, O15.

Introduction

Just as any ecosystem, the organizations are formed around some values, rules, principles that come in shape through behaviors and over time becoming habits, or various individual that have different skills, roles and a form of influence towards a common goal. As the description of an organization may sound to be a known reality, it is a given that relations, structures and overall culture can easily go wrong. For example, from the empiric knowledge of the author, the cultural health can go wrong due to the policies that are not people centric or hierarchical structure that are too vertical, or that personal ego and interests prevails, beyond the business or organization in decision-making. These are individual perceptions based on twenty years of corporate experience that culminate with such commonsense observations. Further, the current paper shall diagnose the culture healthy of the organizations, staring with a scan of the current relevant literature. The organizational culture is a topic that can offer a wide range of data and studies, however, looking at the health of the organizations and proposing a fix, almost a kind of a treatment. This is the aim of the research, to address the health state at a company level, from an organization in the outsourcing space. The survey that adds the value of the research paper, proposed the few actions and focus areas to introduce and make a smooth and most effective change towards a heathier culture, given the current demand of employees and critical working environment, remote working and team interaction, in pandemic or even close to war zones.

Literature review

Many research organizations have taken this task of understanding and measuring the elements that drive the culture healthier environment. Dettmann (2020) brings a very apt position of where the organizations are standing, providing a set of statistics that help understand the needed changes. Also argues on the “mutuality zone”, being the ideal intersection of traits, while developing the organizational culture.

Experts in the field of organizational culture, working towards demystifying the diversity of such cultural subtle elements and proposes a tool to diagnose the culture and its intelligence. The cultural intelligence traits evaluated and analyzed through the so-called three brains: head, heart and body, are proposing some profiles to better understand and navigate through the cultures and their hidden intelligence (Earley and Mosakowski, 2004). This is once more drawing the attention on the individual, rather than the practice and other governing rules of an organization. Similarly, Rowland (2016) brings a series of best practices that worked in cross-cultural environments and detailing the research that generated valuable insights on how to tackle large and diverse cultures working together. Amongst other many recommendations, she brings a concept of “freedom within a framework”. Azeem et al. (2021) argue a multifold approach of the organizational culture, touching upon the benefit of competitive advantage, while looking at various aspects linked to the core of a culture.

Organizational culture exists in any groups of people that are interacting, within or outside countries, just that the diversity of the people may bring more elements from the cultural,

national diversity, legislative practices, biases and furthermore. The list can develop into many areas, which can take shape in the perception of the individuals that are part of the organization. Faculty members, as reported in a study from Egitim (2022), have also similar challenges that drill down in elements of human behavior, leadership, perceptions that are shaping into the culture of the groups or organizations.

Studies on organizational culture often explore and connect the impact on some measurable elements, behavioral or procedural aspects of the organization. To that point of interest, researchers have centered their focus on correlating a relation of the organizational culture towards multiple factors like innovation (Scaliza et al., 2022), knowledge management (Liu et al., 2021), and Thelen and Formanchuk (2022) connect an ethical culture organization to human behaviors and advocacy. Surely, this sets the tone of the vast and myriad options of research and studies that the organizational culture can provide. All seem to be converging to the same element of human, people (Dettmann, 2019) as the central focus of such a conversation or research, regardless of the depth of it. Theories around the right behaviors, reinforced or newly educated, seem to be the trending recommendation and action plan of the organizations, to avoid any risks (Alpern, 2020).

Another interesting view on the conversation and corrections made in an organization, start right at the beginning of employment, welcoming the new hires. Here too, there are multiple studies of different action aiming a healthy environment nurtured in day one of hiring. The goal is to retain the workforce, by educating and introducing new practices that are more human driven. Multiple sources talk of the main reasons of new hires that quit (Schappel, 2016; Fica, 2018) basis a study conducted by BambooHR. The findings can easily reshape the cultural and organizational practices to ensure that the company becomes "employer of choice" (Onoufriou, 2021).

Given the timeline of what defines the employment lifecycle, the organizational culture benefits from several milestones to ensure a culture healthy work environment. This brings good news, as there are multiple opportunities of adjusting a less positive experience and reinforce a healthy culture on the course of becoming a tenured employee. Furthermore, research companies and similar studies often provide the right support and result when diagnosing the organizations on these aspects using various instruments, surveys, index measures on organizational health, or OHI – Organizational Health Index) (McKinsey, 2016; Dettmann, 2020, Engert et al., 209).

Research and methodology

The paper analysis the results obtained post a multinational culture health survey conducted at a global level by a third party, Ernst and Young. The results of the survey are the basis of the paper and it provides a worldwide overview of an organization, as compared to the benchmark linked to the same industry of outsourced services. The findings are proposing an adjustment of the present context and some new and improved practices. The author's contribution to the research comes in multifold as a participant, beneficiary of result implementations and lastly, responsible to a certain extent to introduce some of the recommendations to generate the changes proposed, from the survey outcome. The aim is

to draw some major lines of actions that can be a quick fix towards a healthier cultural organization. The diagnose survey was launched across one company globally present in the outsourcing industry, and targeting a randomly selected respondent pool of half the size of the employees, hence 50% of two hundred thousand employees across all continents. The purpose of the survey was to enable value creation and at the same time protect company's values. Another aim was to identify what motivates the employees and how to get there. The third goal revolved around the behaviors that aimed for nurturing employees, behaviors that need to start or behaviors identified to stop. There were 28 questions launched during July and August of 2021. There were 15 standard questions as per the EY diagnose survey and 13 customized for a deeper dive in the organizational culture and its specifics. The five regions targeted were Americas, Europe, Middle East, India and Asia Pacific. The construct of study was rating the motivation of the employee's from zero to 10. Another element tested was the positivity score, as percentage ratio between negative and positive traits in the tops ten selections. On the behavioral risks, the stop behavior was evaluated in terms of how often selected and how severe and prevalent one behavior rates, from one to 100. Putting together the puzzle pieces of the elements in scope, all such have resulted in some insights that confirmed multiple global studies available on the benchmarked data and hence, bringing the results and some particularities of the current research.

Results

The response rate was at 40% on average across the regions, which is acceptable given the size of the organization. Smaller companies would have probably had a higher response rate, up to the level of 75% of the targeted audience. The data analyzed is representative in the current scenario of data collections.

The outcomes of the core culture health stand at a 65% as compared to the benchmark of 70%. That indicated a level of moderated culture health, definitely worth finding some fixes and course corrections. The resulted score of culture health derives from the total data gathered on the three main areas investigated on motivation, positive traits (versus negative ones) and behavioral risks. The benchmark of the three goals stands at 6.7 motivation out of 10, at an 89 % positivity from a max of 100% and at 25.5 score for behavioral risk, where lowest score marks the healthy behaviors. All scores relate to companies with a response count higher than 5 thousand respondents.

The researched population scores on motivation 7.1, which stands at a 0.4 level below the benchmark. Positivity is also at a lower level than the benchmark, at 70%, as compared to 89%, quite a significant drop; however, it shows a certain level of being open and disposed to be positive about the culture of the organization. More than half of the respondents selected out of 60 traits, customer centric 47% and ethical 47% as top positive traits. On the flipside, hierarchical, bureaucratic and overworked scored as negative traits the highest, yet each scored in the range of the 20's. Simple comparison indicated that the incident and consistency of the positive traits are stronger as being in the upper 40's range.

Third objective that generated data is around the risks of behaviors considered to continue, stop or start. Risk stands at a 31 versus 25.1 on the benchmark. Some concerning behaviors that scored over 40 in senior levels, were fear at 43 and not taking responsibility scored between 36 to 43, depending on level. Both such findings are dangerous behaviors that may affect severely the company and the dynamics of the teams.

The stop and start of the risk behaviors are almost mirroring in terms of the impact of stopping one will almost surely generate the needed behavior. For example undervalue people can equally much be matched with talent and people centric and even recognition focused. The consistency of such data shows the readiness and reliability of the data into generating a change. Readiness to adopt changes is present given the match of selections. Also, keep and start behaviors are up to a certain level sustaining each other of complementing elements to transform such traits into the natural DNA of the company. The survey run anonymously and the questionnaire did not have the qualitative question layer of investigating reasons behind the answers like "fear". Hence, this may indeed be a limitation of understanding, unless such results and findings are taken up for further discussion and better understanding of self-definition of fear or other traits and behaviors. As Hyman (2018) rightly stated, understanding the reason of why people leave, that can provide a fair insight and plan for action on how to retain existing talent and attract best suitable profiles and employees that exist on the market.

The novelty of the current paper resides in the practices proposed basis such an organizational diagnose, understanding the market as per relevant literature and proposing the needed changes to "cure" the organization. Every major change starts with a small step or action of correction. That action done in a consistent manner, the right time and place, genuinely thriving for a positive change may be the right mindset and recipes for success. This may sound as an easy fix, yet the complexity resides in the massiveness of large organizations, where value and behaviors are outside the control of the greater goal. Using a visible change communication campaign, with common sense changes of behaviors, including influential roles and people, could help to a certain level. However, the two call outs, as top major elements of success are consistency (in the meaning of discipline) and time. Keep doing good every single day and let it "marinate" until it brings out the expected results. Not giving up and consistently *walking the talk*, shapes the space around us.

Conclusions

The paper brings in forefront some common sense data, however not common practice. To drive the shift of behavior from common sense to common practice certain actions are imperative. Bringing in perspective the personal gains, the elements of self-motivation of an employee, as a strong factor of sustaining the change. The "What's In It For Me" or simply used as WIIFM, properly identified and used in organizational conversations makes a major shift of positioning the role and task expectations. Some such identified motivators are "self-impact on the success of the company", "enjoying the job", "career advancements", to name a few. Being able to filter out such elements of pride and joy and utility to a greater goal, through self-contribution, become elements of impact. These

people can than become self-ambassadors for change and influence others in their circle of power, colleagues and friends. Underestimating the power of new employees, or the young generations, or the ones at the bottom of the pyramid, is equally much dangerous as believing that company success relies on the senior leadership alone. Execution and task driven expectations towards the employees at the bottom layer cannot exclude mental power, or certain level of influence in the densest population of a company. Understanding that the organization is a living organism, which implies engaging people at all levels in any major change initiative, to secure success. The good news is that such practices exist, multiple tips and tricks or easy fix methods are existent in numerous studies available for best suitable option selection and implementation. Reilly (2014) proposed a simple "5 ways to improve the employee engagement" with immediate applicability in any team or for any leader, while Morgan (2017) even brings samples and stories of failed engagement activities at very high investment costs, as a further valuable literature to guide professionals and organizations towards the right strategies.

As each study and business practice confirms, here is no one-size approach to fit all. Maybe there is one action to implement and fix all issues, or simply get creative and innovative, excluding what has been done, and try something never tested before. That all relies on experience, determination, consistent behavior and time. Adding to that, the right intention to generate good for the people when making the change, not just good of the organization. Organizations are cultures and cultures are people.

This paper was co-financed by The Bucharest University of Economic Studies during the PhD program.

References

Alpern, M., 2020. Culture Sank the Titanic, Not an Iceberg, *Corporate Board Member*, retrieved from <https://boardmember.com/culture-sank-the-titanic-not-an-iceberg/>

Azeem, M., Ahmed, M., Haider, S. and Sajjad, M., 2021. Expanding competitive advantage through organizational culture, knowledge sharing and organizational innovation, *Technology in Society*, Vol. 66, retrieved from <https://doi.org/10.1016/j.techsoc.2021.101635>

Dettmann, J., 2020. How to evolve a healthy corporate culture in a remote working world, *EY*, retrieved from <https://www.ey.com/en_gl/workforce/how-to-evolve-a-healthy-corporate-culture-in-a-remote-working-world>

Dettmann, J., 2019. Why people must be the center of your culture efforts, *EY*, retrieved from <https://www.ey.com/en_gl/workforce/why-people-must-be-the-center-of-your-culture-efforts>

Earley, P.C. and Mosakowski, E., 2004. Cultural Intelligence, *Harvard Business Review*, retrieved from <https://hbr.org/2004/10/cultural-intelligence>

Egitim, S., 2022. Challenges of adapting to organizational culture: Internationalization through inclusive leadership and mutuality, *Social Sciences & Humanities Open*, Vol. 5, Issue 1, retrieved from <https://doi.org/10.1016/j.ssaho.2021.100242>

Engert, O., Kaetzler, B., Kordestani, K. and MacLean, A., 2019. Organizational culture in mergers: Addressing the unseen forces, *McKinsey & Company*, retrieved from <https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/Organization/Our%20Insights/Organizational%20culture%20in%20mergers%20Addressing%20the%20unseen%20forces/Organizational-culture-in-mergers-Addressing-the-unseen-forces.pdf>

Fica, T., 2018. What People Really Want from Onboarding, *BambooHR*, retrieved from <https://www.bamboohr.com/blog/onboarding-infographic/>

Hyman, J., 2018. To Attract the Best, First Understand Why They Leave, *Forbes*, retrieved from <https://www.forbes.com/sites/jeffhyman/2018/05/09/whytheyleave/?sh=7364ffe23486>

Keller, S. and Price, C., 2011. 3 Attributes to Diagnose Organizational Health (Performance Isn't One of Them), *Chief Executive*, retrieved from <https://chiefexecutive.net/your-companys-health-performance-is-not-enough/>

Liu, G., Tsui, E. and Kianto, A., 2021. Knowledge-friendly organisational culture and performance: A meta-analysis, *Journal of Business Research*, Vol. 134, retrieved from <https://doi.org/10.1016/j.jbusres.2021.05.048>

McKinsey, 2016. Diagnosis on the organizational health and corporate culture of Korean companies, Report, retrieved from <https://www.mckinsey.com/kr/our-insights/diagnosis-on-the-organizational-health-and-corporate-culture-of-korean-companies>

Morgan, J., 2017. Why the Millions We Spend on Employee Engagement Buy Us So Little, *Harvard Business Review*, retrieved from <https://hbr.org/2017/03/why-the-millions-we-spend-on-employee-engagement-buy-us-so-little>

Onoufriou, D., 2021. How to be an employer of choice in increasingly competitive labour markets, *LinkedIn*, retrieved from <https://www.linkedin.com/pulse/how-employer-choice-increasingly-competitive-labour-demetra#:~:text=Higgs%20model%20identifies%20four%20organisational%20positions%20in%20competitive,to%20the%20nature%20of%20the%20job%20i.e.%20charities>

Reilly, R., 2014. 5 Ways to Improve Employee Engagement Now, *Business Journal*, Gallup, retrieved from <https://www.gallup.com/workplace/231581/five-ways-improve-employee-engagement.aspx>

Rowland, D., 2016. Leading across Cultures Requires Flexibility and Curiosity, *Cross-Cultural Management*, issue of *Harvard Business Review,* retrieved from <https://hbr.org/2016/05/leading-across-cultures-requires-flexibility-and-curiosity>

Scaliza, J.A.A., Jugend, D., Jabbour, C.J.C., Latan, H., Armellini, F., Twigg, D. and Andrade, D.F., 2022. Relationships among organizational culture, open innovation, innovative ecosystems, and performance of firms: Evidence from an emerging economy context, *Journal of Business Research*, Vol. 140, retrieved from <https://doi.org/10.1016/j.jbusres.2021.10.065>

Schappel, C., 2016. 5 biggest reasons employees quit jobs quickly, *HRMorning*, retrieved from <https://www.hrmorning.com/articles/5-biggest-reasons-employees-quit-jobs-quickly/>

Thelen, P.D. and Formanchuk, A., 2022. Culture and internal communication in Chile: Linking ethical organizational culture, transparent communication, and employee advocacy, *Public Relations Review,* Vol. 48, Issue 1, retrieved from <https://doi.org/10.1016/j.pubrev.2021.102137>

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 88-105

Agile approaches to developing e-Business solutions in a secure cyber environment in 2022

Marius Lorinel ȘTEFAN
Bucharest University of Economic Studies, Romania
marius.stefan@mfe.gov.ro

Abstract. *Modernity is characterized by major transformations and evolutions, which have penetrated into the depths of all levels of human existence, in all economic, political and social spheres, thus significantly increasing the quality of life. The Information Society is the model of society in which the main good is information itself. Although the accelerated development of information and communication technologies (ICT) is the process behind the evolution of the information society, the new model of society means much more than technological progress. In the technological age, action plans and policies are being developed to meet the challenges, the most important technology being ICT, which allows information to be processed and conveyed in a revolutionary way.*
The information society is the ICT-based knowledge society. Information society technologies will evolve in the direction of being at the fingertips of the knowledge process, by generating, storing, and transmitting knowledge. Knowledge is the result of the information management process, thus promoting innovation, economic development, and decision-making in an efficient and transparent way.

Keywords: e-Business, emerging technologies, digital transformation, digital culture and cybersecurity, security of critical infrastructure of national interest, European funds, development of the national economy.

JEL Classification: O30, P10, O11, O32.

Introduction

E-business is the basis of the new economy, of an information society that catalyzes the future of an increasingly secure artificial intelligence for the development and use of new technologies of the future. The fracture between e-Services vs. e-Activities in the post-pandemic context is evidence of the emerging strategy, which will generate various opportunities for the ever-changing business environment: e-Applications (e-learning, e-working, e-banking, e-Services, e-Activities, teleworking), basic services (e-mail, file transfer, Virtual Private Network), telecommunication networks (telephone lines, cable, radio, satellite, 4G, 5G, 6G), emerging technologies adoptable to the e-Business sector (IoT, EoT, Cloud, Fog).

The technological infrastructure of the new economy, in constant need of ensuring all the principles related to cyber security, generates new e-business models, from e-commerce to the desideratum of the e-Government implementation strategy, through digitalization and computerization of public administration in Romania.

Electronic applications made because of the efficient management of European funds are a national interest, to achieve the goal of the positive evolution of the national economy, with critical values for achieving the balance of the rule of law and national security.

The impact of eBusiness on natural resources and production factors draws attention to the efficient use of resources, which has become a business imperative and an essential component of Romania's national recovery and resilience plan. More efficient use of resources can be a major factor in economic growth. The field of European funds is constantly changing as well as the IT applications intended for their management, representing the first attempts at computerization and innovation in public administration. They are a new way of developing the national economy and e-business by promoting and pursuing European policies: distance learning (e-learning), remote work (e-working), electronic commerce (e-commerce), electronic banking services (e-banking), electronic government (e-government), electronic health services (e-health).

In an information society in which the quality of life, as well as the prospects for social change and economic development, depend to a greater extent on information and its exploitation, the institutional field of management of IT applications for European funds becomes a matter of national importance, with critical values for national security. Reinventing government can be achieved through digitalization and government computerization, which involves modernizing the current IT infrastructure through specific external funding sources such as European funds, doubled and secured by advanced cyber protection and defense capabilities against possible vulnerabilities or cyberattacks.

Modern administrations have as priorities the development of services for citizens, the provision of quality information (consistent and current), in forms as accessible as possible to any citizen regardless of the level of education. At the same time, the aim is to create the necessary tools, the active participation of any citizen, in the administrative and political decisions that concern him. The act of governing should be seen as a business process, the main objective of which should be to diversify and improve the quality of services to

citizens. For a reinvention of government in the information society, at least four defining concepts have emerged – e-democracy, e-citizen, e-politics, e-state:

- Electronic democracy – the internet can strengthen democratic participation in government.
- The citizen of the information society – the citizens of the new society/young people have training in modern technological fields being the key actors of the future governments.
- Politics in the digital age – attempts to manifest politics in digital form are becoming more visible through the significant increase in online election campaigns.
- The electronic state – the phenomenon of globalization fuelled by the digital integration of markets, involves rethinking and redefining the concept of nation-state.

E-Business solutions in a secure cyber environment

The development of e-Business solutions, through financing with European funds, can be the main direction of restoring the economic balance, lost as a result of events such as the CO-VID pandemic, or the marked negative effects in all existing essential plans of the modern individual, shaping a 5th generation war, of an informational type specific to the knowledge society. Because the effects of using advanced technologies include negative aspects and threats even on national security. That is why any development of electronic tools that will generate evolution in the process of digitalization and automation, implies the provision of the cyber defense component.

Through the projects financed from European funds, starting with 2014, a national cyber defense network was developed, of the critical infrastructure type of national interest, comprising most of the key institutions of the state. The use of Emerging Technologies and the improvement of cyber threat prevention activities in MIPE, will result in the evolution in financial management and implicitly the operational efficiency.

In Romania, the evolution of cyber infrastructure for European funds is conditioned by inter-institutional cooperation, carried out in the form of strategies, harmonized with European legislation, and materialized through specific projects to ensure cyber security, as well as awareness of the importance of security at the entire state apparatus.

All state institutions will be included in this national system of prevention and protection against cyber-attacks. Desirable and achievable activities in the context of the transition to the Government Cloud and achieving interoperability, through the considerable contribution of cooperation with state institutions, specialized in ensuring cyber security, such as Cyber-int National Center – National Authority in Cyber – Intelligence.

Malfunctioning or inadequate parameters of applications for European funds, integrated in the related cyber infrastructure, will generate the state of vulnerability constituted by blockages of the mechanisms of registration and increase of the absorption of European funds.

The decrease in the absorption of European funds is and will be a real threat to Romania's national security, due to the implications: economic; financial; social; political; as well as because of Romania's obligations as a member of the European Union.

In any situation of blockage in this sensitive area of European funds, the information for national security will be dominated by the need to capitalize by immediately informing the Minister of European Investments and Projects, as well as by adopting the necessary measures to eliminate the deficiencies found. Thus, avoiding the threats of disengagement risks, through an efficient management of European funds, in the conditions of the desideratum of good management of this objective of national strategic interest.

Achieving the country's interests, as well as acts of destruction, degradation or rendering in disuse the structures necessary for the proper conduct of socio-economic life – can be a threat – even by generating a state of blocking the absorption of European funds, a situation that falls into the provisions of Chapter 3, related to the National Strategy for National Defense 2015-2019 and art. 3, letter f, Law 51/91.

Identifying and capitalizing on these possible risks is information for national security, which will be achieved gradually, due to a high degree of persistence, as well as the perpetual lack of sufficient and efficient resources, endowed with the necessary specialization in the correct management of the computer system, constantly evolving, with more emphasis on results and efficiency and the creation of public values, including at the level of critical infrastructure – national cybernetics, in this newly developed branch of the economy – the field of European funds.

A beneficial approach would be, to adopt a risk prevention strategy at the governmental level. The malfunctioning of the gear behind the fundraising will damage both the national budget and the image of the European level, with interoperability being a basic principle of the Member States. Failure to comply with the obligations assumed as a Member State may cause economic disadvantages, the development of society and the increase in the quality of life depending on developments in the management of current financial resources, as well as future membership of the European Union and specific financial years.

These data of national interest have an impact in the current year, when cyber-attacks are characterized by frequency and persistence, it is vital that organizations are armed with the most effective security tools and knowledge to prevent, detect and respond to cyber threats. Vulnerabilities will always escalate into possible future threats and risks to national security, with the most effective approach being awareness and prevention.

A large-scale computer application goes through several states, transforms and even reinvents itself, if necessary, while ensuring the principles of continuity, operation, efficiency but especially cybersecurity, in the future characterized by the automation of as many processes now undertaken by human intervention.

The computer application MySMIS2014 has now become the unique information management system for the management of European funds, thus explaining the need for security as well as transparency.

The need for security is explainable in the context of the exponential growth in the number and complexity of cyber threats (especially malware/ransomware/social engineering). Developmental deficiencies, hardware, and software solutions, as well as the lack of an adequate infrastructure dedicated to the MySMIS2014 IT system, can cause malfunctions in the electronic services offered to beneficiaries/business environment, the IT system acquires as an area of involvement, importance even at national level, but it can also slow down certain processes in the economy, such as the annual preparation of the national budget.

Including the interoperability requirements in relation to the European Commission, dictates a clear focus on functional and reliable reporting processes, increasing processing of documents in electronic format, signed with digital certificates. Concentration of resources can only provide solutions in safe operating conditions, provided only by a state of cyber security.

Legislation, including harmonization with European provisions, may be a vulnerability in the proper functioning of the business, in the context of increasing EU interoperability requirements request for related services costly for current technology used – EIF, part of Communication (COM (2017) 134)).

The attack on a critical cyber infrastructure of national interest, such as that of European funds, may occur because of security risks, which are not properly treated, resulting in data leaks, exfiltration, or by causing syncope in operation due to unforeseen disruptions induced services, in particular on electricity and internet services.

Long-term trends are the main threats that should be monitored, especially malware attacks in a Government Institution such as the Ministry of European Investments and Projects, which is an area of real interest for cybercrime groups, for the purpose of cyber espionage or theft of strategic information, such as that of the state:

- Malware, in particular: ransomware, worms and trojans.
- Social Engineering, in particular: Identity theft, Fishing, Hacking.

Since 2016, the government area has been at the forefront of data leaks. The ways are diversified, from the sale of credentials in the case of data encryption to the specific AI techniques and the tendency to use in any field of new information technologies, which have allowed the increase in the complexity of hacking attacks.

A common case for public sector reasons, in terms of modernization strategies through public procurement, is that of equipment failure outside the support/warranty period, thus posing a threat to the network topology.

Expiration of security equipment support is a serious issue in the operation of the IT system parameters, as it leads to a serious breach in the security umbrella created by the specific equipment, continuously managed and which should contain the latest updates to be truly effective, in the cyber fight against increasingly complex and persistent attacks.

Poor technology, also manifested in uninteresting trends in continuous modernization, affects the limits of processing in the evolution of servers, especially in the case of increasing the need for balancing at the application level and/or saving and restoring data.

Although data generated and processed automatically is an important pillar of public sector activity, the focus on electronic data assurance policy still does not enjoy a high degree of importance in public institutions due to the perpetual intermediate stage, computerization of public administration.

Awareness of the importance of the Security area, especially among specialized personnel and intended for ICT activities, requires preparation for combating the risks that the public institution will face, starting from the software components maintained up to date in terms of security, and even avoiding in periods technological or governance changes, situations such as the loss or lack of management credentials/access to work environments created by electronic tools. Often the political changes of management in the institutional framework are also reflected in the specific activities of the technical departments, by slowing down the decision-making process, which is not a good institutional practice, especially in the case of ensuring cyber security.

Failure to comply with the procedures for access to and security of data and documents in the public institution, as well as the preservation of obsolete and morally worn equipment or technology, creates a favourable environment for the incidence of security risks, including at cyber level. To align with new trends in cybersecurity and harmonize Community legislation, standards such as information security management (ISO 27001) and business continuity management (ISO/IEC 27031: 2011, 22301: 2012) will be considered, as well as the latest directions drawn by NIS – EU Directive 1148/2016.

Progress in the development of new technologies will establish the desire to align with the new standards of the future, new solutions such as private or hybrid cloud will be adopted and at the governmental level, in terms of budget efficiency, but especially for specific reasons. cyber security. Clear and swift measures are used to address any cyber security breaches identified in the organization through the proper and responsible use of the vulnerability scanning IT component – with capabilities to propose corrective measures for ICT security. The analytical capitalization of information as evidence of virtual activity in the organization, is achieved through the management of technologies specific to the field of artificial intelligence, complementing the specific human cognition through additional learning methods generated by computing power.

Network traffic monitoring and security diagnostics based on behavioural analysis in technology, in order to avoid data leaks caused by possible cyber-attacks, should be carried out as an activity at the level of a public institution, by personnel specialized in ICT and especially in Management of Information of Importance for National Security. All the measures correctly implemented, as well as the cooperation between the institutions involved will considerably enhance the institutional capacity to react in case of a cyber incident.

The Institutional Cyber Security Strategy needs a very good organization of the IT department, through a correct implementation according to the good practices in the field in terms of the network department, the infrastructure department, the department responsible for IT applications.

The Department of Cyber Security is a plus for any public institution in today's modern society. The best strategy involves segmenting security solutions, so that each component will hinder the work of attackers by the existence of security at each critical point of entry into the organization, more precisely at the level of critical areas of activity and institutional intervention: endpoint, server, applications, switch, access point, databases, website, etc.

A public institution should be directly concerned with the protection against cyber-attacks and the prevention of data theft, with the main measure of prevention being the adoption of the decision to set up an IT Security department, headed by a CISO.

The department will have to have the necessary specialization in the field, through certified resources in the field of Cyber Security with emphasis on specific activities such as: implementing security policies and user access control, tracking management platforms, managing, and correlating logs from SIEM and DLP solutions.

At the level of the Ministry of European Investments and Projects, this measure has not yet been fully implemented, the first paradigm-breaking measure being implemented through the Participation and Cooperation Agreement, signed between MIPE and Cyber-int, in a national critical cyber infrastructure project – ICIN 54 MIPE, intended for European funds and specific critical infrastructure, managing the unification through cyber security solutions, of the majority of state institutions, of national strategic importance.

Responding to Security incidents as an activity could involve the existence of staff assigned to such situations, or by outsourcing, outsourcing this service would be very useful to the public institution. The hardware and software solutions that an IT Security department should manage are the following: Next Generation Firewall with traditional Anti-Virus modules, URL Filtering, Application Control, Firewall, IPS, Anti-Bot but also with modules for detecting unknown attacks through Sandboxing technologies. In addition to NGFW, there should be solutions capable of detecting End-Point attacks. These should contain traditional modules such as: Anti-Virus, URL Filtering, Firewall, Application Control, Anti-Bot, but to be able to deal with the latest cyber-attacks, advanced Anti-Ransomware protections are also needed.

In this way, SIEM and DLP solutions are urgently needed for such an organization, which wants to ensure a secure environment for creating excellence through effort and efficiency in results and protected information.

The two-way management of security solutions should be able to easily integrate as many of the existing solutions as possible to prevent or identify attacks both horizontally and vertically. The export of logs should be constant and active, towards SIEM solutions. In MIPE being used the Arc-sight solution, which manages to collect and transmit the data necessary for security analysis, being centralized used to prepare the counter-offensive for cyber-attacks in the Cyber-int National Center.

A SIEM-type solution involves the existence of a strong log correlator to facilitate easy interpretation of the information provided by providing alerts, reports, trends, etc. The public administration should also be concerned with vulnerability patching solutions to ensure that the latest signature updates are available in the operating systems and applications used at the institutional level.

Perfection in computer systems does not yet exist, which is why it would be necessary, for the best results, for NGFW components, Sandboxing, to be doubled by a dual-solution approach, in order to ensure protection, enhanced with superior coverage to a single solution, given that there is no perfect IT Security manufacturer or one that offers 100% protection. At the MIPE level, two technology models are used, thus covering any possible security breach in the ever-changing virtual environment. The technologies used were evaluated before the acquisition to respond effectively to internal needs of MIPE. The Proof of concept (POC) scenarios as well as the establishment of certain POC Success Criteria for pursuing the objectives, were made at the level of the IT Department of MIPE.

Proper implementation is achieved using virtual media, using both hardware and software-based technologies. Optimized use of existing solutions will need to be implemented in a redundant cluster system. The configurations will be tested before deployment – live, in production, and they require backup copies, saved in case of disaster. The "vmware" virtualization solution is used in MIPE, and at the level of the MySMIS 2014 computer application, of national interest, there are two activity environments, the test one and the production one. Access to applications, databases and more, must be optimized by the existence of a Disaster Recovery (DR) system, which must contain traffic load balancer elements – to avoid loading and ensure a constant flow for a quick response and easy access. Situation implemented at least initially by the decision to move some MIPE equipment to the STS data center in Brasov, considered to be the DR of the Ministry of European Investments and Projects.

Public institutions can be targeted for cyber incidents, so protection against DDoS attacks must be ensured, which can be compromised on a voluminous basis, restricting users' access to exposed data and thus blocking the organization's activity.

The applications used by the organization, both those behind a site or portal, whether we are talking about employee access or the outside public, need to be protected by a dedicated solution – Web Application Firewall. It recognizes dedicated attacks at the application level and together with other modules protects the organization's website against other types of attacks at the web platform level. The application was provided within the ICIN 54 MIPE project, currently being administered together with all other security solutions, by a designated MIPE expert, who will obtain for a better development of the cyber incident prevention activity, and the specific certification in national cyber security. Establishing the premises for the establishment of a special compartment for this activity of special importance, still not institutionally aware, as far as possible related impact, in case of disaster or cyber incident.

The Ministry uses in MICE 54 MIPE and other advanced solutions, either at endpoint or network level, which adds an extra security against APT (Advanced Persistent Threat) targeted attacks that can exist up to years infiltrated in within the institution, until the actual launch of the cyber-attack, which can be completed by exfiltrating data after exploiting a vulnerability in the process of penetration and circumvention of existing but insufficient security measures. By using algorithms based on behavior analysis – traps, for example honeypot, network anomalies can be identified that could represent a zero-day attack, without a signature. A critical cyber infrastructure can only be protected under conditions

of maximum cyber security. The proactive use of specific technologies that can identify attacks at the level of files such as pictures, documents, sent in attachments, prevent unwanted situations such as identity theft, credentials, by redirecting users to sites like the most used (phishing, smishing, etc.).

Cybersecurity awareness and training are also very useful, especially among users, or even the use of solutions to protect them from their own password incidents, which should comply with certain security standards.

Thus, avoiding the tendency of password uniqueness, used between computer applications and systems, making a distinction between professional and personal plan. The access of civil servants to the resources of the institution will be carried out in the worst case, using a VPN platform, through the institutional internet service provider – STS. Devices that store data, such as the HDD, must be integrated into an encryption platform. By using a NAC system, the organization can have a unified end-point security policy, network authentication.

User rights reflect the job description and are set by certain network and end-point permissions, depending on the status of the feature, the need to know, and access to data. This MIPE policy is provided through Active Directory but requires migration to a higher solution as the year of production. The password security policy is pre-established by this solution, according to the standards in force: change at a certain interval, a certain number of characters, numbers, and letters. A solution must also be implemented that provides protection against access environments, for example access management to USB ports.

From the perspective of developing and implementing the government digitization strategy, the ICT experience in local and central public administration, the deepening in the field of European funds, can be the considerations of the case study necessary for the evolution in ICT research in the field of public administration innovation. The aim is to modernize, thus promoting an efficient type of government, offering new services to citizens and economic agents, with the result of creating new public values through the instruments specific to European funds.

We are thus turning European citizenship into a reality by supporting citizens through innovative government services and active participation in decision-making, all thanks to the technology-based learning process.

We live in a specific period of redefining the relationship between entities, in which the entire economic, social, and cultural structure of the world's states will be laid on new foundations, in the context of the globalization of the world economy and the increasingly efficient use of technology information and communications:

- Central and local public administration.
- Citizens.
- Civil Society.
- ICT sector.
- Research in the field of Information Society based on Knowledge.
- The business community.

Computer applications for the management of European funds have been developed as a necessary measure to increase the degree of absorption of European funds. This can be done by streamlining the management of document flows, using capabilities of IT applications and new technologies, thus achieving the first notable steps in the process of continuous computerization of central and local public administration.

The field of European funds is an important source of funding for the development of e-business and thus the development of the national economy. Through specific financing lines, including through the National Recovery and Resilience Plan (NRRP), modern and reformed Romania can be built, with emphasis on the development of electronic business and the transition to the desire to create a Government Cloud. It will include public digital systems, which will ensure the necessary interoperability, in streamlining and simplifying the processes specific to the governing act.

The public-private partnership, as well as the competition in innovation inspired by the evolution in technology can constitute new forms of the evolution of modernity. This is possible using all the principles of modern management, as well as the capabilities of a new electronic existence, in an efficient and automated future. The consequences of competition in innovation produce major transformations, including in society, simplifying the complex life of modern man in the information society.

Innovation is a modern fuel for that perpetually necessary process called evolution. Digitization is the transformation of knowledge storage into an easy automated process with the help of information technology and tools that will lead to the creation of a virtual space of knowledge acquired over time (the digital thesaurus of knowledge). Digitization deals with the automation of business processes (while digitization deals with the conversion from analogic to digital format).

E-Government is the process of modernizing and adapting technology to the new information age to provide support to citizens through digitized and innovative government services. E-government offers new public values through the specific technological tools purchased because of the implementation of a digitization strategy. Information management is a process that has as its product knowledge through storage, processing, transmission, or transformation.

In the economic-social-political-pandemic context, imposed by the current conditions, there is a strong need for digitalization and use of electronic services in professional activity, especially at the governmental level. To increase the degree of computerization by modernizing the infrastructure and even transforming the work style, in a collaborative practice achieved through specific hardware and software technologies, it is necessary to extend the coverage of secure network services.

A first result of the digital transformation is the implementation in the institutional strategy of the collaborative work style, achievable through the technologies specific to the knowledge society. It is thus necessary to create a global framework of security and trust in ICT, with an expansionist tendency towards process automation to achieve maximum

efficiency. This strategic goal is aimed at creating scientific and technological excellence, as well as gaining advantages in the field of security and resilience of information systems, services, and critical infrastructure of national importance, with the strategy and desire to digitize government.

Thus, governance becomes an efficient, automated activity, in which the result obtained prevails. It will consist of increasing the degree of digital culture and security among civil servants, but also of some employees of strategic companies, awareness being a constant concern for Romania's Euro-Atlantic partners.

Funding programs have established guidelines for future infrastructure protection developments through the purchase of specific security equipment. With the considerable contribution of state institutions working in the field of cyber security, as well as through sources of external funding from European funds, it has been possible to develop a national system that includes all state institutions. It aims to achieve prevention and protection against cyber threats, as well as to build a specific strategy for digitization and computerization of government systems and applications: ICIN – Critical Infrastructure of National Importance – national system of protection of ICT infrastructures of national interest against threats from cyberspace.

The creation of the European information society cannot be achieved only by adopting decisions and action plans of decision-makers at EU or Member State level, an essential role being played by the final beneficiaries of ICT, such as: economic actors-companies, consumers, citizens.

We need to understand the benefits and risks of developing new technologies, as well as how ICTs can affect our daily lives. During this time, decision-makers have a duty to explain the new model of society and to consider the suggestions and needs of the beneficiaries in developing policies for the information society.

The EU institutions, in particular the European Commission through its programs, take on the role of coordinator and catalyst for investment in the European information society. Coordination is achieved mainly by stimulating cooperation at European level. The budget allocated to innovation in public administration will create and maintain such desirable stability, especially in critical areas, such as European funds. In industry and economics, the role of robotics and process automation will increase considerably, with changes related to technology bringing both benefits and vulnerabilities, especially in cyberspace. It will practically create a virtual parallel world, where the existence of the state, with everything it represents must be protected, in this way the environment being safe and secure even for the individual.

The objectives proposed in the transformation strategy, will contribute to the achievement of the results obtained, by exploring the interactions between individual and organizational learning, in order to streamline how existing or future technologies, can contribute to individual and organizational learning processes, generating a better understanding of learning processes, by studying the links between human learning, cognition and technology.

A constantly changing future can radically change the paradigm of a terrible period in the history of society, marked by the negative phenomena generated by a pandemic such as COVID-19, by materializing revolutionary ideas in the use of emerging technologies to gain significant advantages in the accelerated process. If necessary, of digitization in a crisis situation.

Marked by the instinct of self-preservation and the tendency to evolve towards new skills, which will significantly simplify the agile methods developed in innovation and automation, the information society transforms a strong impact, with negative economic, political, social and health effects on Romania, in an unexpected chance, to accelerate the Digital Transformation, by capturing the need to implement the collaborative work style, in the government strategy, in an orientation towards the use of emerging technologies adoptable to the e-Business sector – IoT, EoT, Cloud, Fog, in the establishment the country's national recovery and development strategy.

The economy suffered a decline during the isolation measures of the spring of 2020, the restrictions imposed by specific measures, changed both the lifestyle of the individual and its quality, shocks and disruptions, created the premises of a global strategy of the National Plan of Recovery and Resilience of Romania, which aims to support socio-economic recovery and long-term development in the post-pandemic period. Pursuing the proposed growth potential with the proposed objectives, while also addressing the older unresolved challenges.

In the evolution of a future of process automation and efficiency, the transformation of organizations is facilitated by the use of advanced technologies. The way organizational and market leaders manage the implementation of change using new technologies ensures that the progress of cloud-based innovation increases.

Organizations that want to accelerate the process of digitization, develop a vision of the future by using transformation technologies to rethink the way they operate. The applicability in the use of emerging technologies, integrates IoT, Machine Learning, AI and Blockchain functionalities in the essential e-business processes, which produce efficient results through modern and quickly ready-to-use SaaS applications.

Emerging transformation technologies offer several types of results identified as useful in progress in real life:

- Supply chains that can identify demand, optimize the movement of goods and record transactions – permanently and securely.
- Healthcare systems that can monitor the patient's vital signs, identify abnormalities, and distribute safe and reliable medical records to physicians, improving a staged response time, which can significantly increase the success rate in saving lives.
- Cyber security systems that can detect network activity, automatically analyze, and fix threats to your systems and data, and preserve evidence (EDR, HX, Darktrace).

Using a Cloud platform will go further than ever, in the race to transform the imagination into an automated and efficient future, overcoming barriers thanks to progress in innovative

technologies. The interconnection of all applications and their enrichment, with advanced features, leads to the creation of completely new applications – as quickly and efficiently as possible. There are several complementary deployment options: public cloud, a cloud in your data center, or a compatible combination (public, private and hybrid).

Literature review

Security is a priority, through specific European programs the capacity of operational cooperation is strengthened, with a desire for consensus on the values that underpin the EU's internal security.

Mutual trust and the exchange of information will increase the preventive nature of the actions of the authorities, thus establishing the Standing Committee on Operational Cooperation in Internal Security, at national and EU level.

The system is a set of principles, rules, forces, which form an organized whole, which aims to put order in a field of theoretical thinking, regulating the classification of material in a field of science or making a practical activity work properly, the purpose pursued by complying with a set of rules and values.

The state is outlined, as a way of ensuring the political existence, by the established order and the development of the community, the defense and guarantee of the territorial integrity as well as of its autonomy.

National security is that state of balance, legality, economic, social, and political stability which guarantees the existence and development of the sovereign, unitary, indivisible, independent state, through order, rights, and civil liberties.

National security leads to the realization of constantly evolving values, guided by constitutional-democratic principles. The national interest becoming a fundamental thesis in the applied foreign policy.

Security policy is represented in the long-term organization and ensuring security change and innovation.

Security strategies, thus succeeding in adopting measures that counteract, threats that evade the state of security.

A strong nation is built on common norms and values, goals and aspirations, of paramount importance to individual interests. Citizen protection is a vision, an integral and important part of the National Strategy for National Defense.

Information and communication technology have a complex impact not only on the economy and its efficiency but also on all aspects of people's lives. For a reinvention of governance in the information society, the following concepts have been identified that should be met:

- Increase the state's capacity to absorb European funds using new technologies.
- Increase the capacity of government administrations in public policy, both at national and European level.

- e-democracy – the internet can increase democratic participation in government, the citizen of the information society is active.
- The electronic citizen – the citizens of the new society/young people are attracted in the modern technological fields being the key actors of the future governments, the politics in the digital age is in continuous transformation.
- Politics in electronic format – the manifestation of politics in digital form is becoming more visible through the significant increase of online election campaigns, the electronic state, and behavioural patterns.
- The electronic state – in the phenomenon of globalization fuelled by the digital integration of the markets of the new economy, it will be desired to rethink and redefine the concept of nation-state.

Thus, increasing the chance of creativity and innovation, by profoundly transforming the behaviours and profiles of citizens, from the reactive to the proactive.

Methodology

The research was carried out at the level of the Ministry of European Investment and Projects, with the main aim of creating scientific and technological excellence, as well as gaining advantages in the field of security and resilience of systems, services and critical infrastructure of national importance, as well as increasing cyber security culture in the central public administration and among contract users or civil servants, with the possibility of establishing within the institutional organization, at least 3 posts with specific tasks in the cyber field, in direct collaboration with the Security structure of the Ministry and in cooperation agreement National Cyber-int.

The period included in the analysis activity is between the years 2014-2022, comprising two programming periods of non-reimbursable financing from European funds, facilitated by the European Commission.

The two projects carried out by the Cyber-int National Center, to ensure cyber security at national level, constituting a security umbrella, on the critical infrastructure of national interest, which will be reinvented by the digital transformation generated using emerging technologies, have produced a considerable evolution, emerging technologies and the integration of Machine Learning or Artificial Intelligence functionalities, at the level of the Ministry of European Investments and Projects, as a development measure through innovation, having positive effects including on the development of the national economy by increasing the absorption of European funds in a cyber secure environment.

The Ministry of Investment and European Projects regularly contracts the services of a certificate authority to allow user authentication and control access to various resources, especially in the application MySMIS2014, the first government IT application with this level of security implemented since 2016. They can be managed of HSM solutions and authentication tokens. Thus, an extra layer of Security can be added by implementing a Dual Factor Authenticator system. Authentication solutions, their management and

monitoring, and even administrators who may have various access privileges may also be useful. Access to the ministry's resources will be secured, and endpoints, mobile or immovable, must contain advanced antivirus protection technologies.

Virtual Private Network traffic tunnelling, and internet access monitoring is performed through ICIN 54 MIPE – Cyber-int and STS. The encryption of the storage spaces that manage the used applications is performed at STS by securely hosting the equipment in the specially organized data center.

Critical systems must be completely separated from the rest of the network to create an area independent of attacks that may enter the organization. This is the area covered by the security equipment within ICIN 54 MIPE, which will benefit this year from an upgrade of capabilities, through refurbishment. Access should be granted only to people who use the system, and the connections will be encrypted by technologies such as data diodes, zero-trust, etc. Updates are performed through dedicated servers and well-defined policies to prevent access to the Internet Windows Server Update Services (WSUS).

Results and discussions

The first step in the use of emerging technologies by integrating Machine Learning or Artificial Intelligence functionalities, at the level of the Ministry of European Investments and Projects, was made within the projects financed from non-reimbursable funds, as a measure of development through innovation, of a critical infrastructure of national interest, by cooperation agreement with the National Authority in the field of Cyber-intelligence – Cyber-int National Center.

The security equipment used, offering advanced management capabilities, for the realization of prevention, detection, and investigation of cyber security incidents, by analyzing the risk generated by possible attacks, as well as automatic remediation of threats.

Raising awareness will be achieved by informing users, which is the first measure of protection against cyber-attacks. Human error can be avoided. This will close the way for hacker attacks, through good regular information, constant emails, courses, trainings, eliminating the possibility of further, much more serious problems, especially regarding information and data belonging to the state.

In the near future, the public administration will evolve towards a different approach to the use of technologies, being transposed into future strategies, the need to use solutions in cloud, on-premises, or hybrid cloud environments, depending on available budgets and advantages or disadvantages. To streamline the activity or in the situation of permanent blocking of the procedures of new employees in the public administration, the subcontracting of services that allow access to these technologies is an efficient way to manage platforms, with a cost-benefit ratio for the benefit of the public institution, will relieve the care of the use of internal resources.

Public administration services can be streamlined using advanced information technology. The European Commission is trying to set its own example in this, through the procedures and tools it uses in its day-to-day work, in its links with Member States administrations and its own decentralized agencies, which are marked by progress in computerization. The aim is to facilitate citizens' access to public information through new computer applications, as well as to achieve better communication between all levels of public administration across the Union, thanks to the high-speed connection.

The development of the European information society involves a considerable and ever-increasing financial effort, which cannot be fully assumed by the European Union and the governments of the Member States. Experience has shown that the private sector is best able to take risks in operating and developing new adaptable markets and has the capital to make such investments.

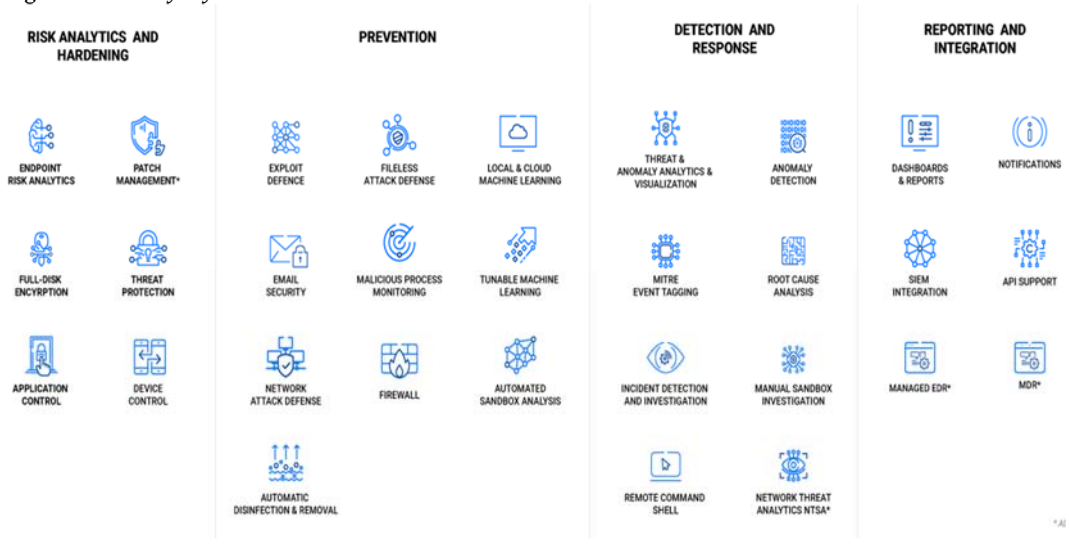
Integrating Machine Learning or Artificial Intelligence functionalities, at the level of the Ministry of European Investments and Projects could be seen in Table 1 below, while security levels could be observed in Figure 1.

Table 1. *Integrating Machine Learning or Artificial Intelligence functionalities, at the level of the Ministry of European Investments and Projects*

Implementation period	Protected workstations	Increasing the degree of cyber protection	Automate responses to detected and remedied cyber attacks	Fixed vulnerabilities	Possible security risks
2014-2017	250 to 450	200 Endpoints	About 50%	75%	25%
2020-2024	450 to 1700	1250 Endpoints	About 75%	99%	1%

Source: Author' own research.

Figure 1. *Security layers*



Source: www.bitdefender.com

Conclusions

Security solutions are needed, bringing real benefits to the institution once they are configured according to the needs of secure operation. Easy-to-use, intuitive management tools can optimize the time required to implement new policies, to make a correct monitoring and alerting. Also, the collaboration with the National Cyber-int Center, offers stability and access to the necessary knowledge in the activity of implementing these systems for ensuring cyber security.

Unified and integrated technologies offer a measurable advantage in results, benefiting from such consoles and tools adapted to the level of expertise, in accordance with the strategies built by the IT Security department. Cooperation with other institutions such as National Cyber-int Center, participation in seminars and conferences in the field, is an excellent tool for improvement, and especially a guide of good practices, assimilated to adopt the best decisions for the public institution.

The budget allocated to innovation in public administration will create and maintain such desirable stability, especially in critical areas, such as European funds. In industry and economics, the role of robotics and process automation will increase considerably, with changes related to technology bringing both benefits and vulnerabilities, especially in cyberspace. It will practically create a virtual parallel world, where the existence of the state, with everything it represents must be protected, so the environment will be safe and secure even for the individual. The consequences of competition in innovation produce major transformations, including in society, simplifying the complex life of modern man in the information society. Thus, constituting a national interest for the Government Strategy, the areas such as attracting European funds and ensuring cyber security, aiming at modernizing, and computerizing the public administration in Romania.

Thus, it is necessary to create a global framework of security and trust in ICT, with an expansionist tendency towards process automation to achieve maximum efficiency. This strategic goal is aimed at creating scientific and technological excellence, as well as gaining advantages in terms of security and resilience of systems, services and critical infrastructure of national importance, as well as increasing the degree of cyber security culture in the central public administration, with the possibility of establishing within the institutional organization, at least 3 positions with specific attributions in the cybernetic field, in direct collaboration with the Security Structure of the Ministry in question and in cooperation agreement with the National Authority in the field of Cyber-intelligence, following designation by SCND- Supreme Council of National Defense – Romanian Service of Information, through the National Cyber-int Center.

In this way, an important stage in inter-institutional collaboration will be fulfilled, to achieve the fundamental objectives of the country strategy, the field of funds becoming critical infrastructure through the implications inherent in the national economy, affecting all plans of society, from financial to economic, social-educational, up to the political one, with all the necessary risks assumed. But most importantly, the efficient management of infrastructure and applications for European funds, having a special importance in the much-needed process of increasing the quality of life, representing the first step towards knowledge, innovation, and development.

References

Cloud Computing, Events – October 6, (2021 at 11:19 am) – Cloud Conference brings new technologies to the forefront – (clubitc). <https://www.clubitc.ro/2021/10/06/conferinta-de-cloud-aduce-in-prim-plan-noile-tehnologii/>

Decision of the Official Gazette no. 677 (2020 – August 14) – on the approval of the National Program for the digitization of micro, small and medium enterprises, financed under the Operational Program Competitiveness 2014-2020. <http://legislatie.just.ro/Public/DetaliiDocument/229226> – OFFICIAL GAZETTE no. 756 of 19 August 2020.

EU Directive 1148/(2016) – Measures for a high level of security of networks and information systems in the Union. https://cert.ro/pagini/ansrsi.

European Commission – Brussels, 3.3., 2021. One year since the outbreak of COVID-19: fiscal policy response, <https://ec.europa.eu/info/files/one-year-outbreak-covid-19-fiscal-policy-response_en>

European Commission, 2022. Jobs and the economy during the COVID-19 pandemic, <https://ec.europa.eu/info/live-work-travel-eu/coronavirus-response/jobs-and-economy-during-coronavirus-pandemic_ro>

European Council – Council of the European Union – March (2010). European Union Internal Security Strategy; <https://www.consilium.europa.eu/ro/documents-publications/publications/internal-security-strategy-european-union-towards-european-security-model/>

European Information Society, 2005. Publisher: Foundation for European Studies.

National Cybersecurity Directorate (DNSC) – (2021) September 30 – European Cybersecurity Month – ECSM <https://cert.ro/citeste/comunicat-luna-europeana-a-securitatii-cibernetice-2021>

Oracle Romania, 2022. Emerging technologies: IoT, EoT, AI, Blockchain <https://www.oracle.com/ro/emerging-technologies/>

Presidential Administration – Bucharest (2020) Romania – National Strategy for National Defense for the period 2020-2024. <https://www.presidency.ro/files/userfiles/Documente/Strategia_Nationala_de_Aparare_a_Tarii_2020_2024.pdf>

Regulation (EU) (2016)/679 – on the protection of individuals with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation).

The European Union Agency for Cybersecurity (ENISA), (2021) September 13 – Methodology for a Sectoral Cybersecurity Assessment, <https://www.enisa.europa.eu/publications/methodology-for-a-sectoral-cybersecurity-assessment>

The European Union Agency for Cybersecurity (ENISA), (2020) April 15 – Advancing Software Security in the EU, <https://www.enisa.europa.eu/publications/advancing-software-security-through-the-eu-certification-framework>

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 106-115

Cultural-creative cities and local development

Marta-Christina SUCIU
Bucharest University of Economic Studies, Romanian Academy,
Academy of Romanian Scientists, Bucharest, Romania
christina.suciu@economie.ase.ro
Gheorghe-Alexandru STATIVĂ
Bucharest University of Economic Studies, Romania
alexstativa95@gmail.com
Ana-Maria BOCĂNEALĂ
Bucharest University of Economic Studies, Romania
anamaria.bocaneala@gmail.com

Abstract. *Cultural and creative economy plays a key role in modern societies. Cities and mostly cultural and creative local communities are the main attraction for people all over the world. Creative and cultural cities reflect a quite new vision, which highlights the essential role that local communities have in developing an environment that better supports the development of creativity, innovation and diversity, based on valuing and promoting the local cultural heritage. Cultural and creative cities have to preserve their authenticity even in the context of globalization. Recent regional studies highlight the importance of city diplomacy preserving local values, traditions and heritage meaning glocalization is more and more important to face the challenges of globalization highly contributing to a long-run sustainable competitive economic and social local development that plays a magnet role in attracting investment. This paper aims to illustrate the role that cultural and creative cities for local development. Thus, from a methodological point of view, the paper had looked to identify if there is a link between cultural and creative economy and the aggregate socio-economic and cultural performance of the local cultural and creative cities based on the new benchmarking called Cultural and Creative Cities Index (C3 index). More concrete in the case of this paper the authors had focused on the cluster of cities that have a population of over 1 million inhabitants. Our results highlight the need for being aware about the importance of cultural and creative economy for the local development of cultural-creative cities based on the high and statistically significant level of the non-parametric Spearman coefficient of correlation. This type of correlation is an important tool useful mostly for the local public policy makers, in order to design local coherent strategies and policies and next to act in line with the new vision regarding the smart, sustainable and inclusive cultural-creative cities' long-run development.*

Keywords: cultural-creative cities; cultural-creative economy; cultural and creative cities index (C3 index).

JEL Classification: R59, Z1.

Introduction

For hundreds of years, cities have been one of the most important catalysts for local social and economic development. More recently, within the context of cultural – creative economy, cities had progressively become centers of innovation, based on valuing on a high level people' creative potential contributing to human development, based on a better, efficient and effective use of high technologies that supports social and economic development on mid-term and mostly on the long-run by exploring the cultural heritage of local communities. During the history of human civilization, mostly within last centuries urban development had been closely linked to culture, as highlighted by tangible and intangible heritage, represented by traditions and customs. The cultural landmarks, represented by museums, concert halls or theater halls and libraries, represent the so-called *historical core* of one city that makes it much more attractive, for residents but also for tourists and visitors. Cities have been able to explore the local human creativity potential, becoming step by step centers of and knowledge and innovation, where partnerships and diverse interactions bringing together people from many social backgrounds, with the main goal of innovation, trade and migration.

It is estimated that 60% of the world's population will live in cities by 2030. This trend of evolution highlight the need to explore the multiple and diverse opportunities offered by extensive investment in infrastructure, urban planning and service delivery, leading to local socio-cultural and economic development (CCI, 2021). Culture and creativity provide an opportunity for cities to better respond to the major challenges they have to face, such as the health crisis, population growth, economic downturns and social tensions.

Culture and creativity help to develop sustainable cities. This is more and more recognized internationally, thanks to the adoption of the *17 Sustainable Development Goals* in 2015 by the United Nation, through which culture has been integrated into the international development agenda. The creative economy is one of the fastest growing economic sectors in the world economy, due to export earnings, job creation and income generation (Hall, 2020). Creative economy support mostly the interactions between companies (many of them being considered as innovative business) and people that used and explore their talents and gifts by producing artistic, cultural activities and innovative products and services. Moreover, the creative economy includes also open spaces where people may be stimulated to present different works, to exchange ideas and to receive and to provide feedback. The creative economy is also about reorganizing services, production, entertainment, and commerce. It contributes to changing the environment in which people want to live, study, work, think, create, invent and interact with other people such as to apply their creative and innovative ideas. Activating creative economies is closely linked to understanding, interacting, and finding practical solutions at the local level (Shareholder Letter, 2020).

Cities are at the heart of the creative economy. As the role of the cultural and creative economy is more and more amplifying, opportunities for the development of this emergent economy based on cultural and creative sectors are widely recognized. Many local communities and cities are embracing creativity as part of their development vision, along with finding solutions to motivate local decision makers to look for strategies and policies

that highly contribute to the improvement and development of local business clusters based on a modern approach of open innovation, online digital collaborative platforms that apply principles of quadruple helix in business

The growth of the importance of intellectual property trade and digitalization, in many cases, has bypassed official statistics. A significant part of the cultural and creative economy is the transactions of physical products that have a relatively low value in terms of materials, but contain a high value of intellectual property, which is not always recognized by conventional statistical measures (ADAGP, 2021).

Culture is highly appreciated now in most regions and cities all over the world and of course in Europe by local residents and by tourists and visitors. The cultural-creative sectors represent an essential part that shapes the attractiveness and competitiveness of the regional economy. Cultural heritage is representing a key element that reflects the local community authenticity that highly contributes to promote the image of cities and regions by different contemporary marketing strategies including the digital one such as virtual tours of famous museums. Culture and creativity play a key role in providing three benefits to cities: economic, spatial and social. Through their contribution to urban development, the creative-cultural industries contribute to increase the attractiveness of cities and thus to the smart, sustainable and inclusive social and economic long-run development of local communities. As highlighted by UNCTAD experts during the period 2002-2015, it was estimated that the value of global exports of creative goods increased by over 150 times (UNCTAD, 2019). From a social point of view, culture and creativity bring together city communities by contributing to inclusion and creating opportunities for those who might be economically and socially excluded. The inclusive dimension of development enable social cohesion and valuing all local communities members creativity at the neighborhood level, enabling the well function of creative networks to promote and design innovative sustainable and smart projects that might shape the local development in a more creative and innovative way.

The main goal of this paper is to investigate in detail the cities that are part of the XXL cluster according to the new benchmarking used on the European Union level since 2017 based on its second edition published in 2019, mainly about C3 – *The Cultural and Creative Cities Monitor* (The Cultural and Creative Cities Monitor, 2019).

This main goal of our paper had been translated into the following research questions (RQ):

RQ1: Why is it important to use the C3 index in order to determine local decision makers to adopt measures related to the creative-cultural sectors?

RQ2: Why is it important to identify the new benchmarking that provides a hierarchy of cities within the cluster to which they belong?

RQ3: Is there a connection between the C3 index and the "creative economy" dimension of this aggregate index?

Brief literature review

For a better understanding of cultural and creative sectors many visions and different approaches have been developed.

The concept of cultural and creative economy has emerged to draw attention to the role of creativity as an important driven force of the contemporary socio-cultural and economic life. Economic development and culture are main factors that make the difference within the contemporary development process.

One of the most common approach regarding the creative economy is connected from an economic point of view to the creative industries that originate in individual talents, abilities, and creativity, which have the potential to create jobs through the exploitation and generation of individual property (DCMS, 1998).

The creative economy reflects the deep and important changes that are taking place in the general economy, namely the transition from an economy based on the production of goods towards an economy based on the provision of services. It is estimated that this change will be similar in proportion to the transformations of the 1700s, when it shifted from an agrarian society to an industrial society (MPI, 2009).

The creative economy is an expanding concept that generates socio-economic and cultural long-run sustainable, smart and inclusive development. Cultural and creative economy creates jobs, generates income and promotes social diversity, social inclusion and human development. Moreover, the creative economy includes cultural, economic and social aspects that highly interact with technological, intellectual property and tourism development. At the heart of the creative economy there are the creative industries (UNCTAD, 2010).

Understanding the creative economy is one of the main debates surrounding the term creative industries. This term has extended the scope of the creative industries beyond the potential of commercial activities (UNCTAD, 2004).

More and more cities around the world are using the concept of creative city in order to better formulate strategies and active policies to support long-run urban development based on the increase of the demand for cultural and creative sectors of activities. The most important resource that a city has is represented by its inhabitants, who have ideas, imagination, and thus have to be better motivated such as to better explore their talents and creative potential, which will highly contribute to local development and success in the future (Landry, 2000).

Creativity is a broad process that might arise from any citizen or from any sector or profession. Encouraging the manifestation of creativity within all economic sectors and in all professions is considered to be a key way to become a creative city. Most creative cities support the active manifestation of the creative potential through unique ways, some of which act as nodes for generating cultural experiences for visitors and locals residents. In order to keep their cultural authenticity local communities are organizing festivals to shape city identity or showcase heritage assets. On the other hand, other cities are suitable for the media industries to provide jobs and to act as a center for urban growth and regional

development, while there are other cities that have a key role in promoting culture such as to rely on its capacity for developing social cohesion, quality of life and cultural identity and cultural vibration.

Main methodology

Main data based used

In 2019, the second edition of *the Cultural and Creative Cities Monitor* was launched. It had analyzed 190 cities from 30 European countries (EU27, Switzerland, Norway and the United Kingdom). Compared to its first edition published in 2017, they were analyzed 22 additional cities.

The main criteria underlying this extended choice, within the second edition of *the Cultural and Creative Cities Monitor*, are:
- UNESCO creative cities (winning cities until 2017).
- Cities hosting at least two international cultural festivals (until 2018).
- Cities that have been *European Capital of Culture* until 2019 or, correspondingly, cities that have been proposed to be *European Capital of Culture* until 2023.

More than 1,000 cities in Europe met these criteria. In order to select the most relevant cities, another criterion was applied, namely cities with more than 50,000 inhabitants. Thus, only 190 cities were validated to be included in *the Cultural and Creative Cities Monitor* within its 2019 edition.

The Cultural and Creative Cities Index (C3) is a composite aggregate index that measures cultural and creative performance within 190 cities from 30 European countries. The quantitative information are gathered based on 29 indicators, relevant for 9 dimensions. These had been next structured on three main components, namely:
- Cultural vibration.
- Creative economy.
- Favorable environment.

Table 1 illustrates the three components of *the Cultural and Creative Cities Index (C3)*

Table 1. *Cultural and Creative Cities Index (C3) components*

C3 Index – Cultural and Creative Cities Index								
1. Cultural Vibrancy		**2.Creative Economy**			**3. Enabling Environment**			
D1.1 Cultural Venues & Facilities	D1.2 Cultural Participation & Attractiveness	D2.1 Creative & Knowledge-based Jobs	D2.2 Intellectual Property & Innovation	D2.3 New Jobs in Creative Sectors	D3.1 Human Capital & Education	D3.2 Openness, Tolerance & Trust	D3.3 Local & International Connections	D3.4 Quality of Governance

Source: designed by authors based on the information from the "Cultural and Creative Cities Monitor", 2019.

For a more detailed analysis, the 190 cities were divided into different clusters, regarding the number of inhabitants, as illustrated in Table 2:

Table 2. *Classification of cities according to the number of inhabitants*

Cluster name	Population (inhabitants)
Cluster S	50,000-100,000
Cluster M	100,000-250,000
Cluster L	250,000-500,000
Cluster XL	500,000-1,000,000
Cluster XXL	> 1,000,000

Source: designed by authors based on the information from the "Cultural and Creative Cities Monitor", 2019.

The *Cultural and Creative Cities* (C3) index is a useful tool for decision makers helping them to design, apply and monitor different effective and efficient cultural strategies (Montalto et al., 2019). Based on this index, numerous studies have been conducted on culture.

In order to identify the importance of the creative economy within the aggregate *Cultural and Creative Cities (C3) index* we had applied *a non-parametric correlation Spearman index*

Nonparametric correlations – Spearman

The correlation coefficient of the Spearman ranks (p-rho) is not influenced by the representativeness of the average. Thus this kind of non-parametric correlation index is used when one of the variables does not meet the conditions for the administration of parametric tests. This coefficient transforms the original values into ranks using the following formula.

$$\rho = 1 - \frac{6 \times \sum d^2}{n(n^2 - 1)}$$

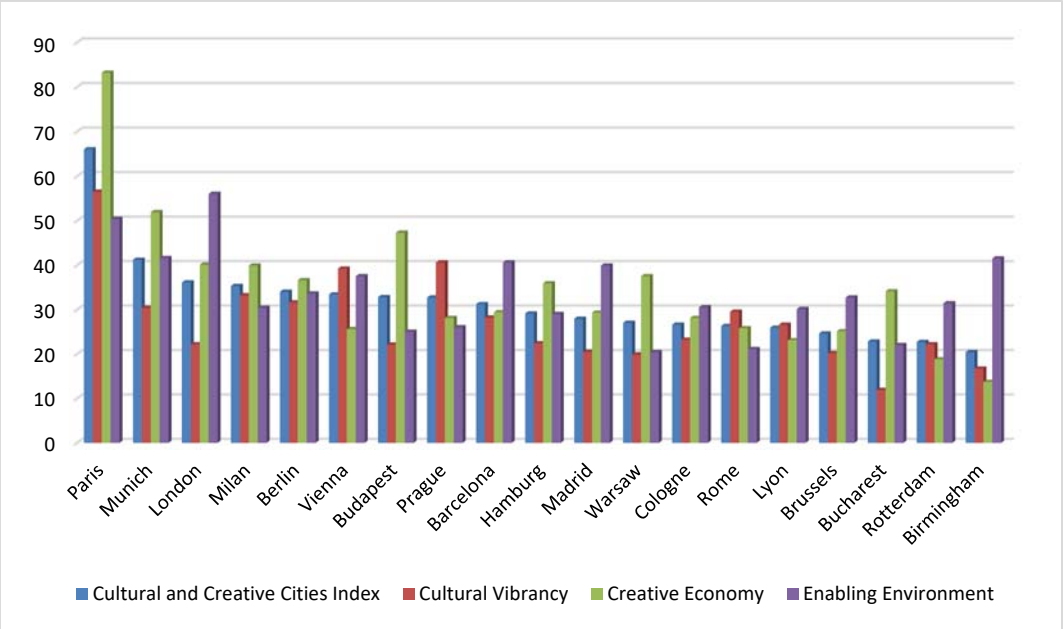
Where:
d represents the difference between the ranks of the values measured in a subject.
n represents the number of subjects taken into account.

The Spearman correlation coefficient is a directional correlation coefficient, which can take values between **-1** (which means the existence of a negative bond) and **+1** (which indicates the existence of a positive connection).

Main results and discussions

There are five clusters identified within *the Cultural and Creative Cities Monitor* (C3), depending on their population. For this paper the authors analyzed just the cities included within *the XXL cluster*, respectively the cities with over 1,000,000 inhabitants. Within this cluster, there are 20 cities, most of them being European capitals (Figure 1).

Figure 1. *Cities included within the XXL cluster*



Source: Designed by authors based on the data from "Cultural and Creative Cities Monitor", 2019.

Figure 1 shows the performance of the 20 cities included within the XXL cluster, in terms of the aggregate C3 index, as well as for each of the three components expressing the three corresponding dimensions.

The first dimension is ***the cultural vibration***. It measures the cultural intensity of a city in terms of participation in culture and cultural infrastructure.

The second dimension is ***the creative economy*** that analyzes the contribution of cultural and creative sectors to the city's economy.

The third dimension is ***the environment***. It analyzes the tangible and intangible elements that contribute to the stimulation and attraction of creative talent.

The top three cities in XXL cluster are: *Paris* (C3-66), *Munich* (C3-41), and *London* (C3-36). On the bottoming part of C3 are: *Sofia* (C3-20), *Birmingham* (C3-20) and *Rotterdam* (C3-23). We consider that C3 index, as well as the new benchmarking of European cities' hierarchy its dimensions and component sub-indicators are very important for public policy and decision makers on the local and cities level. Based on the results highlighted by C3, decision makers had additional tools to design better strategies and local policies and next to take different actions and to monitor their performance and progress. Cities that are in the second part of the benchmarking can learn good practice lessons from the cities located in the leading positions, in order to increase the value of their C3 aggregate index but also on its main sub-indicators. According to our team research questions, presented on the introduction part, the authors analyzed the benchmarking of cities from the XXL cluster, and it's three dimensions (Table 3).

Table 3. *The benchmarking of cities included within the XXL cluster, depending on the C3 index and its three dimensions*

No.	City	C3 index Hierarchy	Cultural Vibration Hierarchy	Creative Economy Hierarchy	Enabling Environment Hierarchy
1	Paris	1	1	1	2
2	Munich	2	6	2	3
3	London	3	12,5	4	1
4	Milano	4	4	5	12
5	Berlin	5	5	7	8
6	Vienna	6	3	16	7
7	Budapest	7	14	3	16
8	Prague	8	2	13,5	15
9	Barcelona	9	8	11	5
10	Hamburg	10	11	8,5	14
11	Madrid	11	15	12	6
12	Warsaw	12	17	6	19
13	Köln	13	10	13,5	11
14	Roma	14	7	15	18
15	Lyon	15	9	18	13
16	Brussels	16	16	17	9
17	Bucharest	17	19	10	17
18	Rotterdam	18	12,5	19	10
19	Birmingham	19	18	20	4
20	Sofia	20	20	8,5	20

Source: Designed by authors based on the data from the "Cultural and Creative Cities Monitor", 2019.

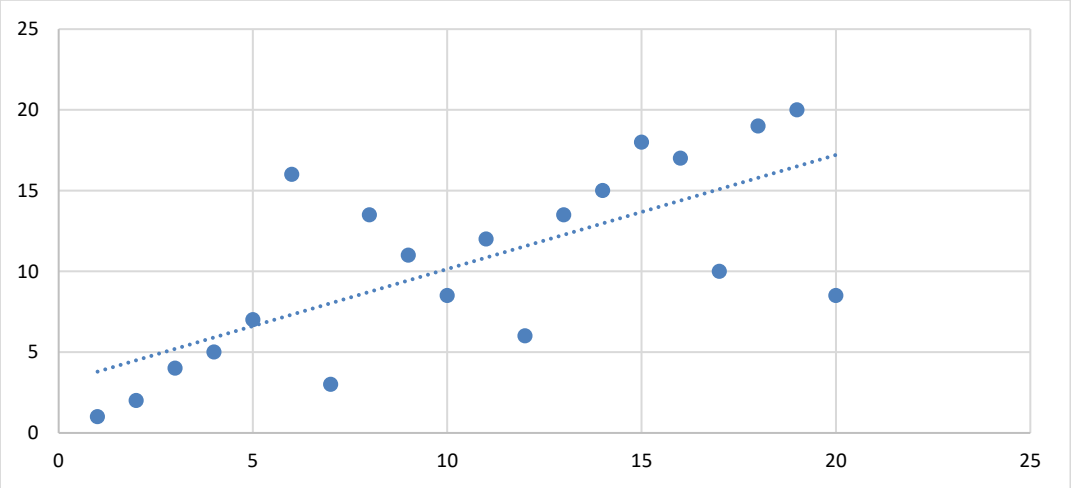
According to data included within Table 3, Paris ranks first in the city benchmarking from the XXL cluster. This is due to its strong performance on all the three dimensions. Paris ranks first in the cultural vibrancy and creative economy dimension. On the medium enabling environment dimension, it ranks second. Within the dimension of cultural vibration, Paris occupies the first position in the benchmarking of the sub-indicators "cultural venues & facilities" and, correspondingly on "cultural participation & attractiveness". With respect to the Creative Economy dimension, Paris ranks first on the Creative and Knowledge-Based Jobs sub-indicator and ranks second on the Intellectual Property and Innovation and New Jobs according to the Creative Sectors sub-indicators. From the point of view of the "enabling environment" dimension, Paris ranks first on the sub-indicators "Human capital & education" and "Local & international connections", on the sub-indicator "Openness, tolerance & trust" it ranks on the 12th position, and on the sub-indicator "Quality of governance" it is situated on the 10th position.

Bucharest ranks on the 17th position within the XXL cluster, with a value of 22.8 of the C3 index. Corresponding to the "cultural vibrancy" dimension, Bucharest ranks on the 19th position and, according to the sub-indicators "cultural places & facilities" it occupies the 20th position. Regarding the "cultural participation & attractiveness", Bucharest occupies the 19th position. With respect to the "creative economy" dimension, Bucharest occupies position 10, and for the component sub-indicators, "creative & knowledge-based jobs" occupy position 16. For "intellectual property & innovation" Bucharest occupies position 19, and for "new jobs in the creative sectors" it occupies position 4. Within in the "enabling environment" dimension, Bucharest ranks on the 17th position and according to the component sub-indicators, "human capital & education" Bucharest ranks on the 18th position. Corresponding to "openness, tolerance and trust" Bucharest ranks on the 10th

position. Regarding the "local & international connections" Bucharest ranks on the 20th position. With respect to the "quality of government", the city ranks on the 19th position.

In order to analyze the connection between the aggregate index C3 and its second dimension (creative economy sub-index) authors had applied a non-parametric correlation index, namely Spearman correlation index. After performing the calculations, the authors obtained a Spearman correlation index with a value of 0.70. This value illustrates a strong connection between the C3 aggregate index its second dimension: the creative economy. The value obtained is statistically significant being higher than the significance threshold of 10% (0.380), the significance threshold of 5% (0.447), the significance threshold of 2% (0.520) and the significance threshold of 1% (0.570). According to the value obtained and the fact that this value is statistically representative, the authors manage to demonstrate that creative economy has a strong influence on the C3 aggregate index (Figure 2).

Figure 2. *The relationship between the C3 aggregate index and the "creative economy" dimension*



Source: Designed by authors based on the data from "Cultural and Creative Cities Monitor", 2019.

As illustrated in Figure 2, the authors had been happy to identify a high connection between the aggregate index C3 and the *creative economy* sub-index. This strong connection highlights the importance of creative economy for the local socio-cultural and economic development in the case of the cities included within XXL cluster.

Main conclusions

The world is constantly evolving and moving towards a knowledge and innovation society. Due to the acceleration of technological progress in last decades the role of creative and cultural economy for the local development of cultural and creative cities had become crucial as highlighted be the high value of the Spearman non-parametric correlation index.

This paper is consider useful mostly for the local decision makers when they design strategies and policies and when they monitor their performances in time according to the corresponding evolution of C3 index and its second component, creative economy.

The main limitation of this research is that the data used are from 2019. There are no recent data, which could capture the evolution of cities during the last years also in connection with the complex multi dimensions crisis due to COVID pandemic19.

Our team intends to continue this research by extending the analyze to all the clusters and correspondingly to its connection with the other two dimensions, namely: the cultural vibration and the favorable environment, as parts of the C3 index.

References

Hall, S., 2020. This is how COVID-19 is Affecting the Music Industry. Agenda (blog), May 27, 2020. <https://www.weforum. org/agenda/2020/05/this-is-how-covid19-is-affecting-the-music-industry/>

Landry, C., 2000. The Creative City. UK: Earthscan.

Montalto, V., Moura, C.J.T., Alberti, V., Panella, F. and Saisana, M., 2019. The Cultural and Creative Cities Monitor, Oficiul pentru Publicații al Uniunii Europene: Luxemburg, 2019.

ADAGP, 2021. EY Study: Rebuilding Europe through Culture. January 26, 2021. <https:// www.adagp.fr/en/actuality/ey-studyrebuilding-europe-through-culture>

Cities, Culture, and Creativity – Leveraging culture and creativity for sustainable urban development and inclusive growth, 2021.

Department for Culture, Media & Sport (DCMS), 2008. Creative Britain: Talents for the New Economy. Retrieved from http://webarchive.nationalarchives.gov.uk/; </http://www.culture. gov.uk/images/publications/CE PFeb2008.pdf>

Martin Prosperity Institute, 2009. Creativity in the Rural Economy: Challenges and Opportunities. Toronto: Martin Prosperity Institute. Retrieved from <http://ruralontarioinstitute.ca/file. aspx?id=3607ea36-0853-4bb4-9b62-50b7d1482f96>

Shareholder Letter, 2020. FEATURED SELLER – Missy Moran Studios, Oakland, CA, <https://s22.q4cdn.com/540910603/files/doc_financials/2020/q1/ Shareholder-Letter-Q1-2020-[Final]-(1).pdf>

UNCTAD, 2004. Creative Industries and Development. Retrieved from <http://www.unctad.org/ en/docs/tdxibpd13_en.pdf>

UNCTAD, 2010. Creative Economy: A Feasible Development Option. <http://unctad.org/es/ Docs/ditctab20103_en.pdf>

UNCTAD, 2019. CREATIVE ECONOMY OUTLOOK – Trends in international trade in creative industries <https://unctad.org/system/files/official-document/ditcted2018d3_en.pdf>

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 116-123

Study on the impact of increasing the share of electric vehicles on carbon dioxide emissions in Romania

Ionuț Laurențiu PETRE
Bucharest University of Economic Studies, Romania
laurentiu.petre@eam.ase.ro
Marian MOTOFEANU
Bucharest University of Economic Studies, Romania
marian.motofeanu@gmail.com
Marius VASILE
Bucharest University of Economic Studies, Romania
marius.vasile@afir.info
Veronica TARAN BACIU
Bucharest University of Economic Studies, Romania
tbaciuveronica@yahoo.com

Abstract. *In this paper we wanted to identify the causal links between the main variables analyzed, namely the share of electric vehicles in Romania, primary energy consumption and carbon dioxide emissions for new vehicles. At the same time, the research sought to determine the impact that the development of the electric vehicle industry may have on carbon dioxide emissions. In this sense, with the help of national databases, the previously presented variables were analyzed quantitatively and qualitatively, resulting in an average to close correlation in intensity between variables, based on which the linear regression model could be performed to determine the function and implicitly the impact on which electric vehicles have on carbon dioxide emissions. Following the results, it was concluded that the inversely proportional relationship between the variables established that with the increase by one unit of the share of electric vehicles, the volume of CO2 emissions will decrease by eight units.*

Keywords: electric vehicles, carbon dioxide, impact, Romania, pollution.

JEL Classification: L62, Q53, Q54.

Introduction

Combating climate change is an extremely important concern at all levels of decision-making, but setting goals and ways to achieve them requires, first and foremost, a global approach, as the phenomenon is taking place on a global scale. The global framework for combating climate change was established at the 1992 United Nations Conference on Environment and Development in Rio (Bran et al., 2011).

Sustainable development requires ensuring a balance between economic, social and environmental considerations. The challenge is to meet the need to reduce the impact of climate change without slowing down economic growth and development (Rojanschi et al., 2006; Rădulescu, 2016).

Transport is an important economic sector, both in terms of contributing to economic growth and in ensuring the necessary conditions for economic development, including the facilitation of globalization. The activities of this sector depend to a large extent on fossil fuels, especially oil, from which the fuels used by most means of transport are obtained. (Abuzarli and Mammadzada, f.d.)

To reduce GHG emissions, the following options can be considered: modal transport, ensuring the transition from road to rail transport and the public transport system; non-motorized transport in urban areas: facilitating the use of bicycles, avoiding the need for motorized transport in favor of walking; the use of biofuels, which have lower specific GHG emissions; promotion of hybrid and electric vehicles; increase efficiency.

Given that 60% of global warming is produced by carbon dioxide (Porombrica and Ciobanu, 2017), in conjunction with previous information on GHGs in the transportation industry, this research was used to highlight the impact it can have. The development of the Romanian electric car industry, on carbon dioxide emissions for new vehicles (Bejan et al., 2009). The research hypothesis is that we consider that there is a close relationship between the share of electric vehicles and carbon dioxide emissions, but an inversely proportional relationship, so that carbon dioxide emissions are inversely proportional to the increase in weight electric vehicles.

Methodology

In this paper we want to establish the possible link between the expansion of the electric car industry in Romania, and the level of carbon dioxide emissions. For this, a quantitative and qualitative analysis will be performed of the main indicators taken from the national databases (National Institute of Statistics), indicators such as: share of electric vehicles in the total fleet, primary energy consumption and average CO_2 emissions/km which they come from new cars.

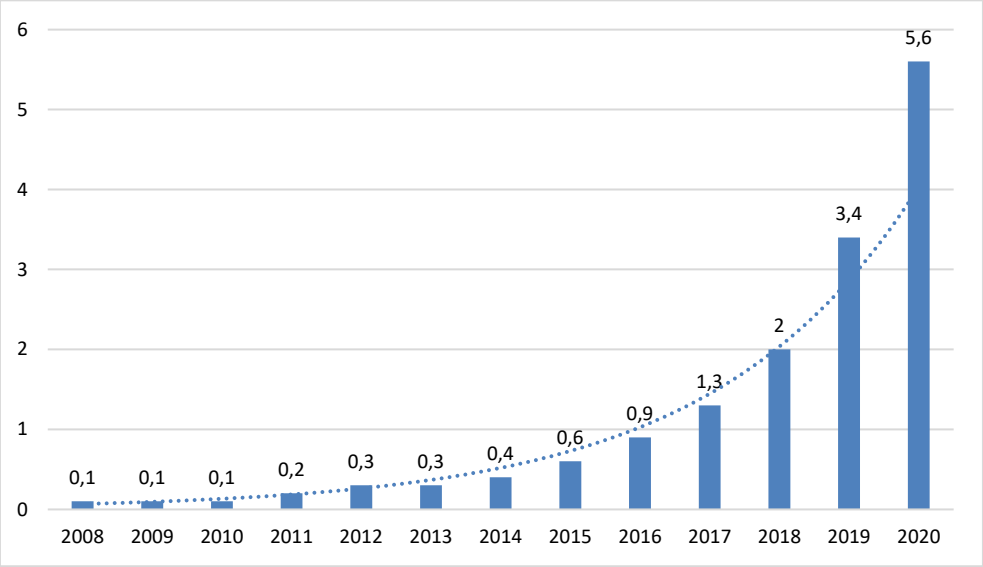
These data will be analyzed by studying the dynamics, the average annual rate of change, the simple arithmetic mean, then determining the degree of connection between them using the Pearson correlation coefficient, and finally using the linear regression model. Simple

will determine the regression equation between the main variables, respectively, the independent variable – the share of electric vehicles, and the dependent variable – carbon dioxide emissions.

Results and discussions

The purpose of this study is to determine the impact that the development of the Romanian electric vehicle industry may have on the dynamics of carbon dioxide emissions per kilometer. In this sense, we propose the analysis of the following variables: the dynamics of the share of electric vehicles in Romania, of the primary energy consumption, as well as of the average carbon dioxide emissions per kilometer that come from cars.

Figure 1. *Evolution of the share of electric vehicles in the total fleet of vehicles (promilles)*

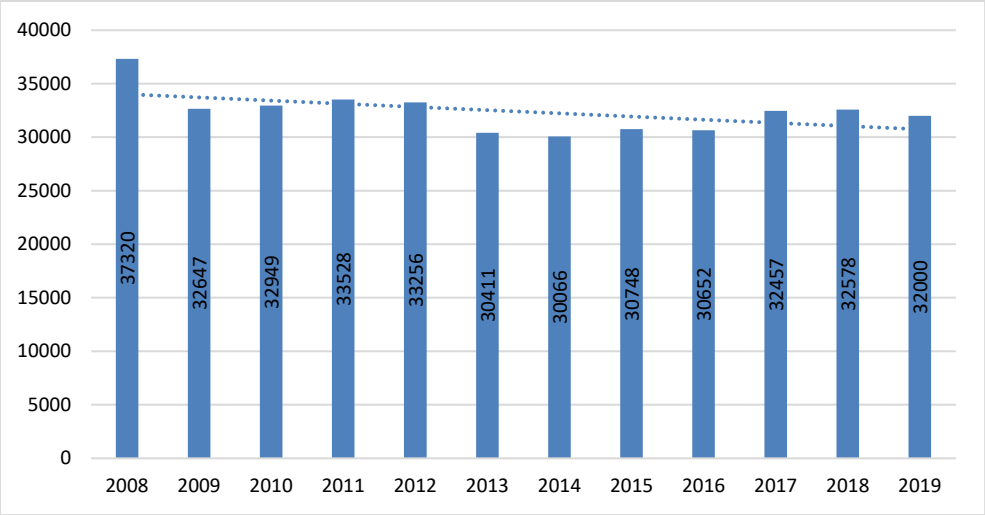


Source: processing based on NIS data.

As can be seen from Figure 1, the dynamics of the share of electric vehicles in the total fleet of vehicles in Romania, is an exponential one, in the analyzed period. Thus, in 2008 there was a share of electric vehicles of 0.1 per 1000 vehicles, in 2020, this share reached 5.6 vehicles per thousand.

On average, the share of the thirteen years, being 1.17 vehicles per thousand, but recently the share has increased significantly, with the increasing development of the industry, resulting in increased accessibility, of any kind, on electric vehicles. Thus, comparing the last year of the analyzed period, with the first one there is an increase of the indicator 56 times, and the average annual growth rate in the analyzed period being of 39.85%.

Figure 2. *Dynamics of primary energy consumption (thousand tons of oil equivalent)*

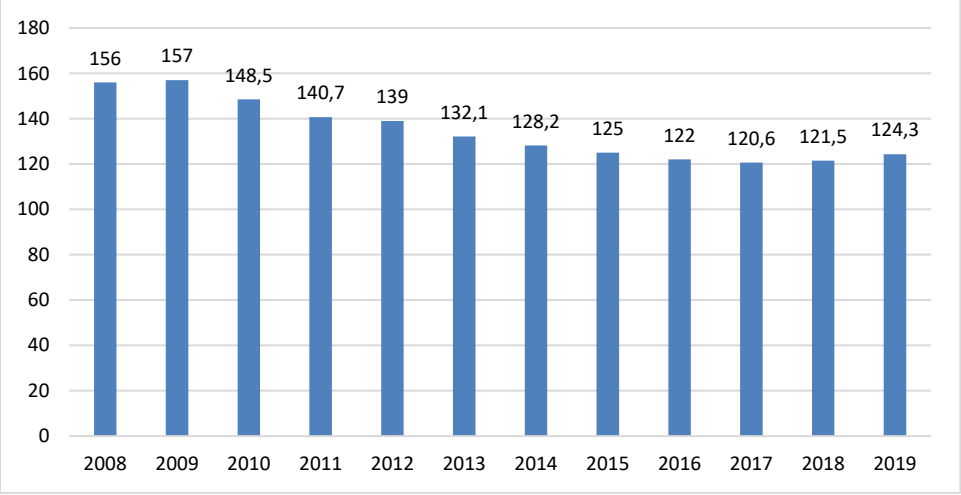


Source: processing based on NIS data.

Figure 2 shows the dynamics of primary energy consumption, thus, there is a decreasing trend of primary energy consumption, even if the share of electric vehicles has increased exponentially. If in 2008 there was an energy consumption of 37.3 million tons of oil equivalent, in 2019 there was a fixed consumption of 32 million tons of oil equivalent, however there was a minimum consumption in 2014 of 30.06 million tons of oil equivalent.

Analyzing on average, there was a consumption of 32.38 million tons of oil equivalent, and in dynamics there is a decrease in the last year compared to the first by 14.25%, and the average annual rate of change is -1.38%. We motivate this decrease based on the technological development of products, consumers, who are more and more energy efficient.

Figure 3. *Dynamics of average CO_2/km emissions from new cars (grams of CO_2/km)*



Source: processing based on NIS data.

Figure 3 shows the graph of carbon dioxide emissions per kilometer in the period 2008-2019. There is a declining trend in emissions, if in 2008 there was a value of 156 grams of CO_2/km, in 2019 there was 124.3 grams of CO_2/km, and the minimum was recorded in 2017, being 120.6 grams of CO_2/km.

On average, during the analyzed period, there was a level of emissions of 134.5 grams of CO_2/km, and analyzing the last year compared to the first, there is a decrease of 20.3%, and the average annual rate of change being – 2.04%. This decrease is due to the technological modernization of the automotive industry, being imposed by certain regulations by the European Union, but also due to the increasing popularity of hybrid and electric cars.

Table 1. *Determination of Pearson correlation coefficients between variables*

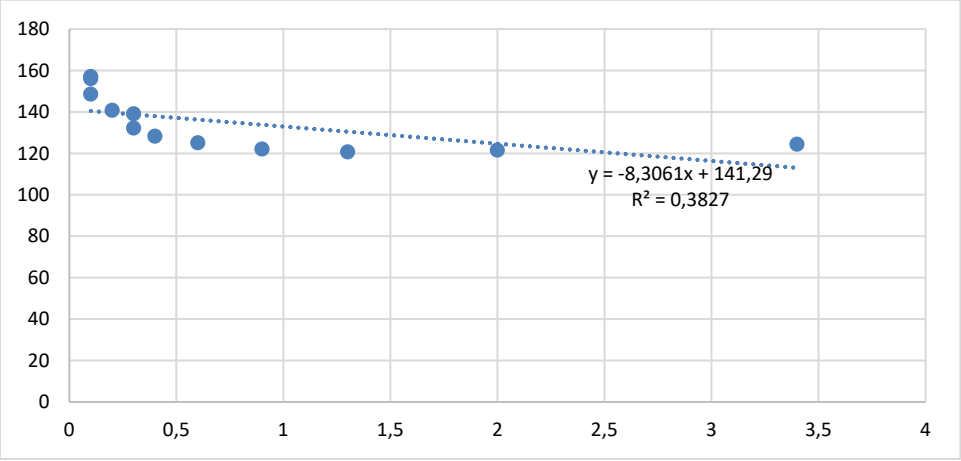
	Share of electric vehicles	Primary energy consumption	CO_2 Emission
Share of electric vehicles	1		
Primary energy consumption	-0.17784	1	
CO_2 Emission	-0.61859	0.651647	1

Source: Authors' own research.

Table 1 determines the Pearson correlation coefficients between the variables presented above. It is observed that between the share of electric vehicles and the consumption of primary energy, there is not a close link, being an even inversely proportional which is somewhat unnatural, the coefficient being -0.177, so the share of electric vehicles still does not influence primary energy consumption. There is a positive and close correlation between primary energy consumption and carbon dioxide emissions, with a coefficient of 0.65, as expected.

What we want to determine is based on the last coefficient analyzed, namely that between the share of electric vehicles and carbon dioxide emissions from new cars, this coefficient being inversely proportional, as we expected, of -0,618, which determines a relationship medium to tight. Thus, it is estimated that when one of the variables increases, the other decreases, or vice versa. Thus, by analyzing a few variables, and trying to determine the dependent and independent variables, we can say that when the share of electric vehicles will increase, carbon dioxide emissions will decrease.

Figure 4. *Correlation between the share of electric vehicles and average CO_2 emissions*



Source: Authors' own research.

To test this hypothesis, namely the one in which the weight of electric vehicles influences the carbon dioxide emissions, the correlation was determined, in figure 4, where on the abscissa, the independent variable was taken into account, respectively the weight of electric vehicles and on the ordered axis, the dependent variable, namely carbon dioxide emissions, was taken into account. Making the point cloud between the indicators and the right of the function, a coefficient of determination of 0.38 is observed, which indicates that the dependent variable is explained by the independent variable in proportion of 38%.

Table 2. *The simple linear regression model between the share of electric vehicles and the average CO_2 emissions*

Regression Statistics						
Multiple R	0.618591					
R Square	0.382655					
Adjusted R Square	0.320921					
Standard Error	11.05965					
Observations	12					
ANOVA						
	df	SS	MS	F	Significance F	
Regression	1	758.1632	758.1632	6.198401	0.032009	
Residual	10	1223.159	122.3159			
Total	11	1981.323				
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	141.2891	4.179205	33.80766	1.21E-11	131.9773	150.601
Share of electric vehicles	-8.30613	3.336254	-2.48966	0.032009	-15.7398	-0.8725

Source: Authors' own research.

To continue testing the hypothesis, we resorted to the simple linear regression model, with the two variables presented above, model found in Table 2. Thus, we can see the correlation coefficient, Pearson, previously determined, (multiple R), being 0, 61, representing a close relationship, as well as the coefficient of determination (R Square) of 0.38, mentioned and described above.

Analyzing the data from the ANOVA table, which involves the analysis of variation, we can see the value of the statistical parameter f and its level of significance. Thus, the value of this parameter may or may not reject the null hypothesis, respectively the validity of the model, comparing it with F-critical. Therefore, the critical value of the parameter F was determined, for a significance level of 0.05, but also for the degrees of freedom between groups (1) and those within the groups (10), the value of F-critical a is 4,964. The value determined by the ANOVA table, in the case of the previously presented model is 6.19, respectively higher than the critical value. Also, the significance level recorded by parameter f (Significance F) is lower than the maximum allowed threshold of 0.05, respectively it registers a value of 0.032, which gives validity to the model, rejecting the null hypothesis.

In the table of coefficients, the validity of the model can be tested once again with the help of the parameter t state, the level of significance and the confidence intervals. Thus, similarly, the parameter t state will be compared with the critical value t, the latter being 2.2 for a probability level of 95% and 11 degrees of freedom. It can be seen that the value of the parameter t State in the case of the model in Table 1, absolutely established, is higher

than the critical value. Also, the level of significance of the coefficients (P-value) is lower than the maximum accepted threshold of 0.05, for both coefficients. At the same time, also for both coefficients, the confidence intervals do not contain the zero value, thus, it can be said that the value of the independent variable cannot take the value zero, in a proportion of 95%, thus rejecting the null hypothesis.

With all these indications that give validity to the model, the regression equation can be determined, which was also established in the correlogram, but now it is statistically tested, respectively:

CO_2 emissions = -8.3 × share of electric vehicles + 141.29

From this equation we can see the value of the coefficient x (share of electric vehicles) being -8.3, which shows that when there is an increase in the share of electric cars by 1 car per 1000 there will be a decrease in emissions of CO_2/km with 8.3 grams.

Conclusion

It can be seen that in the last thirteen years the share of electric vehicles in Romania has experienced an exponential development, increasing 56 times, this being possible for several reasons, including technological development, which has made these vehicles be much more accessible, not only from a financial point of view, and on the other hand, in Romania, in the last year, the decision-makers have implemented financial support programs for the purchase of these types of vehicles.

Although the share of electric vehicles increased exponentially, however, when analyzed in absolute terms, this share did not reach a very high level, being 5.6 per thousand in the last year, which made the level of primary energy consumption not to increase, the latter registering even opposite trends, respectively of decrease, due to the technological modernization of the “consumers” that were conceived out of the care of the energetic efficiency.

Although the share of electric vehicles is not very high, carbon dioxide emissions per kilometer decreased during the analyzed period. It should be noted that not only electric vehicles contribute to this decline, but also other alternatives, namely hybrid vehicles, but also those on natural gas or hydrogen, but in general, the European Union has regulated thresholds to be met by vehicle manufacturers, thus, this regulation is also one of the reasons, corroborated with the technological modernization, smaller and smaller engines were made, and the manufacturers tried to keep the performances.

Analyzing the correlation coefficients between the variables, it was found that the share of electric vehicles does not yet influence the primary energy consumption; it has also been found that carbon dioxide emissions are influenced by primary energy consumption, but most importantly, that carbon dioxide emissions are influenced by the share of electric vehicles.

Carrying out the correlation and determination of the regression equation, after testing the model using the linear regression model and establishing its statistical significance, it can

be seen that there is an inverse, close relationship between the dependent variable (CO_2 emissions) and the independent (vehicle weight). It has been determined that an increase in the share of electric vehicles by one unit (respectively one car per thousand) will decrease the level of carbon dioxide emissions per kilometer by 8.3 units (grams).

References

Abuzarli, D.U. and Mammadzada, D.L. (n.d.). Opțiuni strategice pentru reducerea emisiilor de gaze cu efect de seră în diferite sectoare ale activității economice. Retrieved from <http://conferinta.academiacomerciala.ro/CD_2016/ARTICOLE/4/OPTIUNI%20STRATEGICE%20PENTRU%20REDUCEREA%20EMISIILOR%20DE%20GAZE%20CU%20EFECT%20DE%20SERA%20IN%20DIFERITE%20SECTOARE%20ALE%20ACTIVITATII%20ECONOMICE-Abuzarli,%20Mammadzada.pdf>

Bejan, M., Rusu, T. and Bălan, I., 2009. Efectele poluării aerului datorate activităţii de transport auto. *Buletinul AGIR*, 532(4), pp. 192-199.

Bran, F., Rădulescu, C.V., Ioan, I. and Popa, C., 2011. *Sinergii globale în direcția protecției mediului*. Editura Universitară, București (University Publishing House, Bucharest).

Porombrica, A. and Ciobanu, R., 2017. *Ecologia mijloacelor de transport şi importanța ei pentru planeta Pământ*. Retrieved from <http://repository.utm.md/bitstream/handle/5014/1961/Conf_UTM_2016_II_pg122_123.pdf?sequence=1&isAllowed=y>

Rădulescu, C.V., 2016. Direcții strategice pentru dezvoltarea afacerilor sustenabile. *In 25 de ani de reformă economică în Republica Moldova: prin inovare şi competitivitate spre progres economic*, Vol. 1, pp. 181-185.

Rojanschi, V., Bran, F., Girgore, F. and Ioan, I., 2006. *Cuantificarea dezvoltării durabile*. Editura Economică, București (Economic Publishing House, Bucharest).

NIS – National Institute of Statistics, database: tempo-online, <http://statistici.insse.ro:8077/tempo-online/>

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 124-130

The process of communication within the public administration in the context of the pandemic

George-Alexandru ISTRATE
Valahia University of Targoviste, Romania
georgeistrate88@gmail.com
Alexandra Elena TANASE (MIHAI)
Valahia University of Targoviste, Romania
alexa.tanase@yahoo.co.ph
Claudiu POPA
Valahia University of Targoviste, Romania
av.claudiu.popa@gmail.com

Abstract. *Communication plays a key role in public administration. It creates professional connections between employed civil servants, good working environments, understanding and, implicitly, increases the level of productivity. Communication processes are created based on the needs of employees to work and collaborate with managers, to share their ideas and to receive and provide feedback, to remove barriers to employees and to facilitate their work. Given the pandemic context, communication has changed radically. It works in three modes of communication such as online, hybrid or office, where the situation allows. In this sense, new communication routes have been created through online programs/software or through integrated programs. They have created platforms for interacting with citizens and issuing documents online and platforms for paying taxes. Adapting to the new communication processes is imperative for public sector employees, because without maintaining this trend, employees risk not improving their skills and not performing their duties.*

Keywords: communication, civil servants, pandemic, public institutions.

JEL Classification: D83, D73, I10.

It has often happened to us that our message sent to the interlocutor does not arrive as we wanted because of barriers, noises or communication filters. Time has shown that technology has solved much of the communication problem. Once used, communication as a dynamic process is constantly evolving.

Communication, from a chronological point of view, is the process by which people socialize and interact. When we talk about communication, we find the following components:

- externalized communication;
- metacommunication and intercommunication;
- communication can be manifested orally, by speaking and listening, and in writing, by writing and reading.

Communication in the public sector is an essential resource for those interested in the relationship between public organizations and stakeholders. This article presents the factors that contribute to the communication policies and practices of organizations, such as public institutions, in their sphere of influence, from several perspectives, including organizational structures and managerial style, bureaucratic policies and practices and rhetorical strategies used when addresses customers/consumers or other groups, which creates communicative intelligence at the institutional level.

Communicative intelligence is the ability of a public organization (e.g., mayors or decentralized public institutions) to produce dialogue and exchange information with citizens about administrative issues, programs, and the like.

Without communication one cannot work efficiently and in a controlled way, one cannot create working relationships and development opportunities. Communication can lead to performance, overcoming barriers and obstacles that stand in the way of performance.

In a public organization, people work with common goals, working according to the mission and vision of the organization. However, obstacles and barriers require us to find solutions to the problems or news that have arisen.

Adapting to new ways of working must be fast and efficient. A clearer approach to activities in the context of the Covid-19 pandemic is a particularly important step in the work of civil servants by creating an integrated map of reality. The desire to implement new work habits has become a necessity because the pandemic has forced us and at the same time forced us to change the way we communicate and work. Every day, we create and send dozens of messages to communicate with the public about everything from road closures, programs, government services and announcements, etc. At the same time, citizens send us messages about issues, suggestions for improvement, and connect with the right service. It takes a lot of work to manage all this traffic and it can be overwhelming and complicated to manage. The change is not easy, but it must be done in time to perform. But for this it is necessary to establish communication processes, a well-established flow in the current pandemic context. The creation of communication processes is based on the needs of each public institution, their values and beliefs. Creating new work environments means knowledge and the acquisition of new knowledge, which, if based on enthusiasm, will be successfully implemented. Education and the acquisition of new knowledge must be constant, because

the world is changing, technology is evolving, and if we are not in step with them we will regress. It is clear that we can no longer work according to the old patterns. However, change cannot be made overnight, it takes time and concrete things, well developed, through analysis, opportunity studies, by creating new communication processes to support civil servants in carrying out activities in the context of the pandemic.

The Covid-19 pandemic also brought new opportunities for public administration, by developing communication systems that facilitated public access to documents without having to move within them. Communication with citizens can also be done online, through various integrated platforms of each institution, official documents can be issued, requests can be registered, there can be debates, taxes and fees, fines and various fees can be paid online platforms that they are made available 24 hours a day, 7 days a week. The creation of these platforms is based on the need of citizens and the simplification of access to documents, but also the creation of new more productive branches of work for civil servants.

The new communication processes are based on the following aspects:
- awareness;
- analysis and study;
- diagnose
- evaluation;
- creating new communication processes;
- goal setting,
- planning;
- implementation;
- adaptability.

Awareness of the level of communication and the problems encountered is the first step in creating new communication principles that have the role of simplifying the work of employees. Following awareness, new communication principles can be created that are given for analysis and study.

Analysis and study are essential in implementing the new principles of communication. A thorough knowledge of these principles that are intended for communication within organizations is essential and fully helps employees to meet their individual and common goals.

Diagnosis. It is important to customize the selection of analysis methods to the specific problem. For example, if it is necessary to examine a particular structure or department/ office of the organization, one possibility would be to conduct interviews, record observations, and analyze and evaluate records to diagnose what factors are actually involved. In other cases, workshops on critical incidents or problem-solving seminars may be needed.

After observing these aspects, the implementation of communication processes becomes a necessity, but also an opportunity to increase the performance of civil servants. Communication processes are about connecting employees and establishing relationships between them. The communication processes have the role of simplifying the work of the

officials and the role of increasing their results, both individually and at the level of the institution, which means improving the communication skills.

Improving communication skills is an opportunity to create a new pattern of governance in public administration to harness human potential. Improving communication gives a green light to constructive thinking, creates new branches of development, improves collaboration between employees and helps to take large-scale and decisive actions in achieving micro and macro objectives. However, for these to happen, intentionality is needed.

Intentionality occurs when the action begins to occur. It is very clear that we are migrating into a digital age, where communication has changed and will continue to change. Many employees cannot easily adapt to the new communication processes, to the new work programs and software, which is a minus. The fear of the new must be transformed into prudence, the fear of making a mistake must be perceived as an instruction, and the desire transformed into concrete, well-established actions. Managers who organize a good correspondence between employees will create important work routes, which will be beneficial in the activity of civil servants, implicitly of the organization. If an open and transparent work environment is created through which employees can communicate in an easy way through which they can address the ideas and proposals of their hierarchical bosses, but also their feedback to be taken into account, they can motivate themselves by trusting it was offered to them through effective communication.

The institutional communication process has changed continuously and is now radically changed. There is a lot of emphasis on communication, on useful and applicable information, on connecting all the offices to create an optimal and efficient way of working. Deepening this branch creates new opportunities to increase the level of public administration performance.

A first principle of communication is one that focuses on the problem, not the person. Ignoring problems will sooner or later lead to even more serious, perhaps even unsolvable, problems. That is why it is necessary for the focus to be on the problem and its solution, not on the employee.

A second principle concerns the authenticity of each employee. An important aspect is to be honest with each other, open to discussion and constructive, and to act with integrity.

Employee empathy helps a lot even if professional relationships have a limit when it comes to interacting with other employees. It is very important to be sensitive so that others feel that we care about them, the colleagues we work with. If they see that there is no empathy and sensitivity, it will be quite difficult to work together.

Flexibility with colleagues is a strong point. The fact that we allow others and other points of view shows a lot of openness to them. Innovation and creativity come from diversity.

Appreciating employees and their work, but also their own achievements, creates an even more appropriate work environment. Open appreciation builds trust at the institutional level. Underestimating can create anger, frustration, and encourage other colleagues to underestimate our work.

The satisfaction of the organization creates even closer ties. When we are supported or when we are asked to do our homework, it would be ideal to thank those who support us.

Gratitude provides even more confidence in each other, creates connections, provides the opportunity to create closer bonds that, in turn, will create new opportunities to thrive, increase productivity, and evolve professionally and spiritually.

In order to double our productivity, it is essential to eliminate what distracts us. Let's realize what consumes us time and energy from which we produce nothing. It is proven that in one hour of uninterrupted work the productivity is as high as in four hours of interrupted work. According to a study by the University of Illinois, researchers found that after a minute of work interruption, it takes another 15 minutes to return to the initial state of concentration. Time thieves can be physical, interrupted colleagues, phone calls, but also digital, such as incorrect use of social media platforms such as facebook, tik-tok, instagram. What can we do about it? Let's tell people, colleagues, that, for example, we have work to do in the next three hours and we don't want you to be interrupted, to turn off phones and notifications on your laptop or computer. If we manage to "isolate" ourselves for a few hours and focus only on those topics/tasks we have, productivity will increase dramatically.

Communication in the current pandemic context has changed and is constantly changing. The activities of civil servants are very focused on communication, and the Covid-19 pandemic has forced us to reanalyze and recreate new strategies and principles of communication through online programs that offer new opportunities such as online meetings, the transmission of documents in a very short time. Briefly from one institution to another. You can create private online video and audio meetings, online presentations, create online rooms by job categories where employees can participate according to the positions they hold. An opportunity that Covid-19 pandemic is that you can work from home or hybrid through installed VPNs (Virtual Private Network), or through created domains, which offers a fast connection, live interventions, video and audio connection, document creation, signing them online, communicating with citizens and offering them new facilities such as requesting documents and issuing them online.

Change is imperative, but at what cost? The mere human presence and interaction of people is the biggest cost we pay at the moment, but there are many opportunities. As you well know, internet access was an unimaginable luxury in the not too distant past, but we have this opportunity to use this infinite resource of knowledge that we can apply, we can connect, communicate and work from anywhere in the world, live, clearly and using futuristic tools to help us increase the productivity of our work, to simplify the work and to give a better yield than when we used the ink on paper.

Conclusions

The Covid-19 pandemic has fundamentally changed the way we think and work in public administration. It was perhaps too abrupt a transition from working physically in the office to working from home or hybrid because of this insidious virus. New communication processes have been created through which employees can work with each other, but also with citizens, these processes having the role of solving the problem of interaction, in the first phase, and later, when they will improve, to increase professional performance.

At the time of the pandemic with the new coronavirus there was a chronic shortage, things were not clear, it was not known exactly how to work, how to write documents and how to release them, how to interact with citizens or how to be working meetings. But this was resolved in a relatively short time. As you well know, things can't be done overnight. New principles of communication have been and are being worked on intensively, which are meant to improve the connection between employees, with communication being the main key in the productivity of civil servants in public administration. There are many ideas, which in turn are selected, segmented and put together, unified and implemented.

We can clearly state that the digital age has been catalyzed by this pandemic with the new coronavirus, but let us not forget that the Internet was not invented during the pandemic or in its immediate vicinity. Until the end of the 90's and 2000's it was the industrial age, and since 2000 the Internet appeared, where at the beginning there was only readable content, later, after 2007, the video content appeared, the creation of accounts, could be done edits, the transmission of the file which at that time lasted from a few minutes to a few hours before being downloaded. But now the Internet has evolved to unimaginable standards. You can create online, virtual meetings, you can send official documents in a very short time, the use of the Internet being on a very high scale compared to 10, 15, 20 years ago.

Clear digital visualizations are a key part of ensuring a transparent allocation of efficient public sector resources and services. A standardized set of tools is needed that can be used to ensure full visibility between institutional departments. A clear digital presentation helps public sector employees to work more efficiently, through which they can create effective connections.

Communication is a key factor in high performance, which aims to excel the work of every civil servant, to have a connection between employees, empathy, flexibility on their part, satisfaction with colleagues, appreciation and gratitude. These, if applied, will create a conducive work environment, will create enthusiasm, and employees will be able to better put their skills into practice.

References

Abric, J.C., 2002. *Psihologia comunicării,* Polirom, Bucureşti.
Alvesson, M., 2015. *Changing Organizational Culture,* Taylor & Francis Ltd, Abingdon, UK.

Arasaratnam, L.A., 2011. *Perception and Communication in Intercultural Spaces,* University Press of America.

Bovee, C.L. and Thill, J.V., 1992. *Business Communication Today,* McGraw – Hill Book Company, New York.

Cabin, P. and Dortier, J.F. (coord.), 2010. *Comunicarea,* Polirom, București.

Chelcea, S., 2004. *Iniţiere în cercetarea sociologică,* Comunicare.ro, Bucureşti.

Chiru, I., 2009. *Comunicarea interpersonală,* 2nd Edition, Tritonic, București.

Cismaru, D.M., 2010. *Comunicare internă în organizații,* Tritonic, București.

Coman, A., 2008. *Tehnici de comunicare. Proceduri şi mecanisme psihosociale,* C.H. Beck, București.

Dinu, M., 2007. *Comunicarea. Repere fundamentale,* Orizonturi, București.

Emmers-Sommer, T.M., 2016. The Effect of Communication Quality and Quantity Indicators on Intimacy and Relational Satisfaction, Sage Publications, *Journal of Social and Personal Relationships,* Vol. 21.

Franc, I.V., Popescu, C. and Ristea, A.L., 2020. *Metodică în cercetarea ştiinţifică,* Expert, București.

Frank, E.X.D. and McQuail, W., 2004. *Modele ale comunicării pentru studiul comunicării de masă,* Comunicare.ro, București.

Goldhaber, G.M. and Rodgers, D.P., 1979. *Auditing Organisational Communication Systems: The ICA Communication Audit*. Dubuque: Kendall – Hunt.

Goleman, B., 2019. *Emotional Intelligence: For a Better Life, success at work, and happier relationships. Improve Your Social Skills, Emotional Agility and Discover Why it Can Matter More Than IQ.* (EQ 2.0), Independently published, London.

Hybles, S. and Weaver, R.L., 2014. *Communicating effectively,* 11th Edition, McGraw-Hill Education, New York.

Marinescu, V., 2006. *Metode de studiu în comunicare,* Marinescu, București.

Maxwell, J.C., 2010. *Everyone Communicates, Few Connect: What the Most Effective People Do Differently,* Thomas Nelson.

Mortensen, D., 2007. *Communication Theory,* 2nd Edition, Transaction Publishers, London.

Pânișoară, I.O., 2008. *Comunicarea eficientă,* 3rd Edition, Polirom, București.

Please, A. and Please, B., 2020. *Abilități de comunicare,* Curtea Veche, București.

Popescu, C., 2009. *Managementul serviciilor publice,* Valahia University Press, Târgoviște.

Stanciu, G.I., Tudor, R., Tran, V. and Tran, A., 2014. *Teoria comunicării,* Tritonic, București,

Ștefănescu, S., 2021. *Sociologia comunicării,* Cetatea de Scaun, Târgoviște.

DeVito, J.A., 2017. *The Interpersonal Communication Book,* 5th Edition, Pearson, New York.

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 131-138

Staying relevant by developing green skills

Teodora ABRAMIUC (TODORAN)
Bucharest University of Economic Studies, Romania
teodora_todoran@yahoo.com
Maia MAN-ABRAMIUC
Wolsey Hall Oxford, England
maiamanabramiuc@gmail.com
Iulia Maria GANDEA (ROSOIU)
Valahia University of Targoviste, Romania
iulia_gandea@yahoo.com

Abstract. *Organizations, people and skills have a strong connect into keeping the business economy sustainable. The three elements that drive that motion are the ones generating value to the organization, safety and stability for the people and relevance to the needed skills, all under the everlasting and mostly unforeseen changes of the business environment. The current paper revolves around the megatrend of green skills, the definition and furthermore the proposal of a set of skills to keep relevant in the business, as a human. Some interviews of professors and corporate professionals reveal aspects of the common sense and need for action. The conclusion of the paper marks one skill that was there for the past 7 years as a leitmotiv, yet now taking the gear. That one skill is adaptability, not just as a concept, but a measurable practice for being a sustainable individual.*

Keywords: green skills, sustainability, economy, job relevant.

JEL Classification: I2, J24, L80, L84, M5, M53, P46.

Introduction

Simply addressing the topic of green skills sets a very promising context for the future professionals. However, this is not enough to ensure there is an execution around the concept of sustainable skills and furthermore into the generated impact. In other words, while professionals, academics and business are all sensitive around this topic, it brings and sets a certain level of importance in ensuring the right approach towards the skills that need development. That mean that is a known fact that the current curricula and learning objectives are to be adjusted basis the realities and new capability demand, while the business is in a continuous and rapid change, so are the professionals in constant demand of new skills.

Summarizing the problem statement, the foundation of these discussions starts from an old school approach of developing skills, a rigid and overcrowded curricula and the means of education that may be outdated (Florescu, 2015). All these put together are no longer enough for ensuring the education in the foundation of a successful individual. The practices did not upgrade at the same pace and complexity, as the business and demand of skills have evolved. On top of that unfortunate context, there is also uncertainty and unexpected changes of realities, like a pandemic with various restrictions, lockdown that impact education or business practices, or even worse, political crisis and times of war. The immediate question comes naturally and may sound like "how can we prepare for the unexpected?"

The current paper proposes to present some of the most current research studies and available literature review around sustainable skills. Next, the research methodology tries to bring an element of novelty to the subject, by interviewing some relevant stakeholders on their own perceptions and self-lived scenarios in coping with the change of educational and professional environment and the demand of skills. Gathering such inputs basis this qualitative research, the findings and results undergo a thorough analysis and are correlated with the existing relevant literature and studies, to identify potential gaps, innovation opportunities. The paper concludes with the suggestions around the findings and areas that should be in focus when developing strategies for sustainable individuals and skills sufficient professionals.

Literature review

The interventions of the European Union, through the European Commission projects, are very visible towards addressing the educational practices, skills development, learners' opportunities and engaging relevant authorities, to name a few. On a higher-level objective, given numerous other interventions, projects, collateral activities like green economy theme focused conferences (Baloch-Kaloianov, 2021), the European Union targets a green economy, green jobs (Meister, 2022).

Various initiatives and institutions have developed and aid system to support and address the needs of professionals into their sustainability. One example brought from the BBN (Bildungs- und Berufsberatung Niederoesterreich) for career guidance, matching the

legislative imperatives of a green economy, environmental wise, offering counseling towards people aged 15 to 65 into repurposing or offering counselling for new skills towards the aim of green economy. All such skills have been aligned basis the Sustainable Development Goals (SDG: The 17 Goals) of the United Nations and this initiative is mapped under the fourth goal "Quality Education".

Similarly, as the green jobs carry a higher impact and outcome towards the environmental changes, so the education and skills should be proposed and introduced as sources of sustainability for individuals, to keep them relevant in the business context for the green economy as a holistic concept.

Mann (2021) contributes with a set of relevant findings around the career readiness perspectives of 15 years old students. The study is exploring elements of potential career interests, career uncertainty resulting from survey study from 2018 compared to 2000. The future is somehow promising, looking at the available findings, yet still a long way to go in terms of addressing certainties and perceptions, with real facts and opportunities.

To the same note of addressing and focusing the educational practices towards sustainability, the Nordic Region has also explored ad proposed a four-year program on developing targeted practices and activities to enhance the opportunities developed through six different projects funded by the Nordic Council of Ministers. Their strategy sounds like this: "The Nordic Council of Ministers is funding the programme contributing to the Nordic region's vision to become the most sustainable and integrated region in the world in 2030" (Stefánsdóttir and Stefánsdóttir, 2021).

The report on the qualifications of the European Higher Education Area, as per Bologna Working Group on Qualification Framework, 2005, is addressing and formulating the framework that explains and shaped the national qualifications in education. In addition, it tries to provide the definitions and concepts of the terminologies, by mapping the education and learning efforts into outcomes. Similar data and further research topics around qualifications to set the skills mapping are part of the European Higher Education Area (EHEA) and Bologna Process. Consoli et al. (2016) argues the skills difference and benefits from a green job, as compared to a non-green job. The higher education and experience are a few of the human capital value add, visible in the green job professionals. Relevant literature also supports the idea of digital skills development as a predictor of green diversification, namely the e-skills do positively predict the ability to specialize faster in technology fields that ae prone for a green economy (Santoalha et al., 2021). Moreover, while predictability is the keyword of the topic of skills and staying relevant, Taleb 2016 has proposed and completely and rather radical new theory. He argues by proposing the "Black Swan Theory" as being the one thing people should not do, predict, or expect historical simplification of complex events into generating future solutions, but rather develop skills of resilience and generalize complexities of the occurring situations, understanding the big picture and no run for the standard risk evaluations, or curve bells analysis.

With no further introduction, exploring the vast literature around the green skills, education and impact, predictability of capabilities into practice, do set a sound foundation of the

research. It also allows the space to further explore possibilities and bring elements of novelty that can serve to the economy, relevance of human skills and jointly develop a sustainable context for education and business practices.

Methodology

The temptation to develop the current topic into various branches of theories and potential research scenario is present in a research paper, as this one. The data points, problem statements and the fact that the current reality is suffering from a lack of workable practices to ensure proper and relevant skills in education or later in the employment lifecycle become statement of the research. With this massive concern, the study proposed by the authors tries to reduce the complexity and formulated the goal into identifying the green skill or skills needed to develop a sustainable individual. As the learning act is a continuum, we should be further narrowing the aim of the research. As students we learn in an education institution, however, as professional adults the learning cannot stop. That learning continuum focuses or targets specific capabilities. Basis the relevant literature, the authors have further proposed the collection of more data points, given the unexpected scenarios (globally due to the political crisis and pandemic impact). The method selected as a qualitative interview, conducted live as a structured discussion. The questions were standardized across interviewers, however the extent of their input was not restricted, and multiple elements came to surface as additional information to the proposed data collection. There were three main questions addressed (available in the results section and further explained) and each of them was targeting towards the goal of the current paper. Discussion duration was between 45 minutes to 90 minutes, depending on the individual interviewed person. The time of interviews spanned across February to beginning of March 2022. The targeted audience were influencers and education experts from international education systems present in Romania (British education in Romania, Romanian college based on Cambridge methodology, American school, to name a few). For the work environment perspective on learning, business professionals interviewed from the L&D (Training, Learning and Development) space, of the top five outsourcing companies in Romania, all corporates with global presence in the industry, operating out of Romania with multiple delivery locations.

The study proposes to identify the three main aspects of concern that can address the topic of the research. One was the long-term effect of the online learning, as this is one of the most impacted aspects of the current learning landscape. The purpose of the question was to understand the acceptance level for such a non-negotiable practice, given the existing knowledge designs, content, delivery methods, other learning, and skills effects transferred through the online. Second question tests the next level of perception and experience concerning educational practices that can or cannot provide the foundation and needed skills to be sustainable as an individual. The third level investigated in the interview was about the targeted skill. Not so much on the methods of teaching, practices, faculty individuals, but pointed on the skill in focus.

Findings

As stated in the methodology, the interviews have generated a solid base on data analysis and results that are feeding into the problem statement, bringing some suggestions on how to further support a "skills first" approach, or rather enhance capabilities of the hour.

The below findings and details are structured in a two-level design. First level dedicated for each of the tree questions and presenting a summary of findings, basis data gathering (education institutions experts and business professionals' perceptions). The second level of data, where the case, is to bring available results and elements of the existing literature, and research studies as additions, for either supporting or debating such results. The aim for the detailed analysis remains the same, formulating the number one skill or skills that should be in focus on any continuous learning journey, towards sustainable individual educational structures.

First question: "What is the long-term impact of online teaching towards education, knowledge and results?" From an educational institution perspective, the teachers and professors at such international schools in Romania, have a very tolerant and absorbent attitude towards online. Not only that is a clear reality, something that they know and expect to be there as the standard mean of education, but it is something that brings the awareness of the needed change in the curricula and the knowledge and wisdom that is to be transferred. However, stating a certainty towards the long-term impact might be a less prudent statement, as such outcomes are hard to predict, living under the "black swan theory" (Economic Times, 2016). For some adventurous and bolder professors, such an answer would ideally be given in some 30- 40 years from now, as it is a sure fact of stability, the un-adapted education in the online environment.

At the same time, the corporate professionals are converging towards the long-term impact, rather than effect of online, that being the decisive factor of "those who will want to learn will come towards the knowledge". In the business environment, learning is mostly an option, a benefit, a bonus or a choice and little less seen as a mandate. The mandatory courses are never linked to actual growth capabilities, but policy, security and, or business rules. In other words, for an adult in the business environment, learning is a differentiator between average and spark. As a secondary level of results, connected to the interview level, Koss (2020) states that the productivity and measures or people relevance in the job will no longer be output-based criteria, but rather a "human task" oriented approach. Expecting value creation and rewarding it, letting people chose selecting their work habits and allowing technology to take the burden of the classical way of looking at productivity.

Second question of the research: "What are the educational practices that can help students become sustainable individuals?" Scholars and education experts, influencers in promoting "Quality education" as per the SDG prerogative, feel that the current learning practices, the curricula and overall education system in Romania is in need of an upgrade towards the present century, rather than teaching as per the past century standards. Such a statement is strong, disruptive and demands a serious plan ad execution to adapt the wisdom. If base knowledge and practices are no longer relevant, the immediate and logical consequence is a new generation of irrelevant individuals, skills wise. Only if that would be the only

needed fix. Yet, a new concern reveals, beyond system of education, but the online driven limitation of social skills. As one of the interviewed experts said, “Socialization is the great hidden element for education”. That is an observation that needs little validation, yet a plain observation into the habits of young learners, and adults in the current scenario. Interacting in an open space is most often sustained by mobile phones, media posts and other e-supports, as if the central human brain can no longer sustain an argument or a conversation. Progress is not to be rejected here, rather adapted with the inflow of data, yet keeping the human interaction alive. That means, adapting the systems of education with a community focus, teaching them how to form a society and nurture it. Moreover, to conclude with one very passionate perspective, building ethos might just make and bring the needed difference.

Corporate professionals, on the other hand, feel that the online has opened a set of new opportunities, connecting diversity, job opportunities and role mobility and offering a higher visibility, to those that are keen to embrace it. One common element as of the academics is the social element, the human factor that needs to be naturally inculcated in the new learning practices. That is an element always factored in the design of new learning content. Adapting to their needs, to the business inputs and the development of the markets, economy, the L&D professionals have a similar task as of the teachers to build a learning culture, develop the right attitudes for a continuous learning environment.

From a second level analysis, connected to the interview, massive open online courses (MOOC) similar to Coursera, Udemy and other similar online learning platforms, have taken their share of benefits, as they have thrived during these times in terms of learning adoption and consumption. This is once again reinforcing the fast and flexible behavior of those that want to learn, as they adapted into the new medium of learning.

The third and last question tested the core element of the study: “What are some green skills that should be induced in the new teaching paradigm that could help make it more successful?”. The teachers and experts of the education have stated some key skills, hard to find as titles of a course. They do not come in the shape of a clear content of a manual or a guidebook, but rather challenge the existing content at a very subtle level. They talk about “compassion”, “empathy”, “being erratic”, “social awareness” and focusing on community. Such skills are a post effect of education, ideally; however, they do not simply develop without a conscious effort. This is to be seen nowadays, as human across generations are struggling to overcome generational gaps, differences and yet willing to adapt. In the corporate world, the human values, visible behaviors of empowerment, ownership and responsibility, trust and communication, are elements that resonate across the board. All are linked to the individual, less to the domain and practical knowledge, the technical or deep domain experts. Such skills become the honeycomb of the organization, and are in focus to develop as a culture.

The literature talks of four Meta competences that are to be developed, as the humans will take most benefit once they develop and focus on them, Miclea (2021). Autonomy, discipline and self-discipline, an entrepreneurial mentality and a designer type thinking. Autonomy seems to resonate most with the above perspectives of the experts, into taking the responsibility and being able to adapt towards the new context.

Conclusions

The current research paper talks about the one skill that seems to be the leitmotiv of the interviews, of the studies available in the relevant literature and silently shaping as a safety net for those that can adopt it and further develop it. Adaptability is nothing new, and that is the value of it, because being an adaptable individual makes you relevant and prepared for any unexpected change the definition of adaptable is reiterating the above statements and findings "able or willing to change" understood as capable to adjust to new conditions.

As a conclusion of the study, the adaptability is not only the responsibility of the earners or the recipient of the educational efforts. The adaptable trait is needed equally much in the teachers' practices, the content design, the system that is rigidly keeping the norms in pace, the content and curricula. It seems to be a simple equation of input and output. Alternatively, walk the talk, if the system cannot adapt and challenge the current state, how can the student and the learner become a flexible and adaptable individual, in an outdated learning environment? Same challenge exists in the business environment, where the pressure is not only at the delivery end, with the learning and development professionals, but also having the sponginess of the individuals, the curiosity to learn. Hence, content design and creation should be constantly revamped, learners experience constantly measured, taking the pulse of the relevance of the content in the business scenarios, their needs into sustaining a learning culture.

Basis authors' personal and professional experience and sustained by the current research, such theory is based on a set of triggers, key words like curiosity, adaptability, society, empowerment and responsibility, to enumerate the most called out. The data and information exist; now the next level of creating impact is to implement the skills in the existing systems, cultures and especially in the policies and procedures. That may in fact become the challenge, of lacking the flexibility and strategy of implementing them, without major disruptions. AS any change, this too will take time, but we are already running against time. Such research papers are more of an alarm system of the imperatives and the immediate needs, to make at least a difference at the level of adaptability and hoping for a quantum leap, changing also other skills for developing sustainable individuals.

The limitation of the paper is the geographical space, keeping in cope the Romanian landscape only, and the international education included in the Romanian systems. Further studies may extend nationally within state schools as an immediate next step.

This paper was co-financed by The Bucharest University of Economic Studies during the PhD program.

References

Baloch-Kaloianov, E., 2021. Review of the Austrian Euroguidance Conference 2021 "Green Guidance", retrieved from <https://epale.ec.europa.eu/de/blog/rueckblick-auf-die-oesterreichische-euroguidance-conference-2021-green-guidance>

Bildungs- und Berufsberatung NÖ, official web site <https://www.bildungsberatung-noe.at/>

Bologna Working Group on Qualification Framework. 2005. A framework for qualifications of the European Higher Education Area, retrieved from <https%3A%2F%2Fufm.dk%2Fen%2Fpublications%2F2005%2Fa-framework-for-qualifications-of-the-european-higher-education-area>

Consoli, D., Marin, G., Marzucchi, A. and Vona, F., 2016. Do green jobs differ from non-green jobs in terms of skills and human capital?, *Research Policy*, Vol. 45, Issue 5, pp.1046-1060, retrieved from <https://doi.org/10.1016/j.respol.2016.02.007>

Definition of "Adaptable", retrieved from <https://dictionary.cambridge.org/dictionary/english/adaptable>

Economic Times, 2016. Black swan Theory, retrieved from <https://economictimes.indiatimes.com/b/black-swan-theory/profileshow/51808954.cms>

European Higher Education Area (EHEA), official website http://ehea.info/page-qualification-frameworks.

Florescu, R., 2015. Julian Hingley, "În România, elevii învaţă după o curriculă de secol XIX.", retrieved from <https://adevarul.ro/locale/cluj-napoca/julian-hingley-expert-britanic-educatie-In-romania-elevii-invata-curricula-secol-xix-trebuie-revolutie-domeniu-1_552d09b6448e03c0fd9c8474/index.html>

Koss, S., 2020. How organizations can evolve outdated ideas of human productivity, *Ernst and Young*, retrieved from <https://www.ey.com/en_gl/workforce/why-covid-19-will-move-us-on-from-the-outdated-idea-of-human-productivity>

Mann, A., 2021. Career Ready? Helping young people navigate the pandemic job market, retrieved from <https://www.oecd-forum.org/posts/career-ready-helping-young-people-navigate-the-pandemic-job-market?_ga=2.151564217.1001537404.1646475682-1784127282.16464 75680>

Meister, M.H., 2022. Jobs for the future – green jobs and their contribution towards achieving climate targets, retrieved from <https://epale.ec.europa.eu/en/blog/jobs-future-green-jobs-and-their-contribution-towards-achieving-climate-targets>

Miclea, M., 2021. Cele patru metacompetențe de care un elev are nevoie în viitor pentru a face față unei lumi volatile, *Edupedu*, retrieved from <https://www.edupedu.ro/analiza-cele-patru-metacompetente-de-care-un-elev-are-nevoie-in-viitor-pentru-a-face-fata-unei-lumi-volatile-mircea-miclea/>

Santoalha, A., Consoli, D. and Castellacci, F., 2021. Digital skills, relatedness and green diversification: A study of European regions, *Research Policy*, Vol. 50, Issue 9, retrieved from <https://doi.org/10.1016/j.respol.2021.104340>

Stefánsdóttir, M.K. and Stefánsdóttir, D., 2021. Education towards Sustainability, retrieved from <https://oead.at/fileadmin/Dokumente/bildung.erasmusplus.at/Policy_Support/Euroguidance/Veranstaltungen/Fachtagung_2021/Workshop_4_Education_for_Sustainable_Development_1_Part.pdf>

Taleb, N.N., 2010. [2007], The Black Swan: the impact of the highly improbable, 2nd edition, London: Penguin.

United Nations, Department of Economic and Social Affairs, Sustainable Development, The 17 Goals, official web site <https://sdgs.un.org/goals>

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 139-149

The analysis of demographic trends in ECE countries

Irene Ioana DRĂGHICI
Bucharest University of Economic Studies, Romania
draghiciirene17@stud.ase.ro
Dermengi Ayten GÜLER
Valahia University of Targoviste, Romania
dermengiayten@gmail.com
Iulia Maria GANDEA (ROSOIU)
Bucharest University of Economic Studies, Romania
iulia_gandea@yahoo.com

Abstract. *The impact of demography on economic, social and environmental developments in the world is undeniable. This paper provides a detailed evidence on recent fertility changes in the countries of Central and Eastern Europe and offers an interpretation of these changes. It focuses on the ten-year period of 1989-1999, which witnessed the most intensive changes in childbearing patterns, such as rapid decline in period fertility rates, postponement of childbearing and an upsurge in the proportion of non-marital births. Changes in fertility and family formation over the 1990s are perceived as results of the collapse of the socialist greenhouse, which was mutually facilitated by two basic dimensions: broader social changes and new economic constraints.*

Keywords: demographic change, fertility, east central Europe.

JEL Classification: J13, N30, N34.

Introduction

In this paper we provide new explanations for the family and demographic changes in Central and Eastern Europe following the political transformations of the late 1980s and early 1990s.

Following these political transformations there were substantial changes in family and demographic beliefs and values, dramatic declines in marriage and childbearing, significant increases in non-marital cohabitation and childbearing, and a movement from reliance on abortion to a reliance on contraception for fertility limitation.

Although many explanations have been offered for these family and demographic trends, we offer a new set of explanations based on ideational influences and the intersection of these ideational influences with structural factors. Our explanations focus on the political, economic, social, and cultural histories of the region, with particular emphasis on how countries in the region have interacted with and been influenced by Western European and North American countries.

Our explanations emphasize the importance of developmental models in guiding change in the region, suggesting that developmental idealism influenced family and demographic changes following the political transformations. We argue that developmental idealism states that the model for the future of development for Central/Eastern Europe lies in Western Europe and North America.

This ideational system suggests that the political, economic, and family structures of the West are more advanced and superior to those observed elsewhere.

The disintegration of the governments and the fall of the iron curtain in the late 1980s and early 1990s brought clear understanding of social, economic, and family circumstances in the West. We suggest that consumption aspirations and expectations increased and clashed not only with old economic realities, but with the dramatic declines in economic circumstances occurring in many places. In addition, the dissolution of the ormer governments removed or weakened systems supporting the bearing and rearing of children.

And, the legitimacy of the former governments and their programs was largely destroyed, removing government support for old norms and patterns of behavior. In addition, the attacks of previous decades on the religious institutions in the region had in many places left these institutions weak.

1. Theories on the phenomenon of demographic transition

What is the demographic transition?

According to demographer and sociologist Dudley (2010), demography is a science that is not rich in theory, but in quantification. Demographic transition is a process by which societies progress from a premodern high fertility and mortality regime to a postmodern low fertility and mortality regime. One of the causes of the demographic transition is the control of contagious and epidemic diseases. Then, with modernization, raising children

becomes more expensive. Women's empowerment and the power to make their own reproductive decisions have the effect of reducing families.

Thus, there is a change in values, emphasizing the quality of children rather than their quantity. Broadly speaking, the demographic transition is becoming a universal process, in which each country can be placed on a continuum of progress in transition. Demographic transition is widely accepted in the economic sciences because there is a strong correlation between declining fertility and economic and social development.

Worboys (2000) states that since the late 1700s, something remarkable has happened, namely that mortality rates have dropped. With the new technologies in agriculture and production, but also the advances in health and sanitation, a greater number of people lived the years of adolescence, increasing the average life expectancy and creating a new trajectory for population growth. This sudden change created a change in the correlation between birth rates and mortality rates, which until then were both relatively equal, regardless of location.

To understand the diversity of demographic regimes across the world, it is necessary to understand the history of demographic change globally.

The model behind this phenomenon was developed in 1929 by the American demographer Warren Thompson. According to this model, within a territory the population changes its numerical structure simultaneously with the degree of economic development that society manages to achieve. Warren Thompson identifies four distinct periods of evolution:

a) Pre-industrialization refers to a period in which the population of a territory registers a slow numerical evolution (high mortality and fertility rates). As a result, the natural increase it is a balanced one, and the population remains constant both in size and structure by age, but it can have important changes following events such as pandemics or wars.
b) In the second stage, due to the impetus given by industrial development (reduction of mass poverty, access to education, evolution of the health system, etc.) living conditions and living standards improve, and the introduction of modern medicine decreases the mortality rate, especially among children. Also, the birth rate remains high which will lead to a rapid population growth. Many underdeveloped countries are at this stage today.
c) The third phase is represented by the declining birth rate as a result of the appearance of the past-industrial stage which is characterized by the increase of the status of women in society and access to contraception. However, the natural increase remains constant because the birth rate is still higher than the mortality rate. Developing countries are at this stage.
d) Phase four: birth rate and mortality decline. The drastic decrease in the birth rate leads to a decrease and aging of the population. Most developed countries are in the fourth phase, they tend to have higher levels of education, stronger economies, better health care, and a large proportion of women work.

Currently, a fifth stage is being discussed, which can be interpreted in two contradictory perspectives. In a pessimistic way which consists in drastically decreasing fertility which

will lead to a decline in population and would include countries where fertility rates have dropped significantly below the replacement level (2 children). This periodization is linked to the concept of "Second Demographic Transition" developed by R. Lesthaeghe and D. J. van de Kaa in 1986.

An optimistic outlook would be that the birth rate may start to rise after reaching a minimum, which will result in an increase or if not at least a constant population. (Caldwell, 2006, pp. 301-320)

The debate over fertility research involves two major theoretical perspectives: those that focus on ideational forces and those that focus on economic forces. The "second demographic transition" of Lesthaeghe and van de Kaa (1986) is the ideational literature. Families will gradually become smaller due to greater individualism and post-materialism, which are associated with increased urbanization and post-industrialization.

Lesthaeghe and Surkyn (2004) argue that decreased fertility has become predominant and has been fuelled by three revolutions: a contraceptive revolution, which allows postponement of childbirth; a sexual revolution that broke down the boundaries of sexual activity in marriage; a gender revolution that allowed women to no longer be subject to men or biology.

Another relevant study is "The Economic and Social Implications of Demographic Transition" by David S. Reher, who argues that using the demographic transition model, specialists can better understand the current population growth of a country based on its placement in one of the five stages can then transmit that data to be used in addressing social and economic policies within a country, but also between nations.

Under the model, a country will progress from one stage to another over time, as certain economic and social forces act on mortality and fertility rates. Each country can be placed in the model, but not every phase of it has a country that meets its exact definition. For example, there are currently no pre-industrial countries and no five-stage countries that may be possible, but there is potential for future movement.

Like any model, there will be incorrect values and exceptions to the rule, and the demographic transition model is no different. There are also things that the model cannot describe such as: the impact of other demographic variables (such as migration), and the model does not predict or take into account how long a country will be at each stage.

2. Demographic periods and turning points in the history of ECE

At the end of the Second World War, Europe became bicephalous, with the Iron Curtain separating the western part characterized by democracy and the south-eastern part where the so-called "socialist bloc" was formed. This political reorientation has had serious consequences, as it has led to a new political, social and economic order in the countries concerned, including centralized economic coordination and relatively closed borders to migration. In this respect, it is important to point out, however, that there have been

different forms of socialism and therefore various impacts on those economies and societies.

During this period, as in the case of other totalitarian states, the communist regime in Romania also actively intervened to increase the country's population through three levels. Initially, through the repression of divorce and abortion, and then stimulating pronatalist measures were promoted by providing aid and benefits to large families. And last but not least, the public opinion was guided by through the media towards a more prolific reproductive behavior. These measures have resulted in rapid population growth. (Bolovan, 2004)

The transformations of societies from communism to capitalism that took place in CEE and that began in 1989-1991 are unique in human history. These transitions involved radical, complex and extremely rapid political, social and economic changes in 1989-1991. (Ekiert and Hanson, 2003)

Communist countries with centralized economies, which had never existed before in history, had to be converted into capitalist economies, and at the same time authoritarian systems were trying to transition to democracy. Under such conditions, countries' experiences have been unequal and varied.

Alain Monnier (2006) argues that all CEE countries have made more or less progress in reforming their societies towards open, market-based, capitalist economies, along with changes in political institutions and marked improvements in living standards in most countries. Economic reforms have been successful in the countries of Central Europe and the Baltic States, while those in Eastern Europe have made the least progress.

The change of political regime from socialism to democracy and the market transition in Bulgaria, Hungary, Romania and Czechoslovakia not only led to the emergence of economies similar to those in Western Europe and dramatic changes in the labor market, but also strongly influenced socio-demographic development, increase in unemployment and, at the same time, by creating opportunities for the free movement of the population, which has changed the number and direction of migration flows. For example, in Bulgaria and Romania there has been a rapid increase in the number of emigrants during this period. As a further consequence of the collapse of socialism, new independent countries emerged, and international borders shifted to Slovenia, Serbia, and Slovakia, which again led to increased migration.

Subsequent analysis of fertility changes after 1989 shows that, despite similar trends, such as declining fertility rates and postponing births in the 1990s, a considerable diversity of family patterns emerged in the 1990s and 2000s. This diversity is reflected in strong contrasts between countries in terms of extramarital fertility, time of birth and marriage, the share of single-child families, and abortion rates. Similarly, reproductive behavior is more differentiated according to social status.

I outline social trends after 1989 and highlight theories and explanations of rapid fertility changes. Without excluding each other, four perspectives are highlighted: the vision of the economic crisis/uncertainty, the second demographic transition, the postponement

transition and the contraceptive revolution. The postponement transition, manifested by a shift from birth to higher reproductive ages, is undoubtedly the most important factor behind the decline in fertility in the 1990s, as the fertility of the period was severely affected by such changes. Step-by-step accession to the European Union (EU enlargement) was another turning point that shaped the socio-economic momentum in the region. Integration into the second largest economic zone in the world has brought about a general change of regimes in countries, necessitating their modernization. (Böröcz, 2000; Melegh, 2006)

Austria joined the EU in 1995, Hungary, Slovakia and Slovenia nine years later, in 2004 Bulgaria, and Romania followed in 2007. Serbia gained official candidate status in 2012. Economic reforms initiated in the pre-accession and accession periods they were directed towards a neoliberal order: fiscal policies became stricter in order to comply with EU accession criteria, privatization processes were accelerated and countries became more open to foreign actors. As a result, the volume of foreign direct investment has increased considerably.

Increasing European integration has also led to the free movement of people within the European Union: all EU citizens have the right to enter another EU Member State without entry or exit visas.

2. Family and demographic trend after the transformation

Although the specific pathways of change varied across the countries of the region, the political and economic transformations of the late 1980s and early 1990s were accompanied by family and demographic changes in all of them, with many of those changes being rapid and substantial. We briefly discuss these general trends, beginning with the dramatic declines in first marriage in the region.

Philipov and Dorbritz (2003) characterized marriages before the start of the transition as being universal and contracted at a young age as compared to Western Europe. They further showed that shortly after the start of the transition marriage swiftly lost its universality and was continuously postponed to a later age in life; more over there was a marked rise in cohabitation. Table 1 documents the increase in mean age at first marriage throughout the region.

Table 1. *Mean age at first marriage*

Country	1980	1990	2004
Albania	22.2	23.2	23.5
Armenia	21.9	22.4	22.8
Azerbaijan	21	24.1	24.1
Bulgaria	22.9	25.2	25.2
Croatia	22.1	25.6	25.6
Estonia	22.6	25.7	25.8
Hungary	21.2	26.2	26.3
Latvia	22.8	25.1	25.1
Moldova	21	23.8	23.8
Poland	22.8	24.9	24.9
Romania	21.5	24.1	24.1
Slovenia	22.5	27.8	27.8
Lithuania	21.9	22.7	24.7

Source: Council of Europe (2005).

Because non-marital cohabitation is an unofficial event, it is not measured in official statistics and conclusions about it are more difficult. Nevertheless, there is evidence suggesting that at the same time that marriage rates were declining and age at marriage was increasing, in many of the countries non-marital cohabitation was increasing.

The Family and Fertility Surveys conducted in the 1990s in several of the countries measured cohabitation experience and suggest substantial increases in this experience.

Table 2 provides a summary of the non-marital cohabitation experience of women in several of these countries by age 25 – with the data presented separately by different age cohorts. By comparing across age groups, we can estimate intercohort trends in cohabitation experience.

Table 2. *Cumulative percentage of females who by exact age 25 have ever entered first partnerships that were non-marital unions*

Country	Year of interview	Age at interview		
		25-29	30-34	35-39
Czech Rep	1997	29.3	25.5	20.5
Estonia	1994	64.0	60.8	48.9
Hungary	1992	18.1	14.8	8.9
Latvia	1995	40.0	28.6	25.4
Lithuania	1991	15.3	9.5	12.2
Poland	1994	4.1	3.6	2.8

Source: Tables 8c from the series "Fertility and Family Surveys in countries of the ECE region" for the corresponding countries.

Although the surveys were conducted relatively soon after the political transformations in the region, with the exception of Poland and Lithuania, they reveal substantial increases from the older to the younger cohorts. Perhaps the greatest increase was in Slovenia where the proportion across just ten years increased from 23 to 42 percent, but in the Czech Republic the increase was from 20 to 29 percent and in Hungary from 9 to 18 percent. The relatively small increase observed in Poland is probably related to the fact that the Polish survey was conducted in 1991, very soon after the political transformation. In addition, as we discuss further below, Polish behavior was also probably influenced substantially by the strength of Catholic religion in the country.

More recent data and life table analyses about cohabitation experience from the Generations and Gender Surveys conducted in Bulgaria and Russia in 2004 and in Romania in 2005 are also relevant.

Table 3 displays estimates from three types of life tables, placed in the three columns in the table. Each one of them refers to the indicated time period and comes from a period life table, not a cohort life table. The first column gives the life table estimate of the cumulative percent of women that had not previously been in any form of a union, who by age 40 would have ever entered a first union in the form of cohabitation. For example, according to the 1985-1989 life table for Bulgaria, 54 percent of women would have ever entered a first union as a cohabitation by age 40.

Table 3. *Entry into a first union, with cohabitation and marriage as competing-risks*

	Entry into cohabitation as a first union, cumulative percent till age 40	Entry into marriage as a first union, cumulative percent till age 40	Total
Bulgaria			
1985-1989	54	39	93
1990-1994	60	32	92
1999-2003	65	16	81
Romania			
1980-1989	20	76	96
1996-2005	35	57	92

Source: Bulgaria, Philipov and Jasilioniene (2007), Table 5; Romania, Mureshan (2007), Table 5.

Analogously, the second column informs about entry into a marriage as a first union, with cohabitation as a competing risk. It shows that 39 percent of the Bulgarian women would enter directly into a marriage as a first union, according to the period 1985-1989 life table. The third column gives the percentage of women who would ever experience any form of a first union.

The percentage ever experiencing a union is also the sum of the percentage experiencing cohabitation and marriage.

As documented in Table 2, fertility rates also declined dramatically across the 1990s in every country. In fact, the declines were so substantial that by the year 2004, with three exceptions, the total fertility rate was between just 1.2 and 1.52 across the region. Although such low total fertility rates have been observed in other countries in Europe and in parts of Asia, the fertility rates in the Central/Eastern European region are among the lowest in the world. In fact, if such low rates were to last for a lifetime, the next generation in these countries would only be around two-thirds as large as the current generation – indicating large-scale population declines.

However the TFR marked a moderate increase after 2000 in a few countries. In almost every country with data shown in Table 2 mean age at first birth increased sharply during the 1990s. As with the increase in mean age at marriage, the mean age at first birth increased by two or more years in some of the countries.

The postponement of first births – and consequently subsequent births as well – is at least part of the explanation of the dramatic declines in the total fertility rate in most of the countries during the same period. That is, significant postponement of childbearing can lead to a dramatic decline in childbearing rates observed in any particular year, even if the women postponing childbearing eventually have the same number of children as their predecessors.

It is too early in the process to know if the low fertility of this period is just a result of postponement or, in addition, reflects a shift to fewer children born altogether. However, current estimates suggest that much of the decline in period fertility is due to postponement, but that there will also be declines in completed fertility for the cohorts of women currently in the childbearing years (Sobotka et al., 2007).

Another indicator of changing marital and childbearing patterns in Central and Eastern Europe is the percentage of children born to unmarried mothers. Table 4 provides data on this indicator and demonstrates increases across the 1990s in every country, indicating a

clear shift from marital to non-marital childbearing. However, caution must be exercised in interpreting these trends as the percentage of children born to unmarried mothers is a product of several different factors: the percentage of women who are married; the birth rates of married women; and the birth rates of unmarried women.

Table 4. *Extra-marital births per 100 births*

	1990	1995	2000	2004
Armenia	9.3	9.3	14.6	11.4
Azerbaijan	2.6	5.8	5.4	20.3
Bulgaria	12,4	25,7	38.4	48.7
Croatia	7,0	7,5	9.0	10.4
Estonia	27,1	44,1	54,5	57.8
Hungary	13,1	20,7	29.0	34.0
Latvia	16,9	29,9	40.3	45.3
Romania		19,7	25.5	29.4
Slovenia	24,5	29,8	37.1	44.8
Ukraine	13,0	13,2	17,3	20.4

Without decomposing the percentage of children born to married women into these various components, we cannot know which of the three components – or which combination of them – accounts for the change. Further investigation is required to know whether or not childbearing rates among unmarried women increased during this period.

In many countries where abortion is tightly restricted, one might expect that a decline in childbearing would be at least partially the result of a relaxation of abortion laws and an increase in abortion. Indeed, changes occurred along those lines in Albania where abortion was legalized in 1991

However, as we noted earlier, abortion was previously legal and widespread in most of Central and Eastern Europe. It then declined substantially during the period of rapidly falling fertility. As revealed by Table 5, in almost every country the abortion rate fell during the 1990s, and in some cases the decline was dramatic.

Table 5. *Abortion rate, 1980-1999, per thousand women aged 15-44*

	1980	1990	1996	1999
Belarus	94	116.9	73.6	56.6
Bulgaria	76.6	67.8	51.3	42.2
Estonia	110.7	87.9	53.6	46.6
Hungary	36.3	41.2	34.5	30.6
Latvia	107.8	87.2	46.1	35.0
Moldova	101.2	83.1	45.8	38.8
Poland	16.7	7	0.06	
Romania	90.2	199.3	90.2	51.7

Source: estimations of the author based on data from the Council of Europe (2002), 1999.

At the same time that abortion rates were falling in most of the region, the use of chemical and mechanical means of contraception was increasing sharply. The governments in Central and Eastern Europe had long had policies and programs that restricted the distribution and use of chemical and mechanical means of contraception (David, 1999 and the country chapters therein).

Although many couples knew about contraceptives and used them, supplies were often few and irregular, making steady and 41effective use of contraception difficult. As a result of

the policies on contraception and abortion and limited and irregular supplies of contraceptives, there were low rates of usage of chemical and mechanical contraception, and the rates of abortion were exceptionally high – among the highest rates in the world.

During the 1980s the governments of the region began to permit wider distribution of contraceptives. And, in the 1990s effective contraceptives became widely available and used by substantial fractions of the population (Philipov and Dorbritz, 2003). Sobotka and colleagues (2007) report that the percentage of Czech women prescribed the contraceptive pill increased from 4 percent in 1990 to 44 percent in 2004 a remarkable increase during a relatively short period.

4. Concluding remarks

In this paper we have provided a series of explanations for the dramatic family and demographic changes in Central and Eastern Europe following the political transformations of the late 1980s and early 1990s.

Our explanations have focused on the political, economic, social, and cultural histories of the region, with particular emphasis on how countries in the region have interacted with and been influenced by Western European and North American countries. Our explanations have emphasized the concept of development, arguing that the ideas of a developmental paradigm with development progressing through natural, uniform, and necessary stages being a common one throughout Europe, including the Central and Eastern region – for several centuries.

This paradigm generally posited that Western Europe was more developed and advanced than Eastern Europe – a view that continues to be widely shared in the world today. The related methodologies of reading history and the future sideways have also been important in that they have suggested that the model for the future of progress for Central/Eastern Europe lies in Western Europe and North America.

Furthermore, we have suggested that the developmental paradigm and the results of reading the past and future sideways provide values and beliefs that are important in guiding human behavior. This ideational system suggests that the political, economic, and family systems of the West are not only more advanced, but better than those observed elsewhere. This ideational system also provides models to be followed in other places, including Central/Eastern Europe.

In addition, it provides beliefs that modern family systems help to produce modern political and economic systems and accomplishments. And, this ideational system also helps to establish the importance of freedom and equality as human rights. We believe that understanding of this developmental model and the circumstances existing in the West was available in Central and Eastern Europe before the imposition of socialism.

References

Alexander, W., 1995/1779. *The history of women from the earliest antiquity to the present time.* Bristol: Thoemmes Press.

Anderson, M., 1986/1980. *Approaches to the history of the Western family.* London: Macmillan Publishers Ltd.

Andorka, R., 1999. The weak links in social integration-system transformation in Hungary. In Z. Spéder (Ed.), *Hungary in Flux* (pp. 19-34). Hamburg: Kraemer.

Andors, P., 1983. *The unfinished liberation of Chinese women 1949-1980.* Bloomington: Indiana University Press.

Balla, B. and Sterbling, A., 2005. Ethnicity, Nation, Culture: Central and East European Perspectives. In Z. Manfeldová, V. Sparschuh, and A. Wenninger (Eds.), *Patterns of Europeanisation in Central and Eastern Europe.* Hamburg, Krämer.

Beck, U. and Beck-Gernsheim, 2002. *Individualization: Institutionalized Individualism and its Social and Political Consequences.* London: Sage Publications.

Berkhofer, R.F., 1978. *The white man's Indian: Images of the American Indian from Columbus to the present.* New York: Knopf: distributed by Random House.

Bianchi, S.M. and Spain, D., 1986. *American women in transition.* New York: Russell Sage Foundation.

Billari, F.C. and Philipov, D., 2004. Women's education and entry into a first union: A simultaneous-hazard comparative analysis of Central and Eastern Europe. Vienna Yearbook of Population Research, pp. 91-110.

Geiger, H.K., 1968. *The family in Soviet Russia.* Cambridge, MA: Harvard University Press.

Lesthaeghe, R. and Surkyn, J., 2007. When History Moves On: The Foundations and Diffusion of the Second Demographic Transition. In R. Jayakody, W.G. Axinn, and A. Thornton (Eds.), *International family change: Ideational Perspectives*. Mahwah, NJ: Lawrence Erlbaum Assoc.

Macaulay, C., 1974/1790. *Letters on education.* New York: Garland Publishing, Inc.

Wolff, L., 1994. *Inventing Eastern Europe: The Map of Civilization on the Mind of Enlightenment.* Stanford, California: Stanford University Press.

Zakharov, S., 2006. *Demographic Analysis of the effect of the family policy measures in Russia from the 1980s.* In Russian. (Demograficheskij analiz effekta mer semejnoj politiki v Rossii v 1980-h g.).

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 150-160

The impact of green economy on labor market: An overview of united Europe

Rareș Mihai NIȚU
Bucharest University of Economic Studies, Romania
niturares18@stud.ase.ro
Dermengi Ayten GÜLER
Valahia University of Targoviste, Romania
dermengiayten@gmail.com
Radu Alexandru BUDU
Bucharest University of Economic Studies, Romania
buduradu17@stud.ase.ro

Abstract. *This paper explores green economy regarding the impact it has on the labour market. The paper is concerted both on the developments that have already taken place, but also on those that are most likely to happen in the future. Moreover, in order to capture a large informative area, concrete aspects were presented regarding the early encouragement of individuals concerning the adoption of a sustainable production model, an approach specific to the green economy, but also of the reasons and steps taken at European level to encourage the development of environmentally friendly concepts that offer the possibility of sustainable development. Although the green economy has a multiple set of advantages with beneficial effects that can spread at European level, a special importance is the workforce that will have to be oriented towards this field of work that includes several sectors of productive activity. The impact that the labour market has is reflected both in economic policies adopted at European level and from a social perspective. Thus, it is noted that once the principles of the green economy are developed at a macroeconomic level, a number of difficulties that directly concern individuals of all ages will be solved, such as reducing the unemployment rate, increasing productivity and efficiency of activities producing goods and services, and increasing the quality of life.*

Keywords: labor, development, sustainability, environmental, investments.

JEL Classification: O10, Q01, J08, J21, J24, J49.

1. Introduction

The Green Economy as a distinct and interdisciplinary branch of study of the economy has come to the attention of the European authorities for some time. The need for a cleaner, more environmentally friendly environment and the need for a sustainable business model that allows for the sustainable and organic development of the business environment are just some of the aspects that need to be taken into account and that are analyzed by the green economy. These elements specific to the segment of study set out include the labor market. Digitalization, automation, lucrative processes, labor force specialization, the degree of segmentation, all these are elements that change the structure of the labor market. As a distinct and mainstream principle of orientation and planning, the green economy through the models and principles it imposes leads to changes in this segment. One of the main aims on the basis of which this science is formed is the ability to reduce the unemployment rate, create a more inclusive labor market and automatically reduce the rate of people at risk of poverty and social exclusion.

The green economy does not aim to attract qualified people from other fields of activity for new activities, but to include in the economy a higher share of people who have not been employed until that moment, either due to lack of education, specialization or unemployment imposed by unfavorable economic and social conditions imposed by various factors such as the pandemic, legislation or the relative mobility of human capital, as well as the potential of development areas. If the economic centers, the points where the most resources are concentrated are also the points where the largest share of human capital is located, the green economy proposes a dissemination of this resource according to the geographical potential that each area has (Karakula, 2016).

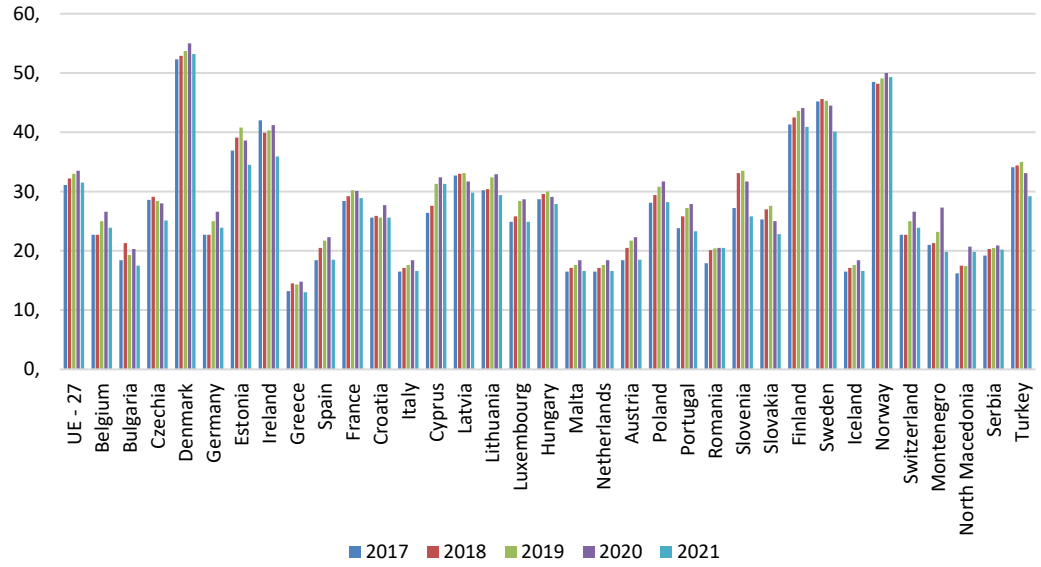
Thus, underdeveloped areas where there are individuals who are not integrated into the labor market can be used for new productive activities that generate more cost-effective, environmentally friendly and low-priced outputs. In this regard, the European Union's green economy program called Green Deal proposes that through such principles and concepts, the number of people who are unemployed should reach record lows.

2. Main objectives of the green economy

At an early stage of the paper we analyzed the level of employment on the labor market in the analyzed field. There are differences in the percentage of people in employment, but the level of economic development must also be taken into account. The number of employees increased between 2017 and 2021 as a result of the investments made and the increase in demand in certain areas such as the supply of electricity for electric cars or qualified personnel to provide the necessary maintenance for public transport cars operating on the electrical system. The year 2020 shows a decrease in these values due to the layoffs made by certain companies in that field. However, the growth rate has a positive trend, which has been achieved by integrating a new workforce and not by attracting human resources already used in existing areas. This sector is treated differently, as a result the integration of the workforce is also carried out in a different way. The specialization or skills that a particular group of individuals possess are not enough to work in this field. It

is necessary to acquire a mindset necessary to approach and integrate specific concepts into the necessary field. Thus, people working in technology, back-office, it, ICT or accounting people (these being some examples), will not have to change your professional behavior. The people to whom such a change in behavior is imposed by the green economy are represented by those who actively participate, directly in the production process, either in the field of research, whether it is the public sector or a research and innovation department of a company being watched. This category includes people who have higher qualifications in the field of chemistry or engineering.

Figure 1. *Employment in the environmental goods and services sector (% of total job sin environmental sector)*



Source: Eurostat Database.

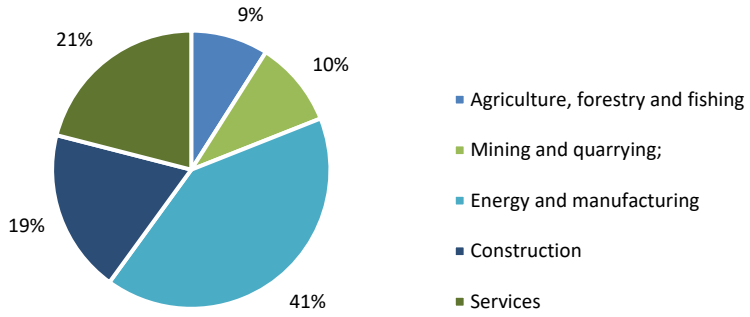
Figure 1 shows the share of people employed in environmentally friendly fields specific to the green economy. It is found that the share of these people in that field is higher in economically developed countries. This is due to a greater financial capacity in both the private and public environment to invest in projects, but to choose in the necessary refurbishment that creates new jobs and new outputs. Emerging economies not having this capacity for innovation, although they have the potential to catch up with developed countries, are often forced to acquire the technology, which requires a longer period of time for the implementation and development of that segment.

The green economy is seen as a method of improving the use of resources, as a way of bringing added value to the economy and society at European level. It is therefore necessary for this to provide positive results with the passage of time and the increase in investment in this area. It can be seen in the two graphs below, Figure 2 and Figure 3, respectively, how the various areas included in the analysis change depending on the potential they have and depending on the efficiency of the financial resources invested. The most important area that remains a constant sector in which improvements and innovations are achieved is

that of energy and manufacturing. The services sector plays a small role in importance because they, in order to be able to exist, use the goods made by the manufacturing industry, thus forming a causal chain between the two, from the first to the second sequence (Dunlap and Laratte, 2022).

Agriculture, forestry and fishing are only analyzed in terms of the resources used to be able to carry out activities, such as the pollution of instruments, deforestation machines, fishing machines and the mechanisms used to take over those raw goods obtained. They are not analyzed in terms of the consequences they generate on biomass and biodiversity, aspects that are considered an output, a consequence of the result obtained. Mining and quarrying is a sector of activity that affects biodiversity by altering the environment and using the resources used. Many of the methods used generate harmful effects on the environment, such as the dynamism of areas with potential. In this sector, the green economy seeks to integrate more environmentally friendly methods of extracting raw materials and making more cost-effective use of their energy potential (Sokołowski et al., 2022).

Figure 2. *Gross value added of the environmental economy, by activity – 2019*



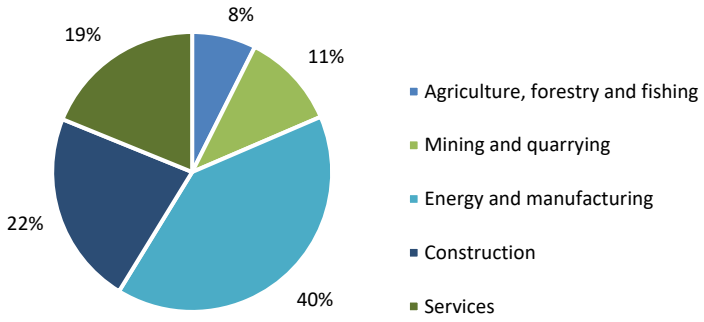
Source: Eurostat Database.

Using resources in an appropriate manner is one of the main concerns at European level. The green economy has the ability to de-stress the relationship between needs and resources. Hydropower plants and energy from air currents is a decisive factor in forming a sustainable production model. Protecting areas with productive potential is one of the measures adopted at European level. Staff in those areas have been and are expected to be more closely integrated into the labor market to serve a profit-making purpose, which reduces the unemployment rate and the risk of social exclusion and poverty (Chen et al., 2021).

The services and constrictions sector is another element that has come to the attention of the authorities. The regulation of some rules on waste management, or on the use of resources (which is achieved through a progressive taxation system) leads to an improvement in the quality of the use of goods. In the field of construction, the question arises of waste management that must be managed properly, by saving and using materials that allow such processes. Services are about the system of rules that a company that uses services as the main way of doing business must comply with in order to receive the

necessary authorizations. The regulations are diverse and differ from one object of activity to another, but they are about the goods they use, about the technical data sheet of the goods and about the qualifications that the persons concerned hold, but also about the drawing up of some rules regarding the limits that the services offer.

Figure 3. *Gross value added of the environmental economy, by activity – 2020*



Source: Eurostat Database.

The energy produced and stored is important because it has effects that spread to all other sectors of activity that use it. The current problem no longer lies in its production, but in the ability to be stored and distributed in a more performant manner. The reduction of inputs and the increase in outputs is one of the main pillars on the basis of which the green economy was formed as a science, and this automatically also includes a more adequate storage of the resources used, especially in the field of energy, a sector of national-European interest. A comparative observation of the two graphs, Figure 2 and Figure 3, reveals that the added value of the energy sector has decreased. This is not due to the reduction of investments, but to the pandemic period that has reduced the rate of activity in this area. Being at an early stage, the effort and resources invested in value were higher than the effects generated, also expressed in value, for this reason being a reduction of 1 percentage point of the gross value added.

The explanation also applies to the other four sectors mentioned in the two figures, being an identical principle, the only differences being formed by the nature of the object of activity, their complexity and the effort required to orient it towards an inclusive way, specific to the green economy (Ziaei, 2022).

3. The labor market from a green economy perspective

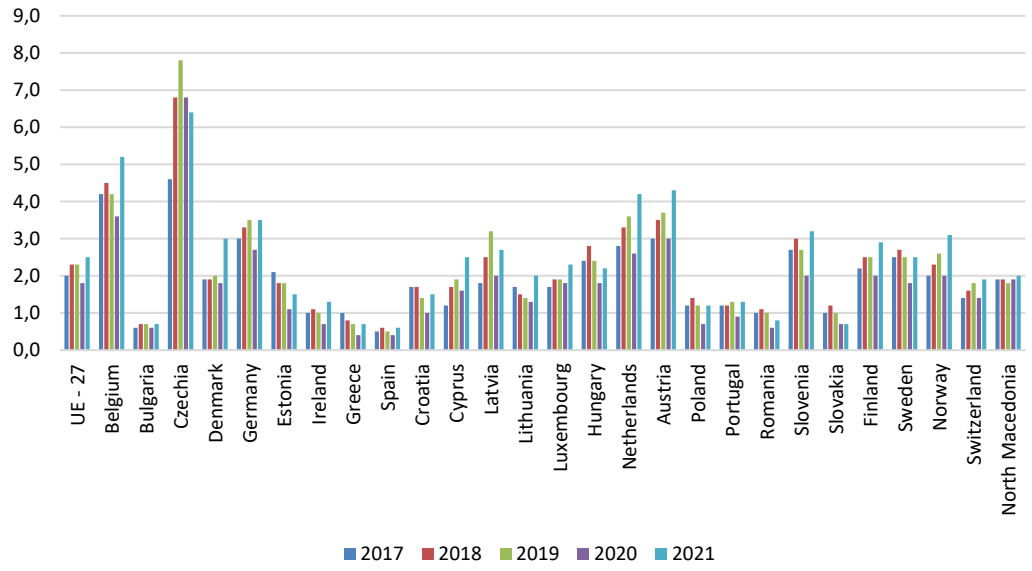
For all these elements aimed at improving lucrative assets, moving towards more sustainable models and increasing the added value in the economy by the green economy sector, human resources are needed. It can be taken from already existing domains in the case of a company that repositions itself on the market, or it can be activated some of the people who are unemployed in the case of the formation of a distinct entity, either of an already existing company or of a new one.

In the first case it is these companies that have given up on the traditional processing model, most often being the case of energy producers, who keep the method classifies but simultaneously develop a segment of renewable energy. In the second case, we are talking about the companies that appear new on the market and specialize from the very beginning of their existence, for example in the area of clean energy production.

In both cases it is a question of a concentration of people capable of working on this sector of activity. It is noted that in Figure 4, the vacancy rate in environmental industries suffered fluctuations between 2017 and 2021. Investment and the increased market introduction of new methods have led to employment. Between 2017 and 2018, the vacancy rate decreased on average at European level by 2 percentage points, which was exclusively due to employment and not to the reduction in the number of economic entities that withdrew from the market.

The period 2019-2020 led to the increase of this indicator due to the financial pressures that affected the economies at European level, difficulties that appeared by the implementation of a series of trade restrictions imposed by the pandemic situation at that time. The reduction was not uniform, but it was observed until 2021, at which time the rate of available jobs increased by 4 percentage points compared to 2018 (Comodi et al., 201).

Figure 4. *Job vacancy rate in environmental industries (% of total jobs in environmental industries)*



Source: Eurostat Database.

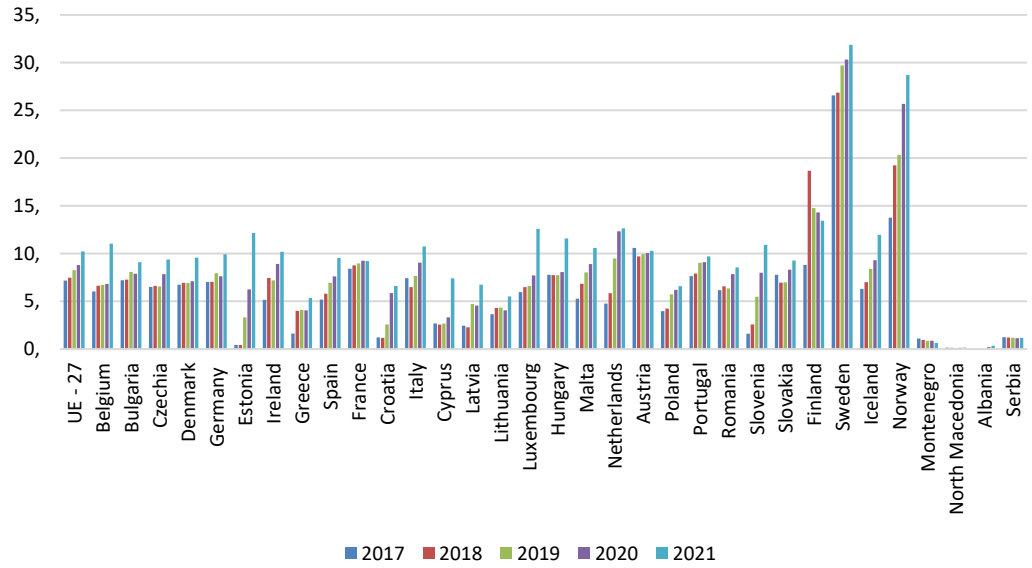
Depending on the resources they have and the conditions offered by the geographical area, each country specializes in a different area. Labor is the decisive factor that drives this process. It can thus be seen that in countries such as the Czech Republic, Belgium, Austria or the Netherlands, the vacancy rate in this sector is high compared to the European Union average, which is due to a lack of staff training.

Although there are significant investments, workers must be taught simultaneously about the specifications of this area. At European level, sums of money are invested in the educational environment, especially to areas that target electricity (engineers – through dedicated courses), ecology and recycling. Currently, in order to be able to be certified as a professional in a certain field, there is no need for the traditional method of doing college. There are dedicated courses, paid for from national or European funds, which are aimed at niche education of people on the field of activity that is needed at that time. Costs are more reduced, time invested is less and training is targeted towards clearly delineated objectives. After the implementation of these new concepts with an educational and social purpose, there were found at European level a series of advantages that constituted to appear constantly after the implementation.

It has been found that reducing costs and training time provides the financial opportunity to attract an increasing number of unemployed individuals to these training programs. Subsequently, the rate of individuals at risk of poverty and social exclusion decreased as a result of these trainings, especially in disadvantaged areas with undeveloped economic potential. The conclusions of these projects were that individuals should not be educated in the traditional way and that they can generate greater added value if the investments are lower, i.e. they are adapted to the needs of the market in the segment of activity that is needed (Griffy and Masters, 2022).

As regards the actual production part, the production of clean energy is not the only area of interest. There are new alternatives to the fuel used by non-electric vehicles. The LPG variant is one of them, but more innovative is the CNG system, which releases an insignificant level of pollutants and which may be common from the residues of the other petroleum components. This is one of the concrete examples provided by the European Union. The high employment rate provides an overview of several aspects: the quality of production, the protection of the environment and the reduction of the risk of poverty and social exclusion. In the last 5 years, investments have taken place both privately and publicly. Even if it is a new approach, the effects propagated so far are beneficial. The issue of concern to the European community is logistics. Energy storage and distribution systems need to be innovated. It has naturally been found that the economies that benefit from the most abundant resources specific to the green economy are those that also have the largest share of people employed in the field of energy. In this case, we are talking about the Nordic countries of Europe, particularly Sweden and Norway. The resources they own and capitalize on for a long period of time consist of the thermal energy that their geographical area has. The majority of the energy produced by these two countries comes from these natural resources, which is why the countries have a rate below the EU average of the level of pollution resulting from the production of energy, being almost 12 percentage points below the European average values.

Figure 5. *Individuals employed in the field of renewable energy (% of total staff employed in the field of energy and fuel production)*

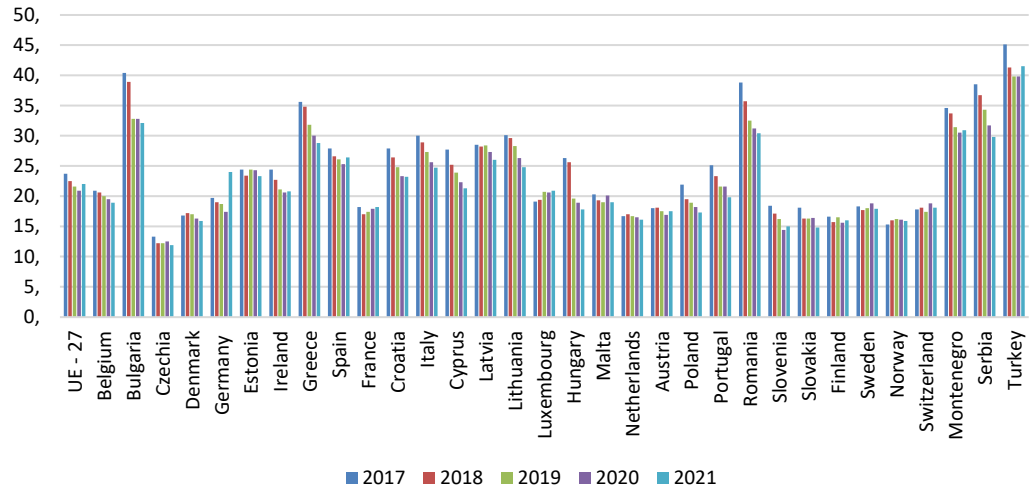


Source: Eurostat Database.

The last period has led to the relocation of a percentage of the workforce in the current areas (electricity generation, energy, recycling). All this attracts a new wave professionals who have the mission to generate the desired effects. Although the effects are short-lived, the reallocation of the workforce has led to supporting production and mitigating the gaps that have occurred following an economic shock triggered by the Covid-19 pandemic. The relocation of the workforce does not support the increase in the number of people active on the labor market, but it contributes significantly to the development, improvement and continuation of these new methods whose effects are spreading to most industries. The European Green Deal program aims among the splints to eliminate the dependency ratio between resources and organic, sustainable economic development, as well as to reduce unemployment up to the levels of natural unemployment, respectively the values recorded in the NAIRU indicator. These objectives can be achieved through different approaches. At European level, there were two ways that have also been adopted by the economies under review: the integration of individuals through training programmes and the creation of new jobs generated as a result of the development of a certain segment that has increased as a result of the takeover of the workforce in other areas. As a result, there can be an improvement in the standard of living in the economies that have adopted such an attitude. Research demonstrates that this approach has also provided beneficial effects at an empirical level, not just theoretically (Wilgosh et al., 2022). The causes of the reduction in the risk rate and social exclusion can be multiple, but the result is identical: the reduction takes place through unemployed employment. The issue that the green economy is concerned about in the first instance is that of turning people who are technically unemployed into an active workforce. However, the manner in which these processes are implemented, although they do not represent high or significant costs compared to other

projects or methods implemented at European level through dedicated programmes, takes time. The issue must be seen not only from the perspective of integration into the labor market, but especially from the point of view of the development of the sector of activity. Even if the profitability will prove to be higher for this sector, even if the growth rate of the active workforce will be significantly higher than other areas, shortcomings in the implementation time remain. Even if the resources allocated to training are reduced, even if the market has growth potential, the change concerns a much larger scope than at first glance, the effects spreading in all other areas, especially when the energy and fuel market is brought into question.

Figure 6. *People at risk of poverty or social exclusion (% – total population)*



Source: Eurostat Database.

The solution to avoid or mitigate the risks to which unemployed people are exposed is thus to strengthen and develop the green economy. However, it should be noted that this cannot be done in the short term. A long transition period is needed in which to solve the multiple and complex problems involved in such a process. In order to search for the transition and its duration, scientific research must contribute to you, in order to give solutions to technical problems. The governments which, being aware of the scale of the risks and the need to act to avoid or mitigate their consequences, have acted, with the means at their disposal, to encourage and support all the activities that make up the green economy.

Conclusions

As an integral part of a long-standing process desired and encouraged at European level, the green economy plays a key role. The labor market has been and still is constantly changing, but new integrated concepts chart certain directions that have a clearly defined purpose. Sustainable development, social inclusion are just some of the elements that need to be pursued and achieved in the long term. The importance of human capital is a sure element for organic growth and the implementation of specific conditions.

The green economy is not a homogeneous and distinct sector of activity, but is found in all sectors, as a component that develops, diversifies and whose share increases as solutions and possibilities are identified to protect the environment, to combat pollution and to replace substances from non-renewable resources. The development of the green economy has become visible, a trend of "greening" can be observed, at different rates, of vast areas of activity. In some sectors, the share of green activities is already so large that they have become distinct areas, the specific characteristics of which are recognized and treated in a particular way. There is thus talk of green energy, of oxen agriculture, of ecological products and services. In other sectors, only green activities or jobs are found that naturally integrate into larger assemblies, without changing the classic nature of these assemblies.

The scale and diversity of the green economy is very different from country to country. In some countries, which have not experienced massive industrialization processes, the natural environment has remained less polluted, even though overexploitation of resources, monoculture and other practices specific to underdevelopment have disrupted ecological systems. In others, extensive industrialization at forced rates and the development of agricultural production through polluting processes ignoring the long-term consequences of this process, induced a massive degradation of the environment and generated practices that could not be curtailed even after the phenomenon, as such, ceased.

Highly developed countries with diversified economies, reaching the highest levels of technological progress, are facing pollution phenomena of a large scale that can disturb the balances at the planetary level. Being, themselves, deprived of resources commensurate with the production capacity they have created and the capacity of productive and unproductive consumption, in order to ensure their sustainability for a reasonable time horizon, they resort to the exploitation of resources from other countries, with the concern to minimize costs, neglecting elementary measures to protect the natural environment.

References

Chen, F.W., Tan, Y., Chen, F. and Wu, Y.Q., 2021. Enhancing or suppressing: The effect of labor costs on energy intensity in emerging economies, *Energy*, Vol. 214, No. 118964. <https://doi.org/10.1016/j.energy.2020.118964>

Comodi, G., Cioccolanti, L., Mahknow, K., Penlignton, R., Lapuerta, M., Hernandez, J.J., Lora, E.E.S., Venturini, O., Palacio, J.C.E., Freires, G.M., Torres, E.A. Silva, J.A.M. and Ramirez, C.C., 2019. Analysis of labour market needs for engineers with enhanced knowledge in renewable energy in some European and Latin-American Countries, *Energy Procedia*, Vol. 158, pp. 1135-1140. <https://doi.org/10.1016/j.egypro.2019.01.279>

Dunlap, A. and Laratte, L., 2022. European Green Deal necropolitics: Exploring 'green' energy transition, degrowth & infrastructural colonization, *Political Geography*, Vol. 97, No. 102640. <https://doi.org/10.1016/j.polgeo.2022.102640>

Griffy, B. and Masters, A., 2022. Labor market policy in the presence of a participation externality, *European Economic Review*, Vol. 144, No. 104081. <https://doi.org/10.1016/j.euroecorev.2022.104081>

Karakul, A.K., 2016. Educating labour force for a green economy and renewable energy jobs in Turkey: A quantitative approach, *Renewable and Sustainable Energy Reviews,* Vol. 63, pp. 568-578. <https://doi.org/10.1016/j.rser.2016.05.072>

Sokołowski, J., Frankowski, J., Mazurkiewicz, J. and Lewandowskiad, P., 2022. Hard coal phase-out and the labour market transition pathways: The case of Poland, *Environmental Innovation and Societal Transitions,* Vol. 43, pp. 80-98.

Wilgosh, B., Sorman, A.H., and Barcena, I., 2022. When two movements collide: Learning from labour and environmental struggles for future Just Transitions, *Futures,* Vol. 137, No. 102903. <https://doi.org/10.1016/j.futures.2022.102903>

Ziaei, S.M., 2022. The impacts of household social benefits, public expenditure on labour markets, and household financial assets on the renewable energy sector, *Renewable Energy*, Vol. 181, pp. 51-58. <https://doi.org/10.1016/j.renene.2021.09.017>

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 161-166

Analysis Fishbone chart in compensation by intrinsic motivation

Cecilia VĂDUVA (BĂCANOIU)
Bucharest University of Economic Studies, Romania
bacanoiu2006@yahoo.com
Georgiana Florina ILIE (POPA)
Bucharest University of Economic Studies, Romania
tinkerbell100486@yahoo.com

Abstract. *Motivation refers to a complexity of forces that inspire a person at work to increase their desire and willingness to use their potentials to perform in order to achieve organisational goals or objectives. This study investigates the relationship between motivation and the level of employee performance. The main objectives of the study are: assessing the effects of motivation on employee performance and assessing motivational factors that may influence employee performance.*

Keywords: motivation, intrinsic and extrinsic motivation, performance.

JEL Classification: J20, J50, J30.

Introduction

Motivation can be defined as the complexity of forces inspiring a person at work to increase their willingness and willingness to use their potential for performance purposes in order to achieve organisational objectives. According to specialists, motivation is a condition that influences excitation, direction and maintenance of behaviour. Human needs must be met, and this can cause motivational forces to awaken. Employee motivation is considered to be an important internal control tool and should be satisfied in order to achieve benefits such as increased employee engagement, increased productivity and efficiency.

Motivation focuses on results-oriented management by setting smart targets and efficient communication systems in an organisation.

According to specialists, employee performance refers to the efficiency and effectiveness of employees in achieving organisational goals and objectives. Employee performance could also be assessed taking into account the level of absenteeism, the quality of the reports and the reporting and departure time

Compensation through intrinsic motivation

Managers can be involved in situations where they are forced to manage a diverse group of employees, from highly motivated, enthusiastic and participative to some of them who are less or non-involved. If employees are in these multiple categories, the overall result of the work effort is difficult to record. Managers often rely on highly motivated employees to perform tasks. In general, motivated employees receive a larger share of workload than do motivated employees. Although not correct, it often proves to be the best use of resources in terms of productivity and costs. Addressing the issue of motivation involves increasing the contribution of all employees. There has always been controversy over the ability of leaders or managers to motivate their people, whether it is a talent of military commanders or a management skill that can be acquired. Motivation is a difficult subject to analyze. It is part of human emotions and is based on individual perceptions. It can be initiated by a wide variety of factors, depending on the uniqueness of each individual's character and circumstances. These are factors that are difficult to define. An application framework is needed to understand this concept.

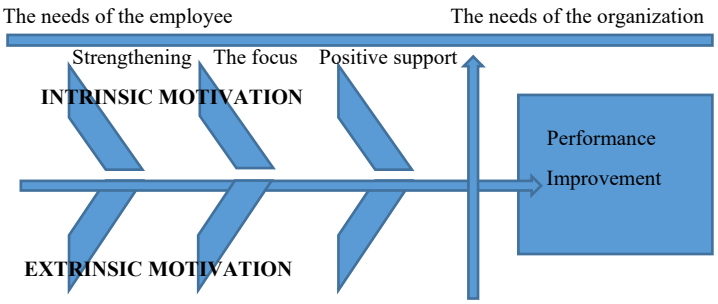
Motivation is a foundation of fulfilling desires and aspirations. The mainstream among social science researchers is that the ability to motivate people is not so much a gift as the implementation of theories derived from the study of human behaviour. This study is called behavioural science and focuses on understanding the particularities of human behaviour. The basic principle that has been established by behavioural psychology is that people behave in a way that meets their needs. Behavioural psychology provides a theory of motivation that will be used in the following lines to develop the Fishbone diagram (fish skeleton –showing the basic fish bone before any need is added to strengthen the structure). First, the key human needs that can be met in the workplace are identified and then the Fishbone structure is used to place these needs in a framework that will have direct application in the design of incentive compensation plans. Once we have fully developed

the Fishbone diagram, addressing the needs of both employees and the organization, it will be possible to integrate behavioural into a compensation system. It is based on stimulating compensation behaviour and will provide employees with the opportunity to meet their needs through behaviour that has a specific impact, well defined by organizational needs.

Current thinking in the field of organizational development has generally defined motivating work as one that offers the satisfaction of doing something interesting or challenging, of doing work that has value and means something to society. This value is not necessarily value for the organization, but a "sense" of the value that is offered to the employee. Employee surveys show that employees who understand how to integrate into the organization, which is their membership, have a significantly better attitude towards their jobs than employees who work only for money. From this knowledge springs the environment of employee involvement, quality circles, participatory action teams and similar motivational techniques and devices. In order to develop a technology that will allow us to apply the motivation of incentive compensation systems, we will propose that these factors, empowerment, concentration and positive reinforcement, are of critical importance in supporting the concept of motivation. These are the three key components on the intrinsic compensation side of Fishbone, because in general, the intrinsic human needs that can be met in one approach can be classified into one of these factors.

As you progress, the elements that define each factor will be added. These elements will provide the basis for concrete actions that management can take on a daily basis to support the incentive objectives regarding employee motivation. Above all its other behavioural attributes, incentive compensation is a management tool. Other factors could have been chosen and questions could be raised about the choice of the three. Fortification, focus and positive support were chosen because they are the best spectrum of human needs that exist in all of us. The term focus indicates a sense of purpose and direction. It is closely associated with the basic human need for adherence, belonging and acceptance. The term positive support is the basic human need for achievement and the assurance that those elements provide for personal respect. The term empowerment was chosen to convey the basic need of the individual to somehow feel control over his environment, with a certain ability to have an impact. Empowerment has a strong relationship with the basic human need for self-fulfillment. In support of this position, information gathered by the consulting firm Hewitt and Associates and provided at a variable compensation seminar held in Boston in 1989 indicates that motivational elements in the workplace include elements such as:

Fishbone diagram



Observations and experience indicate that existing employee performance management systems seem to emphasize the involvement and identification of those seeking extrinsic reward and are exempt from pressure/responsibility. Based on behaviour, incentive compensation provides methodology and financial reasoning to blur this distinction and apply all elements to both exempt and non-exempt employees, with a special focus on extrinsic rewards related to specific, measurable performance outcomes. Motivation is one of the first things that happens to employees when the organization begins to consider their needs at work. If the key factors that make up the intrinsic needs of employees are met or met, this reduces employee anxiety. As this happens, employees' attitudes change from resistance and avoidance to proactivity and opportunity exploitation. Thus, the first big change is a change of attitudes. Research by Hay Group, a nationally recognized compensation consulting firm, indicates that employee attitudes are an indicator of motivation.

1. Research shows that employees' attitudes are shaped by the way employees perceive such problems in the workplace:
- Pay.
- Respect.
- Challenge at work.

If attitudes are a good indicator of motivation, then it is significant to note that in another Hay Group survey, less than 60% of middle management executives who responded rated their organizations favourably on job security. On the topic of advancement opportunities, less than 45% rated them favourably.

2. Professional consultants have data stacks to support the position involving involvement, identification, respect, job challenge, responsibility and pay/extrinsic, based on the fact that rewards are the major motivating elements in the workplace. These are the elements that meet the basic human needs that we have identified. This fulfillment is a form of compensation because it is provided at work by the employer in exchange for the continued contribution of the employees. This list of motivational elements fits very well in the Fishbone chart. The salary is a financial contract between the employer and the employee and is part of the extrinsic compensation. In contrast, intrinsic compensation – involvement, identification, respect, challenge at work, responsibility – are all part of a psychological contract between employer and employee. The Fishbone chart will include the intrinsic human basic needs for empowerment, positive reinforcement, and concentration. Intuitively we can see that responsibility and challenge are manifestations of the need for empowerment; respect for the need for positive reinforcement; and identifying and involving the need for concentration. An organization that provides these elements is one in which employees meet their intrinsic needs. Therefore, surveys show that these elements have a strong association with employee motivation.

Extrinsic compensation

The mainstream of employee involvement and dedication was that the way a product or service is accepted in a market depends on them. Competing organizations adopt this concept and develop a variety of employee engagement techniques designed to encourage

them to contribute their full resources. But if you look beyond employee relationships and organizational development at the compensation function, you can see a different situation. In most organizations, incentive compensation plans are offered only to the most productive of employees, usually the sales force, and to the largest approximately 10% of managers. In the case of civil servants, the situation is different, the differentiation on the basis of remuneration cannot be as polarized. According to the traditional model, thinking about compensation, these people are the only employees able to make a significant contribution to the profitability of the organization.

In real life, of course, most organizations focus on features other than traditional ones that focus on costs and the philosophy of compensation under human resource pressure. In today's social and economic realities, organizations can no longer afford to pursue a cost-based compensation practice. The human element would become very close to the commodity element, which is trying to be avoided since the principle of human resource existed. Market-oriented businesses need creativity and individual input, as well as teamwork to be successful. Civil servants can also follow this model, although at first glance the association between the market and the public institution is not obvious. On the basis of behaviour, incentive compensation will be paid to a greater extent than by encouraging those behaviours among all employees in a process based on financial control. Thus, the discipline related to compensation, relations with employees, organizational development and training of new employees must become a closely linked unit of operation

Conclusion

The challenge faced by organisations or companies in the competition world is how organisations are able to improve and maintain the performance of their employees in order to remain effective in achieving organisational or company objectives.

From the analysis, it can be inferred that the type of motivation will incentivise employees to perform very well and must be in such a way as to meet an employee’s desired needs and expectations. In addition, the motivation must be such as to increase the level of promotion and the position of an employee, i.e. a positive change.

It is therefore recommended that employers always organise self-development programmes for their employees. They must also organise training and retraining programmes. An employee must be moved to different departments so that each staff member acquires complete experience and skills within the organisation. Hard work must be recognised and rewarded. All these recommendations, if implemented or used, will reduce complacency in inactivity, indolence, frustration and high fluctuation of the workforce.

References

Aguinis, H., 2013. *Performance management.* 3rd Edition. Upper Saddle River, NJ: Pearson Prentice Hall.

Allen, J. and McCarthy, M., 2017. How to engage, involve and motivate Employees – Building a culture of Lean Leadership and Two-Way Communication, CRC Press, Taylor & Francis Group.

Anderson, N., Potocnik, K. and Zhou, J., 2014. Innovation and creativity in organizations: A state of-the-science review, prospective commentary, and guiding framework. *Journal of Management,* 40(5), pp. 1297-1333.

Burke, L. Pierce, G. and Salas E. (Eds.). *Understanding adaptability: A prerequisite for effective performance within complex environments. Advances in human performance and cognitive engineering research,* pp. 3-39. Amsterdam: Elsevier.

Ekundayo, O.A., 2018. The Impact of Motivation on Employee Performance in Selected Insurance Companies in Nigeria. *International Journal of African development,* Vol. 5, No. 1, pp. 31-42.

McCoy, T.J., 1992. Compensation and motivation – Maximizing Employees Performance with Behavior-Based Incentive Plans, AMACOM American Management Association, New York.

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 167-176

Analysis of the indicators regarding Romania's transition to the green economy

Marilena E. POTÂRNICHE
University of Economic Studies, Bucharest, Romania
marilenaberheci@gmail.com
Andreea Daniela GIUCĂ
University of Economic studies, Bucharest, Romania
Research Institute of Agriculture and Rural Development, Romania
giucaandreea16@stud.ase.ro
Cristina Maria STERIE
University of Economic studies, Bucharest, Romania
Research Institute of Agriculture and Rural Development, Romania
sterie.cristina@iceadr.ro
Gabriela Dalila STOICA
University of Economic studies, Bucharest, Romania
Research Institute of Agriculture and Rural Development, Romania
stoicagabriela16@stud.ase.ro

Abstract. *The green economy is in fact the economic activity that is based on sustainable development, increasing the use of renewable resources, with the main objective of protecting the environment. By 2050, the EU is planning to become the world's first climate-neutral bloc. In order to achieve these objectives, investment by the European Union is needed from both the private and public sectors. The aim of this study is to highlight the situation of Romania compared to other EU countries in terms of financial allocation for the transition to a green economy. To achieve this aim, indicators have been analyzed which have contributed to the methodology for calculating the maximum financial allocation for each of the EU Member States. The indicators analyzed are: The resident population, the relative poverty rate in Romania, the share of households by expenditure they can afford, the total monthly average income per household, gross domestic product (GDP) and the Eco innovation index in EU Member States. The urban population is higher than in rural areas, accounting for around 54% of the total population in 2021, while the rural population accounted for 46%. At the same time, the relative poverty rate in Romania increased by 8% at 2020 level (23,4%) compared to 2010 (21,6%), and for the Eco-innovation index, Romania still performs low at 23 EU level, with a score of 71. Based on these indicators, the proposed financial allocation for Romania for the transition to a green economy for the period 2025-2032 is €6.6 billion.*

Keywords: green economy, Romania, poverty rate, the European green pact, eco-innovation.

JEL Classification: Q20, Q50, R00.

Introduction

The green economy is a branch of the economy that supports the harmonious interaction between people and nature and seeks to meet the needs of both parties at the same time. Green economy economists are mainly studying the impact of alternative energy sources, sustainable agriculture, wildlife protection or environmental policies.

Climate change and environmental degradation are an existential threat to the European Union. The European Green Pact has been drawn up to help solve these challenges. The new growth strategy for the European Union aims to transform the Community area into a fair and prosperous society, with a modern and resource-efficient economy and competitive in terms of results. The main objective of the strategy is closely linked to the need to protect the health and well-being of citizens against environmental risks and impacts.

According to the scientific findings of the Intergovernmental Panel on Climate change (IPCC) Special report, global net CO2 emissions should be zero and neutrality for all other greenhouse gases should be achieved around 2050, at some point during this century.

The need for and value of the European Green Pact has become even more important in the context of the effects of the COVID-19 pandemic on the health, living and working conditions and well-being of the citizens of the European Union. (European Commission)

The European Green Pact actions will be funded with one third of the EUR 1.800 billion of investments coming from the Next Generation EU Recovery Plan, as well as from the seven-year budget of the European Union.

Literature review

The green economy as defined in the United Nations Environment Program report, launched in February 2011, improves social well-being and equity, while significantly reducing environmental and environmental risks. The green economy is defined as an economy which reduces environmental risks and aims at sustainable development without environmental degradation. It is almost related to the green economy, but it has a more applied political focus. (Gheorghe and Sima, 2014)

Karl Burkart defines the concept of "green economy" as being based on six main sectors: Renewable energy, green buildings, sustainable transport, water management, waste management and land management. (Burkart, 2009)

The implementation of the Green economy concept has been achieved in the form of a long-term strategy for national economies to overcome crises with economic recovery objectives, eradicate poverty as well as reduce carbon emissions and halt the degradation of ecosystems. (Lavrinenko et al., 2019)

In the paper entitled "The green economy and sustainable development: An uneasy balance" drafted by Olivia Bina, it is noted that the term "green economy" was chosen as the main theme for the United Nations Conference on sustainable Development (RIO+20). This work develops the relationship between the times of crisis and the growth of the

concept of "greening", with the aim of understanding and defining the proposals for the green economy, as well as the role and involvement of the greening agenda in the process of sustainable development in the world. The study also suggests that the green economy can be a choice of practical value, which aims to build and promote rapid action at certain times of crisis. In times of economic crisis, a concept is needed that seeks socio-economic progress, based on a new relationship of understanding between man and nature. (Bina, 2013)

The concept of the green economy is being discussed more and more recently. In the *Green economy and related concepts: An overview* study, the author presents various definitions of the concept of the green economy. The Article is divided into 3 parts, highlighting the aims of its development. First, the author focuses on identifying and describing approaches to the green economy, theories of the environment and the green economy, as well as approaches to cleaner production, waste hierarchy, bio-economy, etc. the concept of the green economy is present in many political agendas of various international institutions, according to the author. At the end of the study, the author States that decision-makers in the transition to a green economy should focus on a greener economy or a strong position for sustainability if the ideas of the green economy, of human well-being within the limits of the planet become reality. (Loiseau et al., 2016)

The green economy at national level offers opportunities for renewal and development in harmony with the natural and human capital available to Romania, taking into account the possibilities for exploiting natural resources with responsibility for national wealth for the benefit of citizens, but also for improving the competitiveness of the Romanian economy today and in the future. Romania is characterized by a slow and delayed construction of a functioning market economy, with gaps in the fulfillment of post-accession commitments and further complications stemming from the global financial and economic crisis. In this context, it is vital to find viable solutions for designing new paradigms for sustainable development that do not belong to economic return and decline, the poverty of the population and the limitation of natural resources. (Camăşoiu et al., 2013)

Methodology

The work is based on statistical data provided by Eurostat on indicators such as the resident population, the level of monthly average income per household, the share of households by expenditure they can afford, the relative poverty rate in Romania and the gross domestic product at country level.

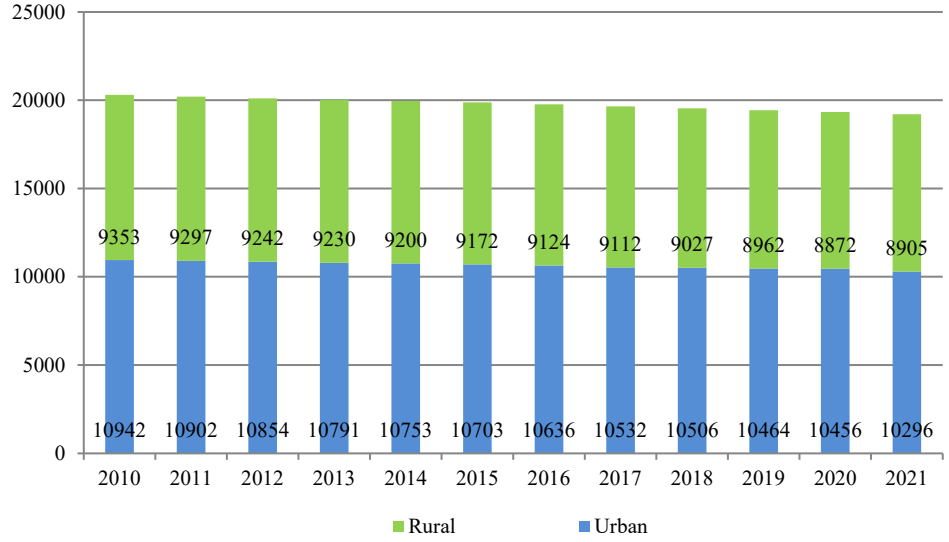
At the end of the work, the maximum financial allocation for each Member State of the European Union for the periods 2025-2032, 2025-2027 and 2028-2032, which has been calculated on the basis of the indicators specified above, is presented. In addition, the indicator on the Eco innovation index in EU Member States in 2021, which shows the eco-innovation performance of one country compared to other EU countries and the EU average, was also analyzed.

The method of quantitative and qualitative data analysis was used to highlight the trend of the indicated indicators.

Results and discussions

The resident population varied between 19.202 2010 thousand people in 2021 and 20.295 thousand in 2010-2021, averaging the period of 19.778 thousand people, thus seeing a 5.39% decline in the population during this period. Among the main causes leading to its reduction are the negative natural increase and international migration, which has led to a steady decline in Romania's population, also family planning, through its various forms, has led to a steady reduction in the annual number of births. (Figure 1)

Figure 1. *Evolution of the resident population on 1 January by Romanian resident averages, at the level of the period 2010-2021 (thousand persons)*



Source: Processing INS data.

Looking at the population according to the place of residence (urban-rural), the population density in urban areas is higher than in rural areas. In 2021, the urban population accounted for 54% of the Romanian population, while the rural population was represented in a 46% share. (Figure 1)

In the period 2010-2020, total monthly income at household level showed an upward trend in both urban and rural areas, with a significant increase of 126% (Table 1).

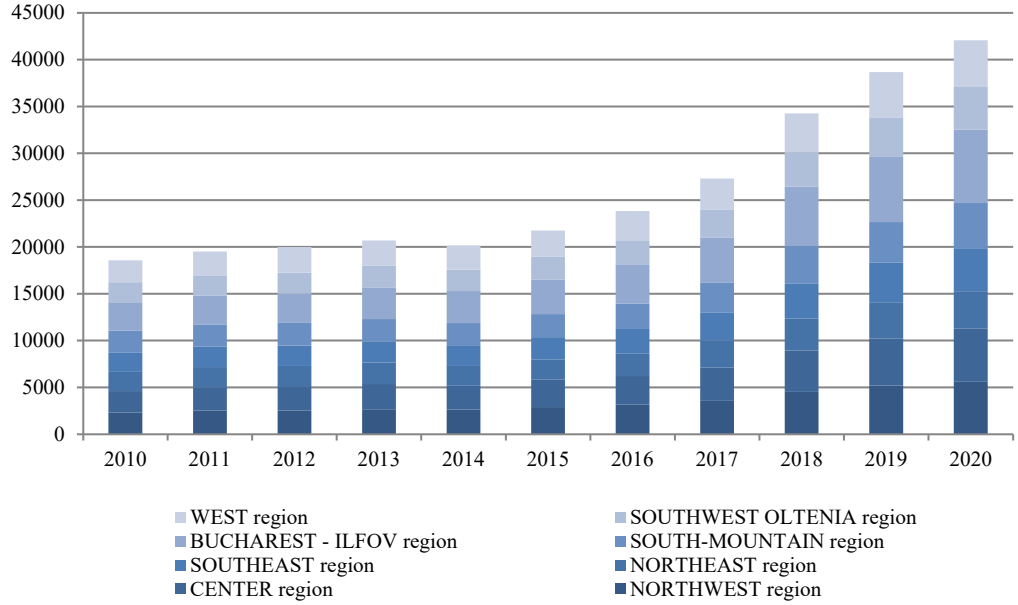
Table 1. *Average monthly total income per household per average of residence (lei)*

Home environment	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2020/2010
Total	2304	2417	2475	2559	2501	2687	2945	3392	4251	4790	5216	126%
Urban	2577	2633	2695	2859	2781	2997	3327	3824	4924	5520	5978	132%
Rural	1940	2134	2182	2165	2140	2279	2447	2825	3386	3835	4240	119%

Source: INS.

In the urban environment, the revenues at the level of 2020 were lei 5.978, by 132% higher than those recorded in 2010 and lei 2.577 respectively. As regards the average total incomes of rural households, an increase of 119% was observed from lei 1.940 in 2010 to lei 4.240 in 2020. It should be noted that there are major discrepancies in urban and rural income, with lower incomes in rural areas. In 2020, the average total monthly income per household in rural areas was 41% lower than in urban areas. These differences can be attributed to the low number of economic activities and the high aging population in rural areas (Table 1).

Figure 2. *Evolution of average monthly total income per household by development region (lei)*



Source: Processing INS data.

The percentage of households after expenditure that they can afford at national level showed increases in the period 2010-2020, the most significant increase was recorded in the category of spending on paying a holiday week, which increased by ca. 89% in 2020 (42.3%) compared to 2010 (22,4%). (Table 2)

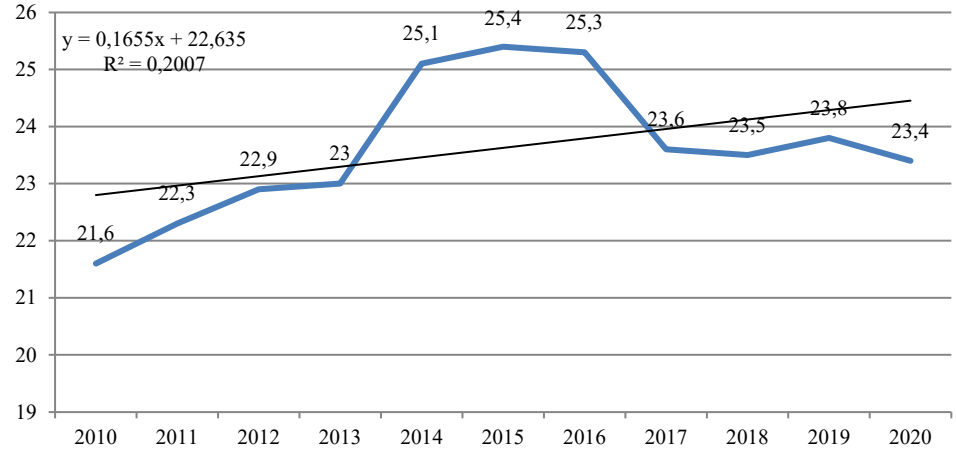
Table 2. *Shares of households by the expenditure they can afford, in total households in each category (%)*

Expenses which the household can afford	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2020/2010
Maintaining an adequate temperature	78,9	84,3	85,9	85,7	87,3	86,9	86,3	88	89,3	89,9	90,3	14%
Payment of a week of holiday	22,4	23,4	24,7	27,7	29,5	30,8	31,6	33,5	39,2	43,9	42,3	89%
Consumption of at least one meat dish or more every two days	77,4	77,1	76,7	77,1	77,2	79	77,6	79,2	82,2	83,4	83,9	8%

Source: INS.

The relative poverty rate in Romania increased by 8% at 2020 level (23.4%) compared to 2010 (21.6%). Trend line y = 0.165x + 22.63, indicates a decrease of approximately 16.5%. It is also noted that there is a very strong link between the two variables; the change in the relative poverty rate is 20% influenced by the time period considered, with the remaining 80% being the influence of other factors not included in the model. (Figure 3)

Figure 3. *Evolution of the relative poverty rate in Romania (%)*

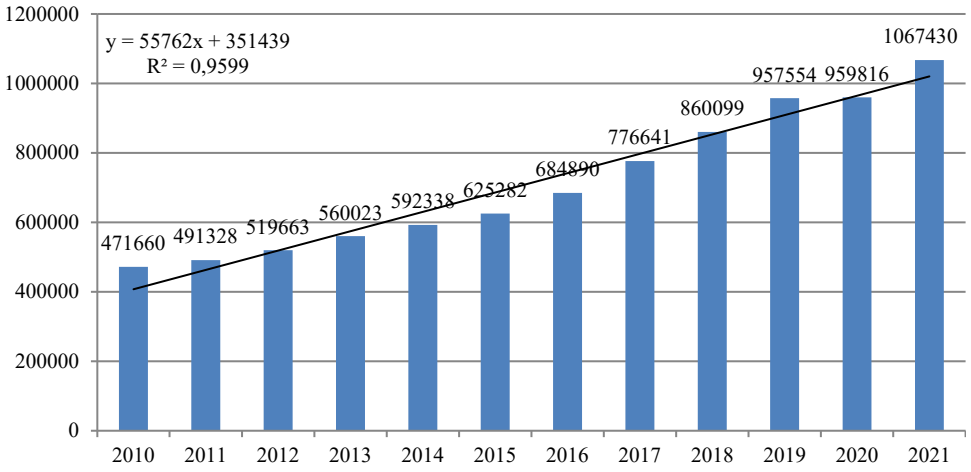


Source: Processing INS data.

Romania's contribution to the EU's total GDP in 2020 was 1.6%. According to Eurostat, Romania's gross domestic product last year was about 218 billion euros at current prices, compared to 223 billion euros in 2019. (Agerpres, 2021)

In 2021, the Romanian economy was lei 1.067.430 million at current prices, having increased by approx. 126% compared to 2010 and lei 471.660 million respectively. (Figure 4)

Figure 4. *Evolution of Gross domestic product (GDP) in Romania in 2010-2021 (lei million)*



Source: Processing INS data.

Table 3 shows the maximum financial allocation for each Member State of the European Union. The following variables were taken into account in the calculation of this in the Fund: The population at risk of poverty living in rural areas (2019); emissions of carbon dioxide from the combustion of fuels by households (average for the period 2016-2018); percentage of households at risk of poverty that have arrears in utility bills (2019); total population (2019); The GNI per capita of the Member State, measured by purchasing power standard (2019) and share of reference emissions pursuant to Article 4(2) of Regulation (EU) 2018/842 for the sectors covered by Chapter Al-IV-a of Directive 2003/87/EC (average 2016-2018).

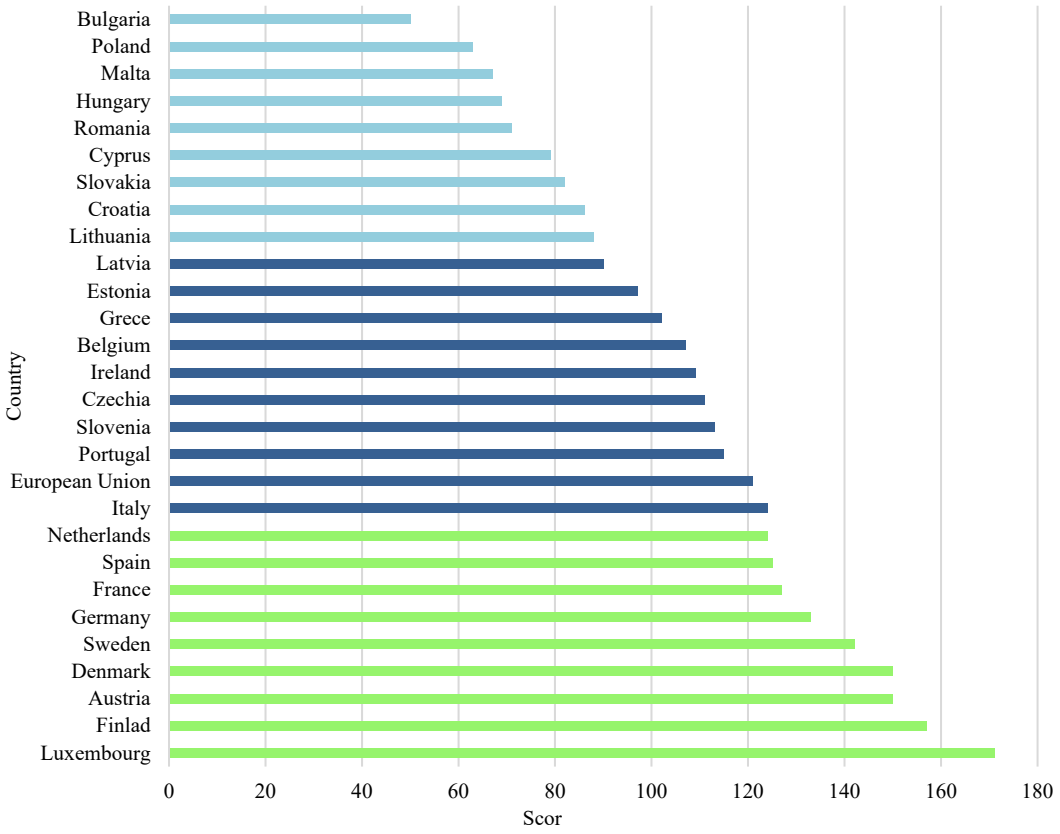
Table 3. *Maximum financial allocation per Member State of the European Union*

Member State	Share in % of total	TOTAL 2025-2032 (EUR, current prices)	Amount for 2025-2027 (in EUR, in current prices)	Amount for 2028-2032 (in EUR, in current prices)
Belgium	2.56	1 844 737 639	605 544 073	1 239 193 566
Bulgaria	3.85	2 778 104 958	911 926 420	1 866 178 538
Czech R.	2.4	1 735 707 679	569 754 460	1 165 953 219
Denmark	0.5	361 244 536	118 580 270	242 664 266
Germany	8.19	5 910 983 488	1 940 308 984	3 970 674 504
Estonia	0.29	207 004 992	67 950 392	139 054 600
Ireland	1.02	737 392 966	242 052 816	495 340 150
Greece	5.52	3 986 664 037	1 308 641 796	2 678 022 241
Spain	10.53	7 599 982 898	2 494 731 228	5 105 251 670
France	11.2	8 087 962 701	2 654 912 964	5 433 049 737
Croatia	1.94	1 403 864 753	460 825 411	943 039 343
Italia	10.81	7 806 923 117	2 562 660 358	5 244 262 759
Cyprus	0.2	145 738 994	47 839 531	97 899 463
Latvia	0.71	515 361 901	169 170 042	346 191 859
Lithuania	1.02	738 205 618	242 319 573	495 886 046
Luxemburg	0.1	73 476 421	24 118 991	49 357 430
Hungary	4.33	3 129 860 199	1 027 391 783	2 102 468 416
Malta	0.01	5 112 942	1 678 348	3 434 594
Netherlands	1.11	800 832 270	262 877 075	537 955 195
Austria	0.89	643 517 259	211 237 660	432 279 599
Poland	17.61	12 714 118 688	4 173 471 093	8 540 647 595
Portugal	1.88	1 359 497 281	446 261 573	913 235 708
Romania	9.26	6 682 901 998	2 193 694 977	4 489 207 021
Slovenia	0.55	397 623 987	130 522 001	267 101 985
Slovakia	2.36	1 701 161 680	558 414 568	1 142 747 112
Finland	0.54	386 966 933	127 023 772	259 943 161
Sweden	0.62	445 050 067	146 089 842	298 960 225
EU27	**100%**	**72 200 000 000**	**23 700 000 000**	**48 500 000 000**

Source: European Commission's strategy.

Eco-innovation and research, promote innovative solutions and are essential for the transition to a green economy. Innovation is not limited to production processes only, but can encourage and support new business models. There are currently many examples of innovative solutions that focus on providing services instead of marketing products such collaborative business models, focusing on service provision, could benefit from new financing mechanisms, as investments and profits follow different patterns of evolution on time. (European Environment Agency, 2016)

Figure 5. *Eco innovation index in EU Member States in 2021*



Source: ec.europa.EU

The Eco-innovation index shows how one country's eco-innovation performance is compared to other EU countries and the EU average. The ECO index is based on a series of 16 indicators aggregated into 5 key components: Eco-innovation inputs, eco-innovation activities and results, as well as environmental and socio-economic results.

Eco-innovation innovations refer to investments targeting specific activities. Such investments may be made through financial or human resources. Eco-innovation activities comprise certain indicators that help to monitor the activities of companies. This strand focuses mainly on the level of effort and the activities carried out, and less on the real results of innovation activities. The results of eco-innovation describe the immediate results achieved and the indicators under this strand are used to track and monitor how the results generated by businesses and researchers are linked to the concept of eco-innovation or not.

Romania still has a low performance in the Eco-innovation index, ranking 23 with a score of 71, which is a slightly improved performance compared to 2020 (score 70) (Figure 5).

Romania faces a number of factors that hamper the transition to a green economy. These factors relate to low demand and low awareness of the business environment and the general population. In addition, the bureaucratic nature of the implementation of the short-

and medium-term plans and the extremely slow and untimely pace of the measures taken in this area are added.

From a political point of view, Romania has a progressive vision of improving environmental performance through support measures that focus on improving waste management. There is now a need to adopt measures to implement financial incentives and effective sanctions to achieve a real reduction in the amount of waste generated by all activities, as well as to reduce disposal through landfilling.

The key to the development of the green economy sector in Romania is based on the factors of a linear paradigm shift toward circular, which are also seen in the new tendency of citizens toward a moral attitude, emphasizing action on the needs of life as well as raising living standards. (European Commission, 2019)

Conclusions

Previous national results in terms of achieving planned indicators with an impact on the green economy show a worrying potential for resource loss due to low separate collection of municipal waste, through soil pollution from landfilling, with synergistic effects with other sectors (agriculture, health, biodiversity, and climate change) as well as declining competitiveness and continuing job losses.

Romania needs to proceed at a fast pace with the effective implementation of the necessary legislation in order to meet the new waste recycling targets. This measure will contribute to increasing resource efficiency, requiring industrial synergy with eco-technologies and the development and financing of new "circular" business models through research and development projects dedicated to this European strategic plan.

The risks arising from delays in implementing measures and tools for strategic planning and implementation of solutions to achieve them also derive from the low or non-interoperable databases at the level of public institutions, with direct consequences in identifying bottlenecks and removing them early.

The opportunities generated by the Green economy Strategy, through concern for the well-being of the human population, the resilience of ecosystems, resource efficiency and waste management, are directly associated with both environmental protection and increased competitiveness, innovation and technological research, building on these opportunities also requires active involvement at public policy and implementation level at local administrative level, but also through a consultation process with all stakeholders in the coordination of the central public environmental authority.

References

Agerpres, 2021. Romania's GDP was higher than Portugal's or Greece's last year (Eurostat), <https://www.agerpres.ro/economic-extern/2021/12/20/pib-ul-romaniei-a-fost-mai-mare-decat-cel-al-portugaliei-sau-greciei-anul-trecut-eurostat--834849>

Bina, O., 2013. The green economy and sustainable development: an uneasy balance?. *Environment and Planning C: Government and Policy, 31*(6), pp. 1023-1047.

Burkart, K., 2009. How do you define the 'green' economy? <http://www.mnn.com/green-tech/research-innovations/blogs/how-do-you-define-the-green-economy>

Cămășoiu, C., Caragea, N. and Cristea, A., 2013. A Green economy and new challenges in Romania, <https://ueb.ro/RePEc/eub/wpaper/eub-2013/2013-07.pdf>

European Commission, Eco-innovation in Romania, EIO Country Profile 2018-2019, <https://ec.europa.eu/environment/ecoap/sites/default/files/field/field-country-files/eio_country_profile_2018-2019_romania.pdf>

European Commission, European Green Pact, <https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en>

European Commission, Green Transition, <https://ec.europa.eu/reform-support/what-we-do/green-transition_en>

European Environment Agency, moving to a green economy that is not limited to waste management, Editorial published in edition No. 2016/1 of the EEA newsletter, March 2016, <https://www.eea.europa.eu/ro/articles/trecerea-la-o-economie-verde>

Gheorghe, I.G. and Sima, V., 2014. Transition to Green economy in Romania, Annals of the "Constantin Brancusi" University of Târgu Jiu, Economy Series, 3, pp. 32-39. <https://www.utgjiu.ro/revista/ec/pdf/2014-03/06_Gheorghe.pdf>

Lavrinenko, O., Ignatjeva, S., Ohotina, A., Rybalkin, O. and Lazdans, D., 2019. The role of Green economy in sustainable Development (case study: The EU States), *Entrepreneurship and sustainability issues,* <http://jssidoi.org/jesi/,> Vol. 6, No. 3 (March) <http://doi.org/10.9770/jesi.2019.6.3(4)>

Loiseau, E., Saikku, L., Antikainen, R., Droste, N., Hansjürgens, B., Pitkänen, K., ..., and Thomsen, M., 2016. Green economy and related concepts: An overview. *Journal of cleaner production, 139*, 361-371.

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 177-184

The sustainability of rail transportation in EU member states

Edi-Cristian DUMITRA
Bucharest University of Economic Studies, Romania
edidumitra@gmail.com
Radu Alexandru BUDU
Bucharest University of Economic Studies, Romania
buduradu17@stud.ase.ro
Cristina BOLCAS
Bucharest University, Romania
cristibolcas@gmail.com

Abstract. *Since 2021 was the European Year of Rail and a small number of solutions and a set of proposals for the improvement of the railway infrastructure for the member states of the European Union were included in the agenda, the paper aims to prove that there has been taken measures to provide a more sustainable infrastructure for railway transportation. The goal of the European Year of Rail has been to create "One European Railway Network" and to promote rail as a sustainable, safe, and modern mode of transportation, regarding to the concepts of green economy.*

Keywords: 2021 – European Year of Rail, railway network, sustainability, green economy, European Union.

JEL Classification: L920, R420.

1. Introduction

2021 – European Year of Rail. By the decision of the European Commission, 2021 was declared the European Year of Rail, to demonstrate that the railway transportation system is one of the main keys for offering sustainable logistics around the member states of the European Union. In this situation, the railway transportation has been once more included in the strategies of development and investment of the EU members for achieving a higher green economy.

The Scientific Literature considers green economy as a list of keywords belonging to the semantic fields of economic and environmental dimensions, each of them covering different issues in the current operations and activities. The economic dimension covers several aspects such as level of development, economic growth, cost, or competitiveness; while the environmental dimension is referring to climate change, renewable resources, energy, and natural capital. Therefore, the "green economy" can be defined as the strong connection between economy and sustainability for prospering and developing (Loiseau et al., 2016).

Thereafter, the European Commission considered 2021 to be the year in which the attention will be given especially to the railway systems of the member states, as long as rail is an important transportation alternative for both passengers and freight. In this order, after 2021 had been declared the European Year of rail, the main goal over the year was to boost and to promote rail as "a sustainable, innovative, interconnected and intermodal, safe and affordable mode of transport", aligning it with the European Green Deal and the Sustainable and Smart Mobility Strategy (ERA, 2021).

2. European Year of Rail and the Green Economy

The most important question of the European Year of Rail was "Why Rail?" and the European Commission worked alongside the European Union Agency for Railways (ERA) to offer an answer to that question, from both economic and environmental perspectives.

The main goal was to improve rail connectivity between the member states, increasing the accessibility of rail alongside the EU as well. Those plans started in the late 1990s when even if the EU possess one of the densest railway networks in the world, the national railway systems vary across the member states. The variation increases even more in the beginning of the 21st century when more countries have joined the Union, countries as Bulgaria, Czech Republic, Greece, Poland, Romania and the latest, Croatia in 2013. The first step in the process of implementing one single European railway area started with four railway packages adopted by the EU in order to open the railway market competition and to increase the interoperability of national railway systems (European Council, 2021a).

The importance of a sustainable railway transport system across the European Union was highlighted once more in the EU's Common Rail Transport Policy, when increasing the share of rail transport in the EU became an essential objective for decarbonizing the economy and achieving the EU's climate goals, taking into account the fact that rail transport has been declared the most sustainable means of transport across the member

states when the statistics proved that it represents only around 0.5% of the total gas emissions around the Union based on 2017. Furthermore, the EU's transport policy got a new key element which was to establish nine core network corridors across the EU, as the TEN-T (Trans-European Transport Network) based on a network of rail lines, roads, inland waterways, maritime routes, ports and airports for connecting the member states and for facilitating cross-border transport for people and supplies by 2030 and 2050 (European Council, 2021b).

For achieving its goal of establishing a single European railway area, a system of railway networks capable to allow the expansion of the rail sector based on competition, technical sustainable improvement, and a joint development of cross-border connections for both passengers and freight transportation, the European Union aimed by its Sustainable and Smart Mobility Strategy to (European Council, 2021a):

- restructure the rail market to open it for competition from the private sector;
- develop the infrastructure to ensure interoperability;
- improve efficiency in infrastructure use and safety;
- ensure fair prices for consumers.

Moreover, the economic and environmental aspects of the green economy are well presented in the figures about the rail transport in the European Union (EYR, 2021a):

- more than 916,000 people work in the EU railway sector;
- the train is the safest mode of land transport;
- 21% of the workforce in the EU rail sector are women;
- over 9,100 kilometers of high-speed rail network in Europe (the main goal is to double the number by 2030 based on the TEN-T and the Sustainable and Smart Mobility Strategy);
- the average distance between railway stations is 6.9 kilometers;
- around 75% of total train-kilometers are traveled by electricity-powered trains.

All those statistics are highlighting once more that the railway system is one of the most sustainable means of land transport across the European Union, especially taking into consideration the percentage of train-kilometers traveled by electricity-powered trains, which proves once more the preference for technological improvement and green alternatives. Moreover, the 9,100 kilometers of high-speed railway networks is a strong argument for the citizens' preference for rail as transport mode between big cities in a short time, competing as well to planes.

Meanwhile, there are also a few social and environment aspects that have been considered when declaring 2021 the European Year of Rail, besides the need to promote a sustainable mean of transportation and to improve the national railway systems from the member states to European Union's standards level. Firstly, the railway network is diverse and can be used not only for commuting, but also for long-distance travels and goods transportation all over Europe while reducing the carbon emissions and using the 200,000 kilometers of rail infrastructure that are available across the member states. Secondly, the railway transportation is sustainable and green because it is largely electrified and the rolling stock emits far less CO_2 than a road means of transport or an airplane, used for the same travel. Thirdly and the most important, rail is affordable, comfortable and safe. Being the safest

mean of transport on land, the passengers can always rely on the safety of their travel due to the lowest incidence of fatal accidents recorded by the railway system, so while traveling with the train, all they must do is to select a window seat, relax and enjoy the view (EYR, 2021b).

3. Promoting Rail on a European Level

To promote rail to a European level, the flagship project was #ConnectingEurope Express. The following was a special train that departed from Lisbon (Portugal) on September 2nd and ended its journey in Paris (France) on October 7th, after 36 days of `railing` and passing by 26 countries around the European continent. Moreover, the train traveled around 20,000 kilometers, crossing 33 borders to connect countries, businesses and people. Even if #ConnectingEurope Express aimed to prove the connection offered by the railway system, contouring the "One European Railway Network" and the interoperability of the network, there have been provided 3 trainsets to fit the different gauges used by the member states of the European Union. In this aspect, the train represented a reminder and a metaphor for the lack of interoperability between some parts of the EU's rail network, while also reinforcing the cooperation between rail stakeholder due to its composition of rolling stocks offered by multiple national companies from the member states (European Commission, 2021).

But #ConnectingEurope Express played as a sign that there is more than just a network cooperation between the railway system of the EU's member states. Once more, for promoting rail as a sustainable and affordable mean of transport to the European citizens and the high mobility between countries, #ConnectingEurope Express represented an image for the Interrail passes (introduced in 1972) that can be used for exploring 33 countries by train (all the EU states with the addition of Bosnia and Herzegovina, Great Britain, Montenegro, North Macedonia, Norway, Serbia, Switzerland and Turkey). The Interrail passes represents one of the most flexible and the simplest way of exploring the European continent by train, hopping on and off as many trains as the holder of the pass desires while showing the pass on a mobile device, aspect that makes it integrated in the digitalisation progress and the new technologies implemented also in the railway systems of the European network. Also, to make it as affordable as possible, the Interrail pass can be either "One Country Pass" (available in only one country) with prices starting from €51 or "Global Pass" (available in all 33 countries) starting from €185 (as March 2022), with an increase in price based on the number of days for which the pass is purchased and the travel conditions (1st or 2nd class). Meantime, taking into account the social and economic aspect of the Interrail passes, there are discounts in price for youths (age 12 to 27), seniors (age 60+) and free passes for children (age 4 to 11); fact that proves once more the interest that the European Commission has in creating a sustainable railway transport infrastructure, accessible and affordable for the citizens of the European Union and non-Europeans who are officially legal residents of the European countries, encouraging passengers to consider rail as a safe and comfortable mean of transport (Interrail, 2022).

4. New action plan and effects of 2021 – The European Year of Rail

As 2021-European Year of Rail came to an end and the direct impacts cannot be yet measured in numbers, The European Commission has created a strategic action plan for boosting long-distance and cross-border passenger rail services. The measures are combined with the changes to the Trans-European Transport Network to double the high-speed rail traffic by 2030 based on the package of measures for efficient and green mobility adopted by the European Commission (EYR, 2021c).

Meanwhile, Adina Vălean (2021), the Commissioner for Transport affirmed that even that rail is one of the most sustainable modes of transport available in the European Union, just 7% of the kilometres travelled by train represent the cross-border trips, and that the action plan is constructed in order to eliminate the main barriers identified for cross-border journeys, such as: redundant national rules, complicate ticketing system and the slow uptake of digital technologies (EYR, 2021c).

At the same time, to overcome the obstacles that are reducing the long-distance and cross-border passenger rail services, the Action Plan implemented by the European Commission aims (EYR, 2021c):

- to accelerate digitalisation while removing redundant national technical and operational impediments;
- to ensure a better availability of trains by monitoring the rolling stock (coaches and locomotives);
- to modernise passenger rail infrastructure for a more efficient use of the rail network;
- to open the rail market more so that the infrastructure can be easier accessed by the rail operators through appropriate pricing;
- to implement a more user-friendly ticketing system;
- to make rail a sustainable transport mode, attractive for young people by increasing its accessibility and affordability.

All those measures included in the Action Plan are also implemented in order to provide a more reliable mode of transport through the rail infrastructure available on the territory of the European Union, due to its facilities and its environmental-friendly characteristic as a green and more sustainable alternative for transport, even if it comes to long-distant journeys or daily commuting, even if it is about the normal passenger trains, freight trains or touristic trains across Europe.

5. Romanian rails after 2021 – The European Year of Rail (short study case)

After becoming a member state in 2007, Romania had to work on its services to achieve the European Union's standards in many fields, such as: economic, logistic, and social welfare. In order to do this, the rail infrastructure and market has been open for encouraging competition and increasing its operations.

By 2022, the Romanian railway infrastructure is composed by 10,628 km, from which 4,030 (37.9%) is electrified, having 904 stations (CNCF CFR SA., 2022a) and 17 cross-border points with all of Romania's five neighbouring countries: Bulgaria (3);

Hungary (5 – one being electrified); Republic of Moldova (3), Serbia (2) and Ukraine (4) (CNCF CFR SA, 2022b). By the data, the Romanian railway infrastructure is not the most environment-friendly, but small steps have been taken to make the Romanian railway system more sustainable and lead more by the measures for opening the railway transportation market, encouraging the competition in the sector for private operators, increasing the interoperability and creating a sustainable performance index to establish a national railway system that is sustainable from both environmental and economic perspectives. Concepts of green economy and the standards that the European Union is implementing for creating the "One European Railway Network".

Therefore, as the main objectives of the European Union's Sustainable and Smart Mobility Strategy, CNCF CFR SA (Romanian Railways National State Company) prioritised its objectives as following (CNCF CFR SA, 2022c):

- increasing interoperability in all of its 8 operational regions;
- promoting industrial innovation;
- building a durable economic model for rail transportation;
- integrating the railway network in the everyday life environment of Romanian citizens.

Since 2021 has been the European Year of Rail and the measures for increasing accessibility and opening the market, while offering a fair price for the consumers had to be applied on the Romanian national rail system as well, some changes took part in the first stage of the process. Unfortunately, even if the data based on the statistics is yet to be revealed, some of the implemented actions can already be seen in the market. Some of the most remarkable ones consist of: supplementing trainset on peak hours between Bucharest and the most frequent used cities for commuting passengers (such as: Buftea, Pitești, Ploiești and Târgoviște) and introducing Regio-Express (R-E) trains between Bucharest and major cities located in an area of 300 km from Bucharest, trains that keeps the travelling time of the upper rank (IR – Inter Regio), with a maximum speed of 120 km/h but are charged as a local regional train. For example, since 12.12.2021 (CNCF CFR SA, 2021) the introduction of R-E trains between Bucharest and Constanța increased the accessibility by supplementing the number of train connections between the two cities, also giving the opportunity to travel for a cheaper price, since one train ticket from Bucharest to Constanța is charged 59.6 RON for an Inter Regio train and 33.2 RON for a Regio-Express train, as April 2022.

Table 1. *Train Schedule from Bucharest to Constanța in 2021 (off-season)*

Train	R8001	IR1581	IR1688	IR1583	IR1683	IR1585	IR1587
Bucharest	06:10	07:10	09:25	14:00	16:00	17:10	20:05
Constanța	10:16	09:31	11:25	16:17	18:00	19:30	22:28

Source: CNCF CFR SA, 2020, pp. 236-240.

Table 2. *Train Schedule from Bucharest to Constanța in 2022 (off-season)*

Train	R8001	IR1581	IR1583	IR1884	IR1585	R-E8081	R-E8083	IR1587
Bucharest	06:15	07:20	08:30	09:30	10:30	11:30	12:30	14:30
Constanța	10:05	09:31	10:40	11:26	12:39	13:51	14:51	16:42
Train	R-E8085	IR1589	IR1681	R-E8087	IR1683			
Bucharest	15:30	16:30	17:30	18:30	20:05			
Constanța	17:51	18:26	19:42	20:51	22:20			

Source: CNCF CFR SA, 2021, pp. 284-288.

The introduction of R-E trains is one step further for establishing a more sustainable rail system by increasing the accessibility in both price and connectivity, introducing a new alternative that is as faster as the already existing one, but 44.29% cheaper, promoting in this way the train as a mean of transport that is sustainable and environmental-friendly. At the same time, by this approach, the number of daily connections between Bucharest and Constanța, during off-season (December – June and September – December) has been increased from 7 (2021) to 13 (2022), establishing one more attribute about using rail: convenience.

6. Conclusions and further discussions

Since 2021 – European Year of Rail came to an end and the statistics are yet to be revealed, the importance of a sustainable rail network has been once more highlighted by the measures that have been established to improve the railway connection between the member states of the European Union or to develop the infrastructure and the processes on national level for the member states. Therefore, as shown in the study case about the Romanian National Railways (CNCF CFR SA), several actions have been already implemented for increasing the accessibility of the rail transportation inside Romania, while the European Commission developed a New Action Plan for creating the "One European Railway Network" and the Trans-European Transport Network on continental level.

Considering those new steps for developing the rail transportation industry and the desire for opening the market to increase competition and to provide more accessibility for both passengers and supplies, the sustainability of railway networks has not reached its full growth and it is still in development for achieving the most sustainable mode of transportation around the European continent, connecting its aspects with the criteria of green economy.

Thereafter, based on the Action Plan's goal to double and triple the high-speed train infrastructure by 2030 and 2050, the shift from the air transportation to the rail transportation is likely possible, considering the fact that today the environment is moving in a fast-paced rate and that the convenience of the railway stations situated mostly in the heart of the big cities will determine citizens to use rail transport more frequently as an alternative not only for commuting, but also for long-distance travels or cross-border journeys.

But this is still yet to be determined by time.

References

CNCF CFR SA, 2020. *Mersul trenurilor de călători 13 decembrie 2020-11 decembrie 2021.* Bucharest: CNCF CFR SA.

CNCF CFR SA, 2021. *Mersul trenurilor de călători 12 decembrie 2021-10 decembrie 2022.* Bucharest: CNCF CFR SA.

CNCF CFR SA, 2022a. ANNEX 12 Main characteristics of the CFR Network (Concentrator table). [pdf] CNCF CFR SA, Available at: <http://www.cfr.ro/files/ddr/EN%202022/Annex% 2012.pdf> [Accessed 7 April 2022].

CNCF CFR SA, 2022b. ANNEX 11 Table of the CFR Border Stations and their main characteristics. [pdf] CNCF CFR SA, Available at: <http://www.cfr.ro/files/ddr/EN%202022/Annex% 2011.pdf> [Accessed 7 April 2022].

CNCF CFR SA, 2022c. 'Prioritati'. [online] Available at: <http://www.cfr.ro/index.php/ct-menu-item-117/ct-menu-item-121> [Accessed 7 April 2022].

European Commission, 2021. Connecting Europe Express. [online] Available at: <https://www.connectingeuropeexpress.eu/> [Accessed 30 March 2022].

European Council, 2021a. Rail at the forefront of smart and sustainable mobility – Council adopts conclusions. 3 June 2021. Available at: <https://www.consilium.europa.eu/en/press/press-releases/2021/06/03/rail-at-the-forefront-of-smart-and-sustainable-mobility-council-adopts-conclusions/> [Accessed 30 March 2021].

European Council, 2021b. Trans-European transport network: Council gives the greenlight for quicker permit-granting procedures. 14 June 2021. Available at: <https://www.consilium.europa.eu/en/press/press-releases/2021/06/14/trans-european-transport-network-council-gives-the-greenlight-for-quicker-permit-granting-procedures/> [Accessed 30 March 2022].

ERA, 2021. European Year of Rail 2021. 10 February 2021. Available at: <https://www.era.europa.eu/content/european-year-rail-2021_en#:~:text=The%20year%202021%20has%20been%20declared%20the%20European,Deal%20and%20the%20Sustainable%20and%20Smart%20Mobility%20Strategy> [Accessed 30 March 2022].

EYR, 2021a. Facts & Figures. [online] Available at: <https://europa.eu/year-of-rail/why-rail/factsfigures_en> [Accessed 30 March 2022].

EYR, 2021b. Why Rail? [online] Available at: <https://europa.eu/year-of-rail/why-rail_en> [Accessed 30 March 2022].

EYR, 2021c. New Action Plan: boosting long-distance and cross-border passenger rail. [online] Available at: <https://europa.eu/year-of-rail/news/new-action-plan-boosting-long-distance-and-cross-border-passenger-rail-2021-12-14_en> [Accessed 30 March 2022].

Interrail, 2021. Interrail Passes. [online] Available at: <https://www.interrail.eu/en/interrail-passes> [Accessed 30 March 2022].

Loiseau, E., Saikku, L., Antikainen, R., Droste, N., Hansjürgens, B., Pitkänen, K., Leskinen, P., Kuikman, P. and Thomsen, M., 2016. Green economy and related concepts: An overview. *Journal of cleaner production*, 139, pp. 361-371.

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 185-193

The European Union's approach on sustainable development: aspects regarding green economy

Rareș Mihai NIȚU
Bucharest University of Economic Studies, Romania
niturares18@stud.ase.ro
Nicolae DIȚĂ
School Inspectorate of Bucharest Municipality, Romania
nicolae.dita@ismb.ro

Abstract. *The present paper aims to analyze the European situation with regard to the green economy. This mainstream concept with a multidisciplinary applicability and able to satisfy many of the needs of modern economies has become a main point of discussion of the official representatives at the European level. The paper explores a series of policies adopted by the European authorities, as well as their need for implementation and the expected consequences. Looking at the green economy from a theoretical point of view, it is noted the need to implement the predominant characteristics of this concept to the extent that material and human resources allow it. For this reason, the work also contains observations of the practical phenomena that have been implemented and that have ended up leading added value to the productive level. Moreover, in order to observe the applicability of these measures, the work also includes a series of indicators that empirically restore the capacity of the green economy to alleviate current problems at the macro-economic level and to increase productivity and the added value of production. Taking into account the current concerns regarding the protection of the environment, the increase in the efficiency of the use of limited resources as well as the imbalances that appear on the labor market, the observation of the principles of the green economy and the implementation of its principles are necessary in order to provide an overview of the effects propagated, but also of the ability to absorb the discrepancies between the standards imposed by the European Union and those actually achieved by the economy. At the European level, the directions drawn by the authorities, as well as the polycystic imposed are expected to ensure this process of reorganization.*

Keywords: United Europe, development, sustainability, policies, productivity.

JEL Classification: J08, J21, J24, J49, O10, Q01.

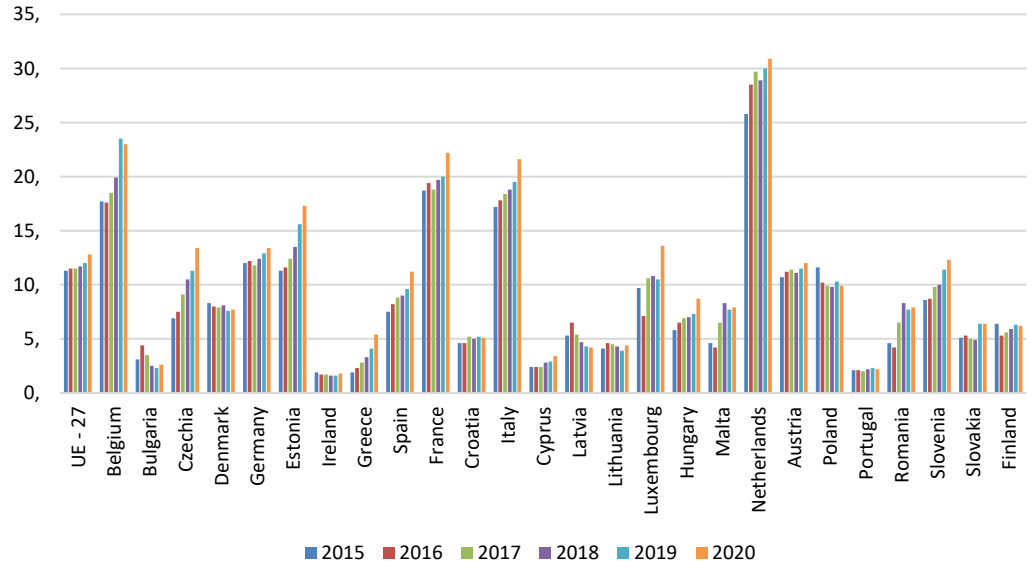
Introduction

Sustainable development is the main aspect that generates the main points, the main directions of all the objectives of the European Union. Under different forms, different aspects and different directions drawn at European and national level by each country, sustainable development represents the trend towards which economies, both developed and emerging, tend to develop. This concept comprises a series of terms that refer to protecting the environment, making more efficient use of resources, increasing the quality of life of individuals and reducing tensions between needs and resources. Even if it takes a long period of time to achieve the objectives of the European Union, the directions are outlined, clearly outlined and established by the most important document containing concrete indications related to sustainable development.

This document is called the Green Deal and has among its objectives the reduction of the rate of poverty and social exclusion, as well as the disappearance of the dependency relationship between sustainable development and the resources used. All these concepts and approaches are part of a branch of independent study of economics, namely the Green Economy. This new science is a subdivision of the economy that has been combined with sectors of ecology and other scientific divisions aimed at protecting biomass. This paper aims to capture the different aspects that underlie the green economy, as well as the way in which they are implemented and the results that are intended to result from the implementation of scientific concepts.

1. Circular materials and their importance in the area of the green economy

Figure 1. *Circular material use rate (% – annual)*



Source: Eurostat Database.

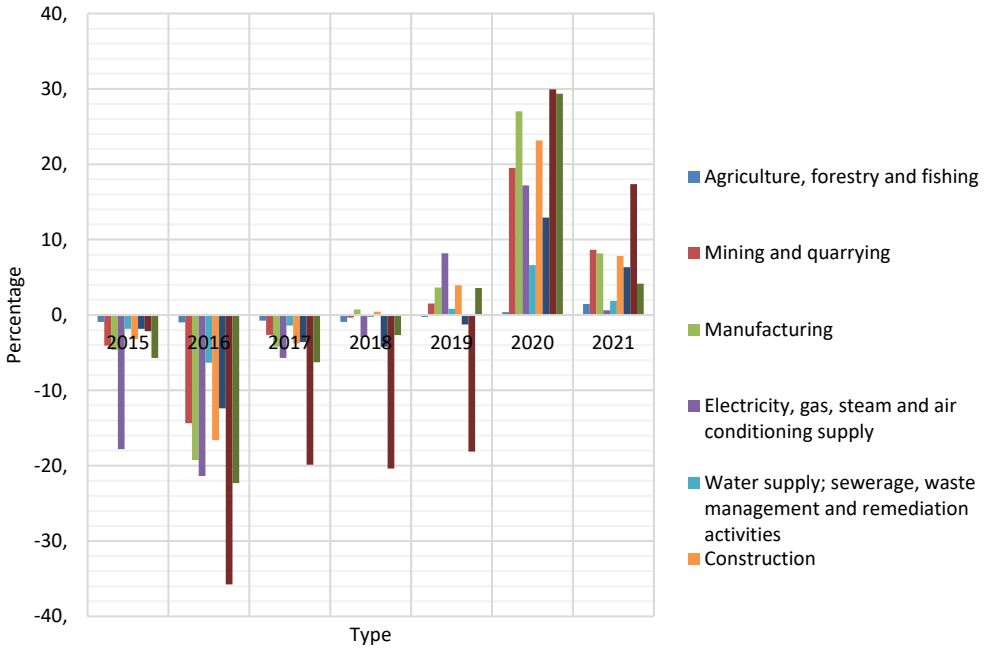
One of the most important aspects in terms of sustainable development is the use of circular materials (i.e. those already existing goods that are reintroduced into the production process in the form of a raw material). The European Union grants significant sums of money that have been and continue to be accessed on the basis of European funds. Two vital aspects that have been noted at European level and represent a structural problem in terms of sustainability are the collection and selection points, but also the nature of the products. In emerging economies, most of which are below the level of the European environment in this respect, there is a lack of environmental education that translates into the lack of adequate collection points for recycling as well as of modern systems of sanitation companies that allow the sorting of this waste (which can be food, chemical, material and other) depending on the potential they have to be reintroduced into production activities (Girogi et al., 2022).

Secondly, it is about the products themselves. It has been found that at European level the share of products that can no longer be reused reaches about 68% of the total existing goods. This does not guarantee that the remaining 32% of products are reused, but only that they have the potential to be reused if the necessary technology and the appropriate resources are in place. From this point of view, clear directives have been drawn up on the raw materials that can be used in certain products, as well as the percentage in which they are used. It has been found at European level that the biggest shortcomings with regard to the reuse of certain goods are their very nature. The current products are mainly created from materials and through processes in such a way that there is no technical possibility to be reintroduced into the manufacturing activity in another aspect. In this way, certain finished goods that have reached the end of the period of use, be they long-term goods or those that are consumed almost instantly, cannot be used as raw material for a new set of goods and services. The solution to this deficiency lies in designing these products from the very early stage in such a way that they are reused (D'Amato et al., 2017). Goods must be designed from the outset so that they can be reused after actual consumption. Thus, the rate of use of circular products increases. On the other hand, it is also about production capacity. Manufacturing, especially at industrial level, is investing large sums of money at European level to modernize production lines with newer, more cost-effective, more sophisticated equipment that generates lower costs. The problem still lies in the long depreciation period of this equipment. Late profit generation slows down the mechanism for implementing concepts specific to the green economy in the industry sector.

The intervention of the authorities at European and automatic national level is necessary in order to encourage the transition to the development of sustainable production models, the mechanisms by which this can be achieved being made up of financial impulses, whether it is the granting of bonuses or subsidies, whether it is the elimination or postponement of costs such as taxes to the state (Dennis and Bernauer, 2021). In this chapter on the formation of sustainable production processes, on the first place in the European ranking are the Nordic countries, namely Norway. This country has been using for a long time the energy taken from the earth's resources, namely geothermal energy. The country's ability to move in a short period of time to a specific green economy development model consisted of low costs in terms of the energy needed to carry out the business. Regardless of the field of activity, the energy used to carry out any economic activity is one of the main expenditures significantly affecting the budget of economic entities (Kaur et al., 2017).

2. The importance of the green economy on the health of individuals in society

Figure 2. *Air emissions accounts for greenhouse gases – EU 27 (% change compared to same period in previous year)*



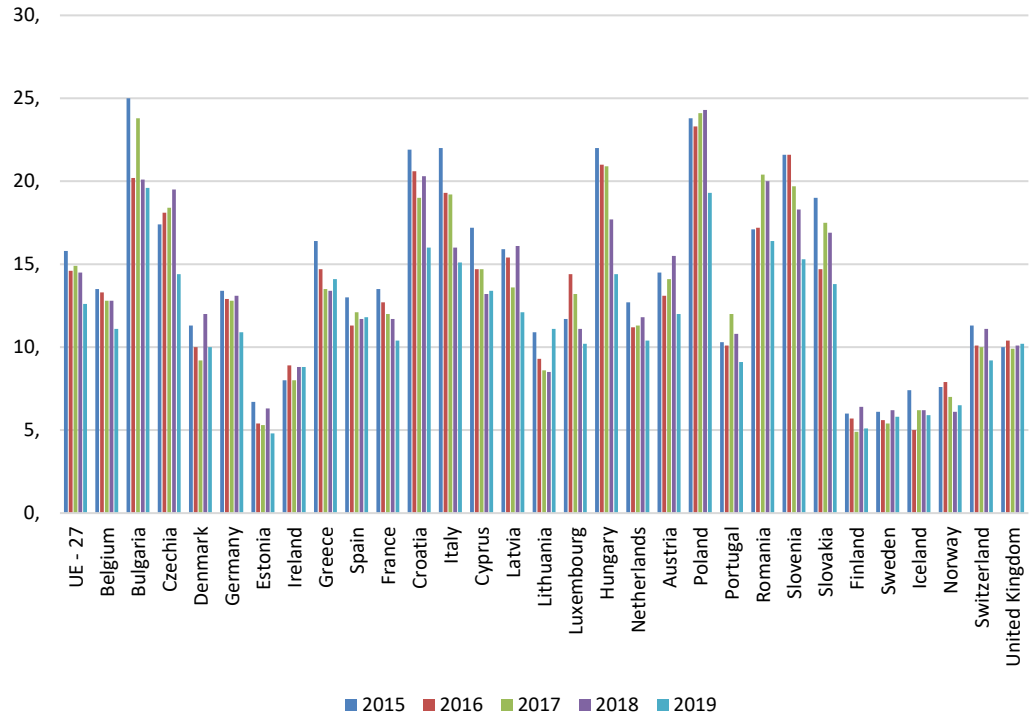
Source: Eurostat Database.

Air emission accounts record the gas and residual emission flows emitted by productive units flowing into the atmosphere. The most important factor that puts the greatest pressure on the environment is that of transport, be it common or private. Greenhouse pollutants are the main factor affecting biodiversity. From this point of view, the European community has already begun to make changes to improve the resources used. Buses are mostly electric in Europe or in Hybrid mode, and trams operate on new transport lines that offer a much higher efficiency in terms of consumption. As for the private car, each country of the European Union allocates funds to encourage the purchase of electric cars. These financial items include tax cuts and the provision of subsidies or vouchers. Electric cars are an important element for the development of a competitive and environmentally friendly economy (Nandy et al., 2022).

Although there are studies on the costs of pollution that emerge after the consumption of electric machines, in some cases even within the production processes, at present, this alternative offers a more beneficial perspective than traditional methods of transport. Subsequently, as can be seen in Figure 2, air pollution is the result of many of people's activities, and the main problem is the resources used and the storage space for materials that can no longer be used. In the field of agriculture and maritime, the highest levels of pollution caused by the fuel of the machines are recorded, which is due to the intensity at which the machines are put within these sectors of activity. Subsequently, it is noticed that

the areas aimed at mining and construction register high levels of air intoxication (Diyar et al., 2014). This discussion raises the question of the materials we use. Products used to create new homes as well as resources extracted from the ground are not managed in such a way as to have a positive impact on the environment. Both areas, both construction and the mining industry, are activities that generate residues that are stored in an unproductive, environmentally harmful manner. Although the causes of gas flows and residual emissions are manifold, it can be seen that the main cause is the use of inadequate resources to produce the energy needed to carry out the activity. Fuel remains the main deficiency to be replaced by a more productive and environmentally friendly alternative. This factor must be given particular importance given that the resource in question is an indispensable element in all other fields of activity (Pitkanen et al., 2016).

Figure 3. *Exposure to air pollution (Particulates < 2.5µm)*



Source: Eurostat Database.

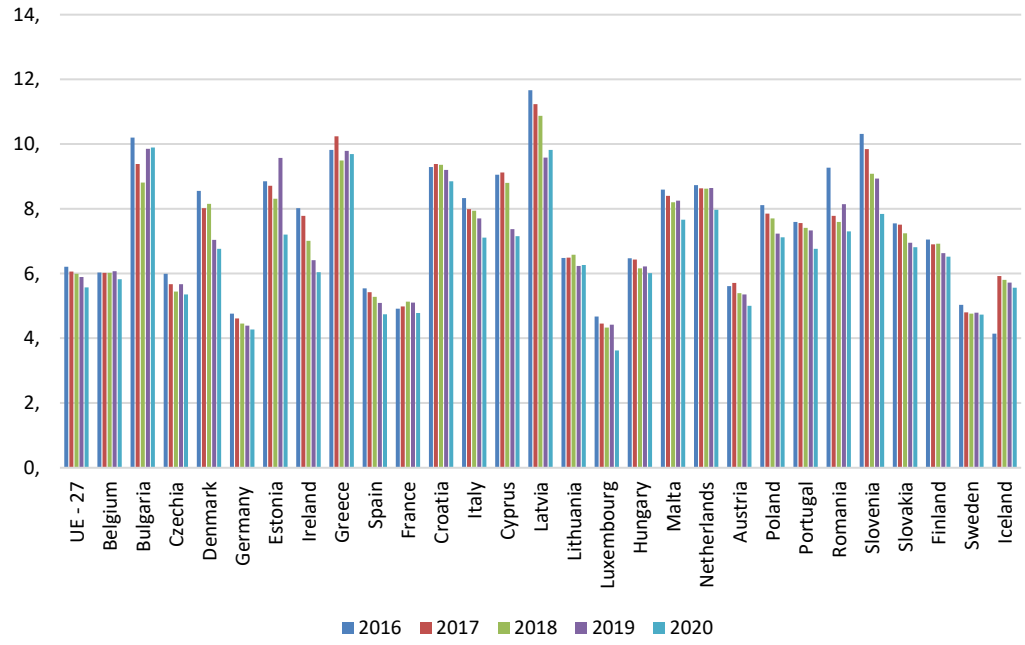
Air quality determines the health of an entire population, as well as the average living and mood of society, all of which are factors that alter the labor market. The graph shows a significant difference, a large gap between certain countries. According to the European Union, the states that have an air of a lower quality in the atmosphere are the countries that do not have adequate legislation on environmental pollution or in relation to the processes of burning waste. Instruments such as green vouchers have not been sufficient to reduce this deficiency, and free movement within the European area has led to the transport and collection of a certain amount of waste in such areas where the issue of recycling and destruction of waste is poorly developed.

The elements that make it possible to create such a gap between developed countries and emerging economies, as well as between countries with a higher level of competitiveness and those with a lower level, are diversified. The most important element is the legislation's statute in question. Like other areas of activity, the green economy sector cannot consist only of theoretical or productive approaches, but must be supported by drawing up clearly defined rules that encourage the approach of sustainable models. In order to achieve this, economic agents must be put in a situation where it is more cost-effective from a financial and time point of view to turn to 'green' production models, rather than continuing with traditional mechanisms (Egoroba et al., 2015).

As a result, a high rate of pollution entails repercussions at national level over a long period of time, which is precisely why the activities to be recovered must be aimed at a long period of time and as far as possible to eliminate the risk of increasing the rate of air pollution. The most important element aimed at this aspect is the health of individuals representing labor. The environment changes the state of health as well as the life span of individuals. In other words, a cyclical process takes place through which the need to protect the environment has as its purpose the protection of the effective community, thus being both a goal and a result in terms of forming an environment conducive to the organic development of the economy.

3. The potential of the green economy to generate added value

Figure 4. *Environmental tax revenues (% of total revenues from taxes and social contributions (excluding imputed social contributions)*



Source: Eurostat Database.

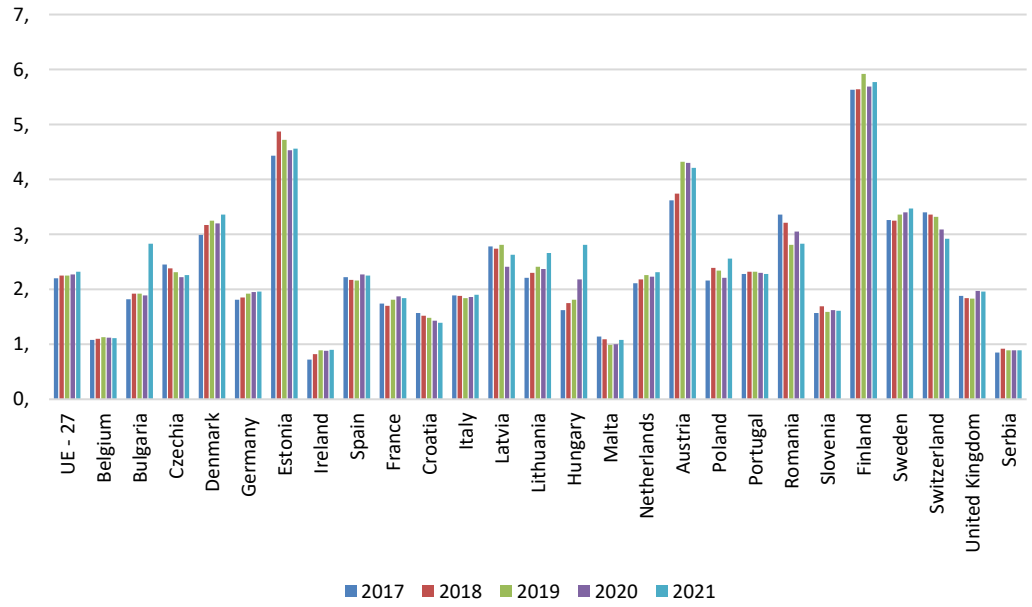
The share of taxes from activities specific to the green economy can determine the level of development of this sector in a given country. Before the pandemic period, investments took place at European level to develop sustainable production models, but the closure of borders and the cessation of most activities led to a slowdown in these businesses. Although the necessary structures have remained functional and active, a compensation scheme has been set up at European level whereby such activities have been exempted from certain payments or have been applied to them a gradual compensation scheme or even deferrals of payments.

The strategy aimed to advance these sectors in the face of traditional methods. The entities are presented by both new entities and players already existing in the market. The taxation is therefore carried out for activities harmful to the environment. Figure 4 shows a higher indicator value in developing countries. This is natural because the more activities with a high degree of pollution, the higher the amount of taxes collected in the field of the environment increases in direct proportion (Chatzistamoulou and Tyllianakis, 2022).

The established rules governing the activities that are considered to be pollution generators are applied uniformly at European level. This provides the possibility of a generally valid observation at Member State level in order to be able to identify the level of implementation of the specific concepts of the green economy.

Given an overall overview of sustainable production patterns, one can see the contribution made by the green economy to the economy through the sector's gross value added. The overall aim of sustainability programmes is to increase the effects of activities while reducing the resources used. An overview can be formed by observing Figure 5 below.

Figure 5. *Gross value added in environmental goods and services sector*



Source: Eurostat Database.

The production of environmentally friendly goods and services reflects the economic opportunities created in a greener economy. The environment sector is generally seen as a sector with great growth potential, which generates wealth and creates jobs. Empirical evidence attests that the added value increases the quality of products, reduces social costs and leads to the formation of new jobs (Pop et al., 2011).

The most important aspect is to encourage the consumption of such goods, which can be achieved by encouraging you through policies implemented at national level. The most important factor of the products obtained from such activities is the price. Currently, most of the areas of activity in this segment bear higher costs, which translate into higher prices compared to products obtained by traditional methods, which discourages consumption and slows down the development process specific to the green economy (Gasparatos et al., 2017).

Conclusions

Protecting the environment must be the primary concern of any economic activity, regardless of the specific field. The green economy was adopted and implemented as a basic principle at European level due to its ability to generate the desired results: sustainable businesses, environmentally friendly product and service concepts, but also to solve a number of social problems such as reducing the poverty rate and social exclusion.

The most important factor in this approach is energy: its production, its storage, its distribution, its use and the profitability that results from the output resulting from the activity. Energy is used by all industries and is used by both producers and households, and is therefore one of the main elements currently contributing to environmental pollution. The goods produced must be integrated into the area of the green economy at the design stage. In order to be re-used, they must be made of certain materials in a certain form, with a certain utility. This approach would lead to increasing added value, reducing production costs, increasing the number of jobs as well as reducing tensions between needs and resources.

Thus, according to what is argued in the article, the green economy presents itself as a potential solution that can solve over time the shortcomings that the Member States of the European Union are currently experiencing in its economies. It is still a long way to go on the way to green economic development. The keys are to form corresponding policies and systems with long-term effects, to save energy, reduce the emission and develop new energy source. All of these can make us facing crisis calmly, keeping the sustainable and harmony development among economy, environment and our human kind.

References

D'Amato, D., Droste, N., Allen, B., Kettunen, M., Lahtinen, K., Korhonen, J., Leskinen, P., Matthies, B.D. and Toppinen, A., 2017. Green, circular, bio economy: A comparative analysis of sustainability, *Journal of Cleaner Production*, Vol. 168, pp. 716-734. <http://dx.doi.org/10.1016/j.jclepro.2017.09.053>

Chatzistamoulou, N. and Tyllianakis, E., 2022. Green growth & sustainability transition through information. Are the greener better informed? Evidence from European SMEs, *Journal of Environmental Management*, Vol. 306, No. 114457. <https://doi.org/10.1016/j.jenvman.2022.114457>

Dennis, K. and Bernauer, Y., 2021. Greening the Economy through Voluntary Private Sector Initiatives or Government Regulation? A Public Opinion Perspective, *Environmental Science and Policy*, Vol. 115, pp. 61-70.

Diyar, S., Akparova, A., Toktabayev, A. and Tyutunnikova, M., 2014. Green Economy – Innovation – Based Development of Kazakhstan, *Procedia – Social and Behavioral Sciences*, Vol. 140, pp. 695-699. 10.1016/j.sbspro.2014.04.497.

Egoroba, M., Pluzhnic, M. and Glik, P., 2015. Global trends of "Green" economy development as a factor for improvement of economical and social prosperity, *Procedia – Social and Behavioral Sciences*, Vol. 166, pp. 194-198. 10.1016/j.sbspro.2014.12.509.

Gasparatos, R., Doll, N.H.C., Esteban, M., Ahmed, A. and Olang, T.A., 2017. Renewable energy and biodiversity: Implications for transitioning to a Green Economy, *Renewable and Sustainable Energy Reviews*, Vol. 70, pp. 161-184. <http://dx.doi.org/10.1016/j.rser.2016.08.030>

Girogi, S., Lavagna, M., Wang, K., Osmani, M., Liu, G. and Campioli, A., 2022. Drivers and barriers towards circular economy in the building sector: Stakeholder interviews and analysis of five European countries policies and practices, *Journal of Cleaner Production*, Vol. 336, No. 130395. <https://doi.org/10.1016/j.jclepro.2022.130395>

Kaur, G., Uisan, K., Ong, K.J. and Lin, C.S.K.L, 2017. „Recent Trends in Green and Sustainable Chemistry & Waste Valorisation: Rethinking Plastics in a circular economy, *2nd Green and Sustainable Chemistry conference*, <https://doi.org/10.1016/j.cogsc.2017.11.003>

Nandy, S., Fortunato, E. and Martins, R., 2022. Green economy and waste management: An inevitable plan for materials science, *Progress in Natural Science: Materials International,* Vol. 32(1), pp. 1-9. <https://doi.org/10.1016/j.pnsc.2022.01.001>

Pitkanen, K., Antikainen, R., Droste, N., Loiseau, E., Saikku, L., Aissani, L., Kuikman, P.J., Leskinen, P. and Thomsen, M., 2016, What can be learned from practical cases of green economy? Studies from five European countries, *Journal of Cleaner Production,* Vol. 139, pp. 666-676. <https://doi.org/10.1016/j.jclepro.2016.08.071>

Pop, O., Dina, G.C. and Martin, C., 2011. Promoting the corporate social responsibility for a green economy and innovative jobs, *Procedia Social and Behavioral Sciences*, Vol. 15, pp. 1020-1023. 10.1016/j.sbspro.2011.03.232.

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 194-206

The impact of green economy in employment in the European Union

Irene Ioana DRĂGHICI
Bucharest University of Economic Studies, Romania
draghiciirene17@stud.ase.ro
Alexandra Elena TĂNASE (MIHAI)
Valahia University of Targoviste, Romania
alexa.tanase@yahoo.co.ph
Cristian STANA
Valahia University of Targoviste, Romania
stanacristiann@yahoo.com

Abstract. *In a world of finite resources, the prevailing model of economic growth, founded on ever-increasing consumption of resources and emission pollutants, cannot be sustained any longer. The "green economy" concept has offered the opportunity to change the way that society manages the interaction with the environment. Throughout last decades the green economy is developing and several transformations have occurred on labor market. The aim of this study is to understand how green jobs can be applied in a labor market, how the transition of labor force is done and what is the impact of the development of green industries on the labor market in a European context. The vocational training and technical education play a principal role in a successful transition to a greener labor market. In addition, there is a necessity to a collaboration between authorities and labor unions in order to obtain a comprehensive transformation without negative influences on labor market.*

Keywords: green jobs, green economy, labor market, sustainability.

JEL Classification: E24, J40, J43, O17, Q56.

Introduction

In a world of finite resources, the prevailing model of economic growth, founded on ever-increasing consumption of resources and emission pollutants, cannot be sustained any longer. The "green economy" concept has offered the opportunity to change the way that society manages the interaction of the environmental.

The green jobs are developing in an up warding slope, several transformations and changes have occurred on labor market. This paper is focused on the application of green jobs in labor market and how a transition to a greener labor force can occur in an effective way in a European context. The aim of this study is to understand how green jobs can be applied in a labor market, how the transition of labor force is done and what is the impact of the development of green industries on the labor market.

It has often been argued that job creation is one of the important benefits of green growth policies – that is, policies to foster economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies (OECD, 2011). For example, UNEP (2011) claims that the greening of economies is a net generator of decent jobs – good jobs that offer adequate wages, safe working conditions, job security, reasonable career prospects and worker rights. Leaders of the UNFCCC organization and the International Labor Organization (ILO) have argued that taking action to mitigate climate change creates high quality employment (Figueres and Ryder, 2014). Labor market aspects of green growth have been a key concern of institutions promoting development.

The OECD has also suggested that investing in green activities has significant potential to create jobs (OECD, 2011). The global economic downturn triggered by the world financial crisis of 2008-2009 has developed many proposals for green fiscal stimuli to promote growth and, in particular, jobs.

2. Literature review

A green organization is defined as one that produces goods or services designed to minimize environmental impact. Building upon the work completed by other organizations which pursue similar objectives, ECO Canada defines a green job as one that works directly with information, technologies, or materials that minimize environmental impact, and also requires specialized skills, knowledge, training, or experience related to these areas. Through the research process it became evident that the viable approach to build a common and universally consistent language would be to conceptualize and communicate green jobs as the ones which focus on the aspects related to production, and more specifically, the production of goods or services that support ecological integrity and minimize environmental impact (Defining the green economy, 2010).

"Green jobs" does not lend itself to a tight definition but certainly includes the direct employment which reduces environmental impact ultimately to levels that are sustainable. This includes jobs that help to reduce the consumption of energy and raw materials, decarbonizes the economy, protect and restore ecosystems and biodiversity and minimize

the production of waste and pollution. A somewhat wider concept of "green jobs" might embrace any new job in a sector which has a lower than average environmental footprint, contributes to improving overall performance, albeit perhaps only marginally (ILO, 2008). There is as yet no single universally agreed definition of a green job. In a broad sense, however, green jobs can be regarded as those associated with environmental objectives and policies. (GHK, 2009) Counting green jobs gives a sense of the magnitude of the implications of those objectives and policies for employment and structural change in economies. (ICLS, 2013)

Some definitions of green jobs or related concepts focus on occupations and skills with an identifiable environmental goal, but most focus on employment in industries (or specific projects) that produce environmentally beneficial products. For example, some concentrate on renewable energy, including or excluding biofuels, while others also include environmental services and/or employment related to improving energy efficiency or developing less carbon-intensive products (such as building railways).

Irena (2014), for example, estimated that renewable energy jobs reached 6.5 million in 2013, with the largest employers being, in decreasing order, China, Brazil, the United States, India, Germany, Spain and Bangladesh. To put this figure in perspective, this compares with total global employment of just over 3 billion (ILO, 2015)

Several studies, notably by the European Commission's Environment Directorate, have used the OECD/Eurostat definition of the environmental goods and services industry (OECD, 1999), comprising "activities which produce goods and services to measure, prevent, limit, minimize or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems".

Green jobs constitute a small but significant share of total employment – 1.7 per cent of total paid employment in Europe (European Commission, 2007). Jobs in the nuclear power sector are not included, and these are not generally regarded as green, although they are in a low-carbon industry.

Many jobs are not counted as green, despite the nature of the goods and services they help produce. For example, jobs in the car industry are excluded, even though some may be devoted to developing low-carbon vehicles. A Eurostat handbook providing definitions, data collection methods and examples for the environmental goods and services sector (EGSS) was published in 2009 (Eurostat, 2009).

Ecorys (2012) estimate that the total number of people working in eco-industries in the European Union (a broadly similar definition to Eurostat's) was around 3.4 million (around 1 per cent of the total workforce aged 15-64).

The OECD has noted that "green growth is gaining support as a way to pursue economic growth and development, while preventing environmental degradation, biodiversity loss and unsustainable natural resource use" (OECD – Martinez-Fernandez, Hinojosa, Miranda, 2010).

There is a particular concern about the consequences of human-induced climate change. As the World Bank's World Development Report (2010) argues, "Economic growth alone

is unlikely to be fast or equitable enough to counter threats from climate change, particularly if it remains carbon intensive and accelerates global warming. So climate policy cannot be framed as a choice between growth and climate change."

In fact, "climate-smart policies are those that enhance development, reduce vulnerability, and finance the transition to low-carbon growth paths" (World Bank, 2010).

Stern (2007) thinks that "the new industrial revolution and the transition to low-carbon growth constitute a very attractive path. It is likely to bring two or three decades of innovative and creative growth and large and growing markets for the pioneers. Low-carbon growth, when achieved, will be more energy-secure, cleaner, safer and more bio-diverse than its predecessors."

The green employment has to be considered as a part of green growth. The link between the climate change mitigation policy, growth and jobs is a complex one. The issue is also relatively recent, hence the existing literature on the subject is not wide and there is an "obvious lack of knowledge" on the relation between climate change and employment (ETUC, 2005). Nevertheless, with the rising interest in the climate change and in its implications, a number of studies at national and European level have recently been developed.

The Stern report (Stern, 2007) estimated that the annual cost of cutting total greenhouse gas (GHG) emissions to about three quarters of current levels by 2050 will range between a benefit of 1.0 to a cost of 3.5% of GDP, with an average estimated cost of approximately 1% (i.e. about €350-400b). The range taken into consideration was wide because of the uncertainties as to future rates of innovation and fossil-fuel extraction costs.

What the exact cost will be will depend on the future cost of low-carbon technologies (which are expected to be cheaper than currently), and also on improvements in energy efficiency.

3. Overall impact of climate policies on employment

Many studies have estimated that the climate policies will create new job opportunities, leading to job reallocation and, potentially, an increase in the employment levels. The Stern Report (2007) highlighted that the expected growth in the markets for renewable energy generation products, stimulated by the climate change policies, will be accompanied by a significant shift in employment patterns.

It is expected that by 2050 the number of people working in this sector will grow from the current 1.7 million to more than 25 million worldwide (Stern, 2007). The European Commission (2008) estimates that the impacts of mitigation policies on the employment could lead to a 0.41% reduction in jobs by 2020, though this figure would be affected by different assumptions on international mitigation efforts and the use of the CDM. According to the ETUC, CO_2 emission control measures can have a relatively small but positive effect on the overall employment, resulting on an increase in the employment of 1.5% in the EU25 in the coming 10-20 years (ETUC, 2005). GHK, IEEP and Cambridge

Econometrics (2007) find that, even if direct effects of policy options on the growth and jobs may be neutral or small, indirect effects can be much larger, generally indicating that the EU economy would gain, especially in employment terms, from the introduction of environmental policies.

It is useful to think of the employment impact of climate policy in three stages. Climate policy will have:

- A short-term effect, when jobs are lost in directly affected sectors and new ones are created in replacement industries. It can be treated as the direct employment effect.
- A medium-term effect, when the impact of climate change policy ripples through the economy. Jobs are created and lost along the value chains of affected industries. These are economy-wide effects of climate policy.
- A long-term effect, when innovation and the development of new technologies generate opportunities for investment and growth. It is dynamic effect of climate policy.

The nature of the jobs created may differ from the nature of jobs lost, and this will have repercussions on labor productivity and pay. For a full assessment, this would have to be taken into account. However, productivity information is scant and little will therefore be said about the relative quality of jobs. (Fankhauser et al., 2008).

In the short term, there will be job creation and loss in directly affected industries. Jobs will be lost in carbon-intensive sectors, which will grow less fast or may even contract (for example, when coal-fired power plants are decommissioned). New jobs will be created in low-carbon sectors.

This is the direct employment effect of climate policy. Its sign will depend on the labor intensity of these industries.

In the longer term, the climate change policy will unleash a wave of innovation as firms reposition themselves and seek to exploit carbon opportunities. Jobs will be created in R&D of low carbon technologies. Over time, the results of this research will generate new investment and further job opportunities. What these will be and how this would differ from what would have happened without these policies is hard to predict.

What is not in doubt, however, is the powerful effect that innovation and technical change can have on the productivity and economic growth. Growth theory has long identified technical change and innovation as a major source of economic growth. Skill biased technical change is a major factor in explaining labor market developments over the last few decades in both Europe and the USA – including the changes in the wage income (through productivity growth), job creation (through expansion) but also wage inequality (since some low productivity jobs remain) (Fankhauser et al., 2008).

Due to the wide range of green jobs available today, there is no single training profile for those known as green collar workers. Other than degrees, courses and postgraduate courses specialising in ecology, green training for a specific job consists of environmental specialisation within a sector.

People who work designing packaging, for example, must have a command of environmentally friendly materials. Likewise, a lawyer interested in protecting nature must

specialise in environmental law and an engineer wanting to work in the energy sector will have to specialise in everything to do with renewable energy, energy efficiency and decarbonisation of the economy (https://www.iberdrola.com/sustainability/what-are-green-jobs).

4. The debates on green jobs in the economic literature

Benefits of adoption of a green strategy for a business

The conservative understanding concerning green economic and environmental protection is that it comes at an extra cost imposed on firms, which may influence their global competitiveness.

Companies are facing growing pressure to become cleaner and greener, various stakeholders push enterprises to diminish their destructive impact on the environment. This is now seen as firm's social responsibility, that business people often refer to as "corporate social responsibility" (May et al., 2007).

Still enterprises can reduce their environmental influences without affecting their economic performance by applying diverse innovation strategies. Such an approach should include strategies that might result in increased benefits or decreased costs, it is important to look at both sides of the balance sheet.

Benefits

Better access to certain markets

First, reducing pollution and other healthy environmental influences may improve the whole image or the fame of a company, and therefore increase customer's loyalty or support sales efforts. Although this argument seems pretty honest, consumers may be aware of a company's environmental performance through its offer of green products, but they are less likely to be familiar with its environmental performance as measured by its emissions to water or the atmosphere. So companies need to focus on the green products. In the same way the eco products must have a competitive prices.

Second, and more specifically, purchasing policies of public and private organizations may stimulate green producers. It is becoming increasingly common for public administrations to include environmental performance as a criteria for selecting suppliers of goods or services. This phenomenon is known as green public purchasing (GPP). As an illustration (Kunzik, 2003) reported that, in general, the central UK government, in its Greening of Government Operations Policy, aims to the following:

- Encourage manufacturers, suppliers, and contractors through specifications to develop environmentally preferable goods and services at competitive prices.
- Ensure that any products derived from wildlife, such as timber, plants, and leather goods, are from sustainable sources.
- UK Department of Environment, Transport, and Regions has a restriction to buy a minimum of 10% of electricity from renewable sources in order to enhance the renewable sources production.

Differentiating products

Greener products or services can allow businesses to use a differentiation strategy so as to exploit niches in environmentally aware market segments and ecolabeling can present information about the environmental features of a product or service. The attractiveness of ecolabeling is increasing, especially in Europe (in particular, sales of products with the European ecolabel went from €51 million in 2000 to €644 million in 2004). Customer's ability to purchase green product in general is important, despite the fact that the real amount committed to such buys may be less impressive.

Costs

Cost of material, energy, and services

(Porter and Van der Linde, 1995) has stated that pollution is usually associated with a waste of resources, raw materials not being completely used, or waste of energy. "Pollution is a manifestation of economic waste and involves unnecessary or incomplete utilization of resources." Also decreasing pollution is often corresponds to increasing productivity of used resources. Specially, this line of reasoning indicates that reducing pollution can cause a reduction of expenditures on raw material or energy.

Cost of labor

A better image of the firm results in a better ambiance in the workplace and enhances higher productivity. Employee who feels proud of the firm for which they work can accomplish better objectives and tasks, but also enhance generosity and lead to a worthy circle of good reputation. This is especially significant in recruiting talented junior scientists, managers, and highly qualified candidates, many of whom basically would not work for a company with a low social and environmental profile. No one chooses to work for an untrustworthy company as compared to an alternative with a good trustworthy profile.

Improved environmental performance could then decrease the cost of labor by reducing the cost of illnesses, absenteeism, recruitment, and turnover. Some companies are aiming to an improved environmental performance to improve the satisfaction of their labor unions (Lankoski, 2006).

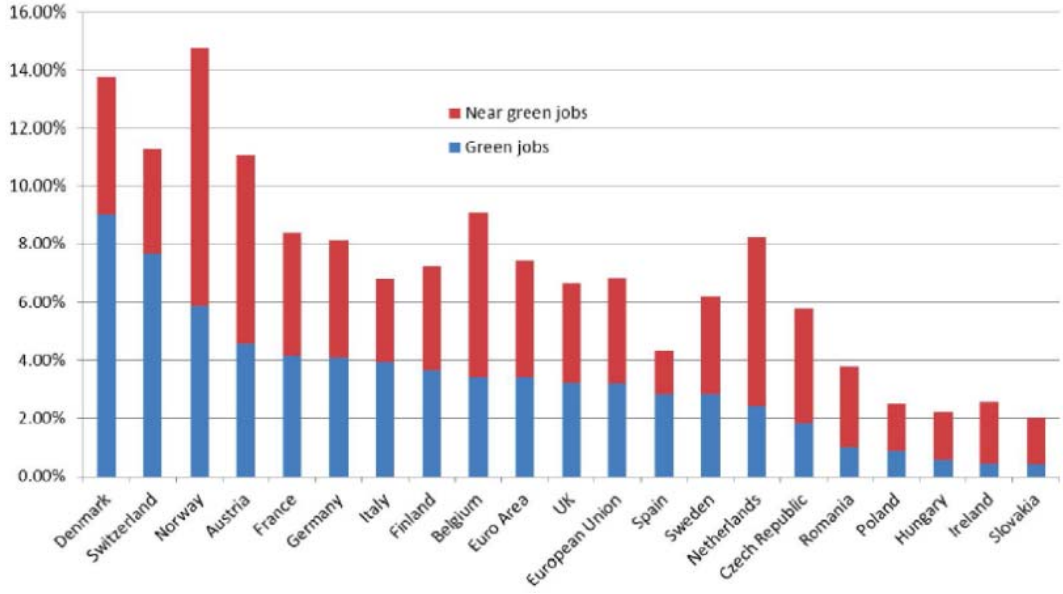
5. Green job application: The case of Denmark

Previously, a literature review was made concerning the green jobs definitions and its presentation in labor market and how it could be beneficial adopting a green way.

This allowed forming a theoretical base concerning the green jobs. In the next part Denmark is taken as an example as it was a pioneer in the greening of industries and jobs.

Denmark has the highest green jobs demand. Green growth has a high ranking on Denmark's policy agenda, with objectives and strategies in place to decrease the usage of fossil fuels and Greenhouse Gas emissions besides investing heavily in green technologies. Denmark does not have a lot of natural resources, but depends on a large extent on its human resources for its competitiveness.

Figure 1. *Green and near-green job demand by country as % of total demand*



Source: Colijn, 2014.

The country's high capability is credited in part to its robust focus on human resources and education, an extensive culture of dialogue, involvement and cooperation, a flexible labor market, well-functioning infrastructures and administration. Denmark has competitive advantage in design, research and development, and its exports base comprise, aside from agriculture, elaborately transformed industrial products and services that have obtained a worldwide recognition.

Denmark has been one of the countries that refused nuclear power as the alternative to fossil fuels and in its place started early on developed impressive goals to move towards renewable energy production and improved energy efficiency.

This shows that green emphasis in the energy policy is not a new concept in Denmark. In the late 70s it became a main priority, as it was mainly driven by regulations and an effective use of fiscal policies to further green behavior among businesses and consumers.

This primary low-carbon policy set the country onto a green path before most other countries, with subsequent progressive effects for the local economy. As a consequence, Denmark is nowadays a world leader in windmill technology and also contains different world leading manufacturers of energy efficiency technologies.

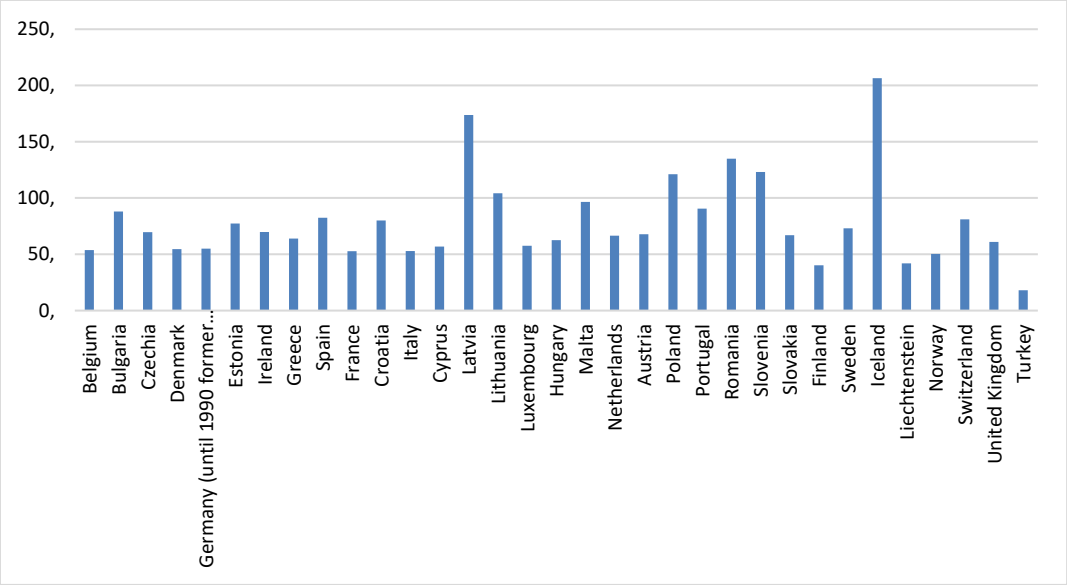
The access to other green policy areas and technologies such as water, air cleaning, waste incineration and recycling technologies have also occurred confirming Denmark as a strong competitive country in these areas.

Cities are having a progressively important role in the lives of worldwide populations. They also play an important role in reducing global emissions. People living in cities have lower per capita emissions but higher per capita GDP. Copenhagen as capital of Denmark is the

best example, with a population with half per capita emissions in comparison with the rest of the country (OECD, 2012). Copenhagen has combined and showed that a green life means a qualitative life.

The Danish system also involves a successful labor market structure that offers guidance, and a job or education to everybody who is unemployed. The ministry of employment also has a general responsibility for measures in relation to all clusters of unemployed persons. For example, the unemployed people who life off of social assistance and those who are simply unemployed, they both benefit from unemployment benefits.

Figure 2. *Pollutant emissions from transport*



Source: Eurostat

Emissions from transport are the main contributor to air pollution. This indicator analyses the transport emissions of nitrogen oxides (NOx), non-methane volatile organic compounds (NMVOCs) and particulate matter (PM10) and in 2019 Denmark had one of the lowest values.

Skills in Denmark

Denmark has a national system for Initial Vocational Education and Training (IVET), and also tertiary vocational education.

Wages and working conditions are typically placed by cooperative agreements negotiated among trade unions and employers' organizations. That's lead to labor market system that is frequently referred to as the Danish Model. This uniquely Danish system is characterized by the social partners (employers, trade unions, government and the education sector) which determine the rules of the market, and they are in the greatest position to recognize changes in underlying labor market conditions.

And normally it is believed that together they are the most successful way to prepare quick and realistic solutions, and adapt to new challenges. Thus, these stakeholders are strategically and formally involved in the continuing process of developing the further education system.

Danish businesses have experience the first benefits in the green industries of the future and in appealing foreign investment into the country. Therefore, in Denmark there is a self-reinforcing two-sided strategy: one concerns the subjects of climate change, and the second focuses on business development and investment attraction.

Additionally, the development of new green collar professions and the changing requirements for current jobs in Denmark will depend on its companies' key competencies concerning green tech solutions.

Green skills needed in the green economy

This Part concerns the importance of green existing jobs as an outcome of policies to deal with the effects of climate change. A lot of sectors have experienced a continuing green transformation in the labor market by time, that started in the 80's as previously mentioned. For the period from 1997-2002 a total of 500 billion Danish Krone (around EUR 67 billion) was offered in order to motivate employment growth in the green industry. (CEDEFOP, 2011). The educational system has been changed progressively to support formal qualifications with green requirements of the labor market. Several programs have been adjusted to match the demand for skills and competences related to green industries, regardless developments were mostly motivated by regulation, while recent development are significantly broader, with a real market pull, additionally enhanced by R&D and innovation investments in this field for enterprise creation.

Energy

Denmark is one of the most efficient countries in energy in comparison with the other EU countries. Since 1980 the Danish economy has grown by 78%, while energy consumption has stayed more or less stable and CO_2 emissions have been reduced. The transformation towards greener energy has caused a significant growth in Danish exports of clean energy technologies, driven mostly by wind turbine industry.

On the other hand, an ageing workforce might influence the demand over 50 % of the present workforce in the energy supply industry as most of its employees are above 50 years old. Predictable demand mainly concerns skills at an upper secondary vocational level. Also, the green side of related occupations is likely to drive other complementary green jobs.

Waste: Denmark was the leading country in Europe to announce a prohibition on landfilling of waste that could be incinerated. The public objective for waste recycling is to be converted into clean energy sources. Workers employed at the landfills were low skilled, without training the work could not be seen as attractive. Increasing demands for energy efficient and environment friendly solutions have changed the occupational profile for those workers at waste treatment facilities. Besides it has increased the attraction of those

jobs. To adapt the changing of skills needed at the plants. The Danish Technological Institute implement the development of public labor market vocational training courses.

At each plant the waste must be rearranged in different groups to optimize recycling. For example waste from agricultural is turned into weed free soil, and then sold. Other inputs of waste will be used after being processed, as energy efficient. That is why employees at the workplace must have some of the following essential skills:

- Identify the difference between chemical substances that allows them to treat waste correctly.
- To be able to handle risky waste properly, in order to decrease associated risks to themselves and to others.
- To be able to categorize different forms of waste properly.

Construction

Over the past decades, the total building stock in Denmark has increased by approximately 40%. Simultaneously, construction in Denmark has the ability to minimize energy usage with climate-friendly solutions that decrease CO_2 emissions. There is a robust demand and attention on energy efficiency in the construction sector, High energy efficiency in buildings has been a political priority for long times and is read as one of the main priority areas among the Danish Government's efforts to target energy and climate change challenges.

The target for the construction sector includes a restoration of the current public building in order to improve overall energy efficiency and transforming them into green buildings. Vocational training already includes a course targeted to persons involved in construction systems that improve and supervise energy efficiency.

Besides the jobs generated in building operations and construction, indirect jobs will most probably be created in industrial, administration, and consulting. The majority of these jobs are expected to be done by persons already working in construction sector. In general, energy efficient measures will lead to a greening of present occupations. Architects and designers must consider the whole life cycle of the building and that green buildings are designed as single, integrated systems, they should understand the various factors elaborated in green building such as efficient heating, cooling, lighting, appliances, passive solar, thermal mass and low effect building materials. Understanding the green building concepts and the national green standards and guidelines requires additional knowledge, training, and certification

6. Concluding remarks

The vocational training and technical education play a principal role in a successful transition to a greener labor market, as well there is a necessity to a collaboration between authorities and labor unions in order to obtain a comprehensive transformation without negative influences on labor market.

The green jobs are developing in an up-warding slope that will require cooperation between businesses stakeholders in order to keep pace with the growing demand of labor and to meet all of the challenges.

A shift to greener economy will be impossible if it is not totally integrated with labor market and the workforce upgrading. At the same time, the labor force is ageing and decreasing those that are not able to advance to new required skills and abilities are at a higher risk of being left behind and not able to take advantage from the new opportunities that green growth offers.

The Danish model has a successful application of the transition to a greener economy focused on the improvement of vocational training and education of workforce to let them able to keep up with the innovation and technology development.

The need for improvements in the capability of current education, training and qualification systems is approximately acknowledged in all European Union member states. Particular emphasis for improvement tended to be on initial vocational education and training, rather than continuing adult education or higher education. (Strietska-Ilina et al., 2011)

There is no a strict model, which must be applied in all countries to attain a successful transition to a greener labor market, but there, is an overall outline that can be applied on every country depending on it's capabilities.

References

Alvarez, G.C., Jara, R.M., Juliá, J.R.R. and Bielsa, J.I.G., 2010. Study of the effects on employment of public aid to renewable energy sources. Procesos de Mercado, *Revista Europea de Economía Política,* 7(1), Primavera, pp. 13-70.

Barla, Ph., 2007. ISO 14001 certification and environmental performance in Quebec's pulp and paper industry. *Journal of Environmental Economics and Management,* 53(3), pp. 291-306.

Bowen, A., 2012. 'Green' growth, 'green' jobs and labor markets. World Bank policy research Working Paper (5990).

Carvalho, M., 2012. EU energy and climate change strategy. *Energy,* 40(1), pp. 19-22.

Colijn, B., 2014. Green jobs in Europe and the increasing demand for technical skills. Paper presented at the The Conference Board Europe, February.

Guilloux, G., 2006. Les produits éco-conçus – Vers une consommation durable. Oral presentation at the Biennale du design de St-Étienne.

Hughes, G., 2011. The myth of green jobs: Global Warming Policy Foundation.

Kraay, A. and Ventura, J., 1998. Comparative advantage and the cross-section of business cycles, Policy Research Working Paper 1948. Washington DC: World Bank.

Kuralbayeva, K., 2013. Effects of carbon taxes in an economy with large informal sector and rural-urban migration, Grantham Research Institute Working Paper No. 139. London: London School of Economics and Political Science.

Lambert, R.J. and Silva, P.P., 2012. The challenges of determining the employment effects of renewable energy. *Renewable and Sustainable Energy Reviews,* 16, pp. 4667-4674.

Lewis, W.A., 1954. Economic development with unlimited supplies of labour, Manchester School of Economic and Social Studies, 22, pp.139-191.

Wei, M., Patadia, S. and Kammen, D., 2010. Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US? *Energy Policy*, 38, pp. 919-931.

Agency, Danish Energy, 2012. Green Production in Denmark- and its significance for the Danish economy. Short version. Copenhagen: Ministry of the environment.

CCC, 2012. The global cleantech report 2012. Copenhagen Cleantech Cluster, Copenhagen.

CCC, 2015. Copenhagen Cleantech Cluster. Copenhagen capacity, <http://www.copcap.com/ccc>

Cambridge Econometrics, GHK and Warwick Institute for Employment Studies, 2011. Studies on Sustainability – Green Jobs, Trade and Labour. Brussels: Final Report for the European Commission, DG Employment.

CEDEFOP, 2011. Skills for green jobs Country report – Denmark: European Centre for the Development of Vocational Training.

CEDEFOP, 2012. Green skills and environmental awareness in vocational education and training Synthesis report. Luxembourg.

DAMVAD, 2011. Green Growth in Copenhagen

ILO, 2012a. Green jobs for Sustainable Development: A case study of Spain: Sustainlabour in collaboration with Fundación Biodiversidad.

ILO, 2012b. Sustainable development, green growth and quality employment Realizing the potential for mutually reinforcing policies. Guadaljara.

United Nations Framework Convention on Climate Change (UNFCCC), 2007. Investment and financial flows to address climate change. Bonn: United Nations Framework Convention on Climate Change.

Upadhyay, H. and Pahuja, N., 2010. Low-carbon employment potential in India: A climate of opportunities, Centre for Global Climate Research TERI and Global Climate Framework Discussion Paper TERI/GCN – 2010:1. New Delhi: The Energy and Resources Institute, Global Climate Network.

World Bank, 2012. Inclusive green growth: The pathway to sustainable development. Washington DC: World Bank.

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 207-215

The role of digitalisation in restarting business and reducing the national and global economic impact of the COVID-19 crisis

Edi-Cristian DUMITRA
Bucharest University of Economic Studies, Romania
edidumitra@gmail.com
Cristian STANA
Valahia University of Targoviste, Romania
stanacristiann@yahoo.com
Claudiu POPA
Valahia University of Targoviste, Romania
av.claudiu.popa@gmail.com

Abstract. *While the COVID-19 crises had a strong impact in national and global economy, the role of digitalisation was important for businesses to continue their activity. Since the beginning of the pandemic, many businesses moved their activity in online, or have been shut down, the digitalisation being used for maintaining their operations or to development other innovative approaches for their business plan. The paper aims to overlook the challenges businesses had while shifting from the on-site activities to online processes, facilitating the development or the restart of their operations while reducing the national and global economic impact.*

Keywords: digitalisation, business, COVID-19, economic environment, economic impact.

JEL Classification: D230, O140, O330.

1. Introduction

Since the global pandemic of COVID-19 was declared by World Health Organisation on 11th of March 2020, the economic environment has been deeply affected by all the measures that have been taken to protect the population from the spread of the virus. In this order, many governments applied measures to limit people connections such as social distancing and lockdowns, measures that suspended the economic activity of many business domains, especially the ones from the hospitability industry.

The COVID-19 crisis determined restrictions of the business environment such as: employees in lockdowns, major supply chain issues at global scale and the most difficult challenge: interdiction to operate, especially for businesses based on physical interaction of customers (Pinzaru et al., 2020).

In order to defend the challenges that the pandemic brought with it, the economy had been reorganized, shifting from the normal environment to the "online mode" in which the majority of the activities have been moved to a digital format, outlining the "new normal" in which on-site operations has been replaced by working from home, school with on-person traditional instruction has been replaced by online meeting platforms and the public administrations have developed their websites and online platforms in order to improve their contact with citizens during these difficult times.

After the measures against the COVID-19 pandemic have been applied for helping businesses to continue their activity, now the digitalisation is strongly used to restart many businesses that were on hold with their economic operations. Therefore, many small businesses and governmental activities have been developed in a way that allows to be approached online, steps that increased their accessibility for costumers or citizens, actions that allowed to maintain a continuous connection with the clients and the population in general.

In a context in which the demand was also affected, the revenues dropped considerably for every business and the workforce was no more physically available, the uncertainty has been the most certain aspect for the business environment, taking into consideration the perspective that in the beginning, for every business the main goal was to survive and then, in time, to reorganize itself in order to prosper on the market (Pinzaru et al., 2020).

2. Digitalisation as an instrument to overcome the COVID-19 crisis

Because many activities have been affected by the COVID-19 pandemic, the need of adaptation and surviving, conducted them to take actions for shifting their approaches of the market since the market has been reorganized itself to prosper in such difficult aspects. Many businesses observed the fact that digitalisation is the key to keep on going.

Since science has its own limits, entrepreneurs and governments took advantage on the existing technology and the progress that has been made by the Research and Development specialists and applied the instruments for reducing the national and global economic impact of the COVID-19 crisis.

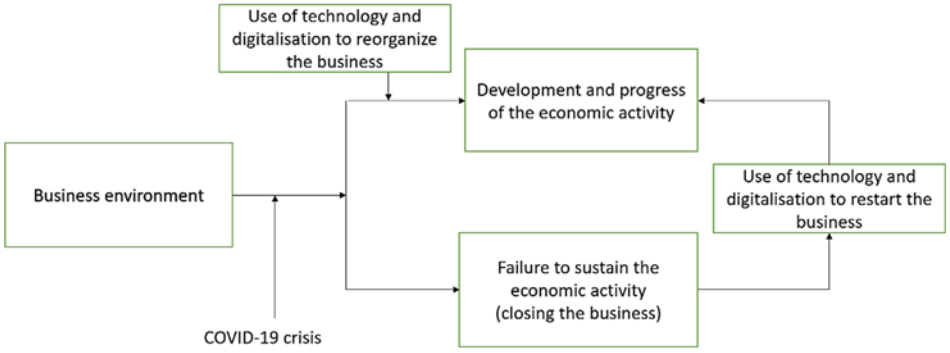
Digitalisation as part of the existing technology refers to the technical process in which analogic or traditional paper-based operations are converted to digital form, easier to access, store and transmit information by the usage of the computer. In other words, digitalisation refers to the processes used for systems to develop new organizational procedures and business models. To digitize, many companies shifted to innovative ways of doing business and to integrated digital platforms, by the usage of websites, social media and content-sharing platforms, smartphones and automation technology, and new market opportunities exploit by Research and Development activities. Nevertheless, companies and the business environment have not reached the full potential of digitalisation, and the COVID-19 crisis is driving the adoption of emergent technologies as in response for the economic challenges (Amankwah-Amoah et al., 2021).

Starting from the beginning of the COVID-19 pandemic, many businesses shifted their perspective from in-person activities to online procedures, which gave them the possibility to engage many new customers and labour and allowed them to maintain their operation.

Use of digitalisation also helped the small businesses to reduce their costs and to improve their operations giving the fact that the online activities are cheaper and more efficient, offering faster access to documents and information. Also, the specialists from the Research and Development departments have engaged themselves in transforming the research into a competition in order to discover the most efficient and the easiest instruments to engage the existing technology in the shifting process, or to develop new technologies that can help businesses to prosper in those determined conditions of the economic environment conducted by the COVID-19 pandemic.

The shift to remote working and remote operations with paperless offices and paperless organizations (Amankwah-Amoah et al., 2021) are the main pylons for businesses to digitize and to continue their activity in the "new normal" economic environment determined by the changes appeared on the market. But these changes are not applicable just for the business environment, since education has been also drove to online instruction at the expense of face-to-face traditional instruction, and most of the local authorities shifted their operations and processes online as well, therefore the citizens situated in lockdowns can still access the services and the operations that they do need.

Figure 1. *The business cycle in response to the impact of the COVID-19 crisis*



As shown in Figure 1, the digitalisation and technology had a massive impact in maintaining, reorganizing or restarting the business as the economic environment has been deeply affected and needed to be restructured for prospering after the COVID-19 crisis. Implementing new technologies and the use of digitalisations are the keys to the new business environment because the development of technology is the main action that will pursue the economic environment in continuous strategic development, as the new technologies also have been used for helping in the treatment of the patients with SARS-CoV-2, especially in China from where all began (Jiang, 2021). Therefore, it is going to be in the benefit of businesses to keep on developing new strategies and modern technologies that will assure them the continuation and the sustainability of the economic environment. Other way, if the business is reticent in adopting and implementing the innovative technologies, has been shown that the business will be determined to shut down based on the conditions of the environment, and after this situation, the best scenario for restarting it is the usage of digitalisation while embracing the recent technologies.

Moreover, as countries worked together to find a solution for the recent problems, so did the companies, to keep up with the changes occurring on the market and in the behavioural economics. Therefore, new approaches of business operations have been implemented, such as working entirely remote, on-line education, online relations between public institutions and citizens, following a better unfolding of the economic activities, business, and market.

Meanwhile, while most companies have turned to digitalisation, the business environment needs to pay attention as well to the barriers that can make the transition process difficult.

In their paper, Joseph Amankwah-Amoah et al. (2021) have categorized the barriers of digitalisation as following: technology infrastructure (technology and digital divides); institutional constraints (institutional impediments, for example lack of government for digitalisation); security and privacy concerns (lack of businesses' confidence in their ability to withstand the threat from cyberattacks) and organizational level constraints (lack of technical expertise to facilitate digitalisation); all of them being accompanied by proposals for removing the barrier. The proposals might include investment in infrastructure; investment in human capital and creating a network of support for businesses to achieve the transition from on-site to online operations.

Meanwhile, because nowadays, the digital economy is an essential part of the economic environment, the Digitalisation Index (DiGiX) assesses the factors, agents' behaviour and institutions that enable a country to fully leverage Information and Communication Technologies for increased competitiveness and well-being. The DiGiX index represents a composite index, which is structured around six dimensions: infrastructure; household adoption; enterprises' adoption; cost; regulation and contents (Cámara and Tuesta, 2017).

As the working paper shows, after summarizing the relevant indicators on one hundred countries' digital performance, the first three countries are: Luxembourg (1.00); United Kingdom (0.97) and Hong Kong SAR (0.95) while the last three countries based on the DiGiX index are: Nicaragua (0.06); Cameroon (0.05) and Algeria (0.00). Therefore, the disparity of digitalisation and technology between the countries of the World is influenced

by the country's geographical position on the Globe, as far as the first two countries based on the DiGiX index are European while the last three countries are based on small American islands or in Africa. But this inconsistency is noted even in the same continent, considering that Luxembourg, United Kingdom, Netherlands, Norway, Finland and Sweden are in the top ten of Digitalisation Index, while Moldova is ranked 73rd (0.33), Serbia is ranked 79th (0.31) and Albania is ranked 84th (0.26) (Cámara and Tuesta, 2017).

Considering that every country is analysed by its own level of technology's development and potential of digitalisation, while adding the fact that technology and digital divides between countries, or regions from the same country, it is noted that the same level of digitalisation cannot be achieved in every country and cannot be applicable for every business embraced by the global economy, which is an inconvenient for the economic environment. At the same time, the fact that digitalisation and implementation of modern technologies require investments that tend to be costly for businesses, especially for the small ones, it is not a detail to be forgotten.

Due to these aspects, companies and businesses can access technological opportunities in order to create new smarter business models based on social trends that will attract the new generation of consumers which has appeared after the COVID-19 pandemic. At the same time, during the pandemic, businesses by the actions that has been taken, have established the need for a more sustainable business model innovations based on the sustainability problem, digitalisation and the technological opportunity and the changes in consumer preferences and lifestyles (Jørgensen and Pedersen, 2018).

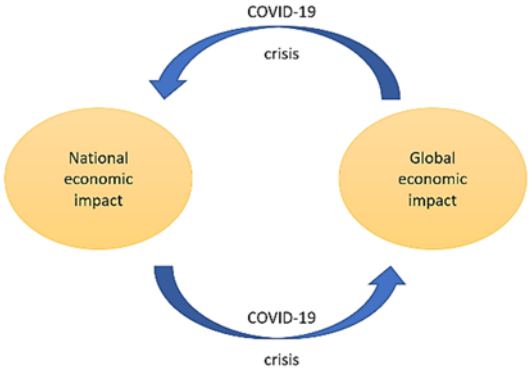
3. The economic impact of COVID-19 crisis

Unfortunately, the outbreak of the COVID-19 pandemic conducted multiple negative effects globally and on local national economies, since globalisation linked one country's economy to another, and the global economy is nowadays conjoined by every single local economic environment.

Between the negative impacts on global scale, can be encountered a wide range of effects, starting with severe contraction of GDP (Gross domestic product) in many national economies, and ending with multi-dimensional environmental and social issues of socio-economic activities, such as: millions were quarantined; borders were shut; school were closed and shifted to an online regime; trade fairs and entertainment events and competitions were cancelled; the unemployment rate has drastically increased by millions while nationalism and protectionism re-surfaced as ways for countries to protect themselves from the COVID-19 pandemic (Ibn-Mohammed et al., 2021).

Meanwhile, the COVID-19 crisis, while distorting the business environment, also revealed the absolute lack of resilience of the dominant economic assumptions to adapt and adjust to unplanned shocks and crisis, exposing the weakness of over-centralization of the global supply-chain and the weak links across industries on local and global levels (Ibn-Mohammed et al., 2021).

Figure 2. *The cycle of economic impacts of the COVID-19 pandemic*



As presented in Figure 2, the national economic impact will reflect on the global economic impact and the other way round. This connection is possible due to the prominent level of globalisation applied to the global economy that was constructed based on the co-operation between countries and economies.

Hence, the most important aspect of the implications of the COVID-19 pandemic over the economic environment it's the fact that once the borders have been shut, the global supply-chain has been disrupted as well, and as a consequence, the countries discovered not in the best conjuncture that nowadays, every local economic system is linked with the others and that individualism is not a proper way of developing a national economy in the actual economic environment.

4. Redefining and restarting business with digitalisation

Since many businesses have been closed in the beginning of the COVID-19 pandemic, the need for reopening come with many other responsibilities alongside a safe environment for the employees and consumers and prioritization of critical business processes to reduce the negative impact of the pandemic (Pronk and Kassler, 2020).

During the breakout of the COVID-19 crisis and after that, the business environment embraced the idea of digitalisation more and therefore, the sudden acceleration of digitalisation emerged, even for the businesses that were reluctant over new technologies. Hence, the adoption of digital and technological solutions has been proved to be the most efficient answer for many companies, as being able to switch from on-site to online remote working, while keeping their efficiency in the given circumstances (Pinzaru et al., 2020).

The answer has been proved by the fact that over time, the businesses that adopted digitalisation measures are the ones that also kept their economic activities on going while the COVID-19 crisis was impacting the global economy, and as the economist John Maynard Keynes (1938) affirmed: "Economics is a science of thinking in terms of models joined to the art of choosing models which are relevant to the contemporary world". This statement confirms that embracing digitalisation was the most efficient solution for redefining and restarting business (Dasgupta, 2020, p. 21).

As following, there are two categories of business models that can summarize the aspects and the impacts of the economic impact determined by the COVID-19 pandemic: the winners and the losers. The winners are the businesses which were not mandated to close their operation while being able to switch to online selling and marketing, taking the advantage of support programs during the pandemic. On the other side, the losers include business which were forced to close their activity and were not offered any financial compensation while taking into account the fact that the businesses were not prepared or did not own the technology to digitalize their operations (Dąbrowska et al., 2020).

In response and for reducing the national and global economic impact of the COVID-19 pandemic, the business environment has been coerced to implement new approaches for efficient and sustainable rebuilding operations (KPMG, 2020):

- usage of artificial intelligence and big data for more robust supply chain platforms;
- incorporation of tax optimization into the current financial analysis;
- usage of the cost-to-serve indicator as to the foundational performance metric;
- modelling scenarios.

As far as digitalisation and its effects can be considered on three distinct levels: technology; organisation; workers and employees (Harteis, 2019), the business environment must consider each level while implementing and developing technologies for digitalisation. If one of the levels is passed over, the efficiency might decrease as the conception of digitalisation is to ease the operations on a general level, for businesses to adapt to the new digital era for their economic activities.

Meanwhile, while small businesses and big companies have been able to overcome the impact of the COVID-19 crisis by adopting and implementing modern technologies for digitalisation in this era of digital economy, it is difficult for governments to plan the economy in advance, considering the fast-paced development of the technology. Therefore, the market itself shaped by the business environment must play a leading role, especially when the exploration of digitalisation possibilities is going to be accelerated by the challenges posed by the pandemic.

A study (Rapaccini et al., 2020) conducted in Italy, on Italian manufacturing firms, showed that for overcoming the impact of the COVID-19 pandemic:

- about 57% of the respondents claimed that the innovation initiatives are correlated with digitalisation and the implementation of new technologies;
- businesses in the same countries have achieved various levels of digitalisation;
- numerous respondents are still completing the introduction of consolidated service management technologies.

Therefore, despite digitalisation being the key for development in the actual economic environment, many businesses are still developing their technologies in order to achieve the most efficient outcome from the impact of the COVID-19 crisis.

5. Conclusions and further discussions

As Fareed Zakaria affirms in his book "Ten Lessons for a Post-Pandemic World", even if by 2018 most of the world was connected, COVID-19 was the breaking point for overcoming the remaining obstacle for a digital future – human attitudes. While some were still reluctant to send card information over the Internet, others would never think of taking a class online, but the pandemic and the lockdowns linked to the COVID-19 crisis compelled changes in behavioural approaches, not just for individuals, but businesses too. Since then, most of the companies from Europe and America reveal that they "intend to permanently shift some of their jobs off-site, in the belief that they can maintain productivity while giving workers more flexibility and cutting office-space costs." (Zakaria, 2020, p. 73), which supports the main goal of achieving an elevated level of digitalisation overall.

In the new modern service-oriented economy, which is using mostly by all the developed countries, collaboration nowadays is conducted by the intellectual teamwork without the physical connection, by the usage of videoconference applications and platforms, while most likely a new hybrid model will be the "new normal" for business approaches in the near future, adopted by the emerging markets as well.

Meanwhile, even if digitalisation played a significant role in restarting and reorganizing businesses, the main decisions adopted by the businesses have been also influenced by the organizational culture and their management strategy, hence the sustainability of each business' digitalisation depends on their own adaptability to pass the test of time.

Therefore, the pandemic certainly has "opened the door to a much broader transformation" (Zakaria, 2020, p. 74) which will exercise pressure on businesses to adopt the latest technologies available on the market to achieve their digitalisation goal.

But in this case, a few questions deserve to be discussed:

- Is digitalisation the only instrument that can be used to overcome a crisis?
- Since the research has been transformed into competition, how long will it take to start the next major Industrial Revolution?
- Was digitalisation by itself enough for reorganizing and restarting business in the actual economic environment?

References

Amankwah-Amoah, J., Khan, Z., Wood, G. and Knight, G., 2021. COVID-19 and digitalization: The great acceleration. *Journal of Business Research*, *136*, pp. 602-611.

Cámara, N. and Tuesta, D., 2017. DiGiX: the digitization index. [pdf] BBVA Bank, Economic Research Department. Available at: <https://afyonluoglu.org/PublicWebFiles/Reports/2017%20BBVA-Digitization%20Index.pdf> [Accessed: 30 March 2022].

Dąbrowska, K., Koryński, P. and Pytkowska, J., 2020. Impact of COVID-19 Pandemic on the Microfinance Sector in Europe: Field Analysis and Policy Recommendations. [pdf] Microfinance Centre (MFC). Available at: <http://mfc.org.pl/wp-content/uploads/2020/10/Impact-of-COVID19-on-MF-sector.pdf> [Accessed 29 March 2022].

Dasgupta, P., 2020. *Economie: o foarte scurtă introducere.* București: Editura Litera.

Harteis, C., 2019. Supporting Learning at Work in an Era of Digitalisation of Work. [pdf] UNEVOC Network, Work-based Learning as a Pathway to Competence-based Education, pp. 85-97. Available at: <https://pefop.iiep.unesco.org/en/system/files/resources/pef000303_bibb-unevoc_work-based_learning_2019_0.pdf#page=86> [Accessed 27 March 2022].

Hiscott, J., Alexandridi, M., Muscolini, M., Tassone, E., Palermo, E., Soultsioti, M. and Zevini, A., 2020. The global impact of the coronavirus pandemic. *Cytokine & growth factor reviews*, *53*, pp. 1-9.

Ibn-Mohammed, T., Mustapha, K.B., Godsell, J., Adamu, Z., Babatunde, K.A., Akintade, D.D., Acquaye, A., Fujii, H., Ndiaye, M.M., Yamoah, F.A. and Koh, S.C.L., 2021. A critical analysis of the impacts of COVID-19 on the global economy and ecosystems and opportunities for circular economy strategies. *Resources, Conservation and Recycling, 164*, pp. 105-169.

Jiang, X., 2020. Digital economy in the post-pandemic era. *Journal of Chinese Economic and Business Studies, 18*(4), pp. 333-339.

Jørgensen, S. and Pedersen, L.J.T., 2018. *RESTART sustainable business model innovation* (p. 253). Springer Nature.

KPMG, 2020. Operations restructuring for a post-COVID-19 world. [online] KPMG. Available at: <https://assets.kpmg/content/dam/kpmg/xx/pdf/2020/08/restarting-supply-chain.pdf> [Accessed: 30 March 2022].

Pinzaru, F., Zbuchea, A. and Anghel, L., 2020. The Impact of the COVID-19 Pandemic on Business. A preliminary overview. *Strategica. Preparing for Tomorrow, Today*, pp. 721-730.

Pronk, N.P. and Kassler, W.J., 2020. Balancing health and economic factors when reopening business in the age of COVID-19. *Journal of occupational and environmental medicine, 62*(9), pp. e540-e541.

Rapaccini, M., Saccani, N., Kowalkowski, C., Paiola, M. and Adrodegari, F., 2020. Navigating disruptive crises through service-led growth: The impact of COVID-19 on Italian manufacturing firms. *Industrial Marketing Management*, *88*, pp. 225-237.

Zakaria, F., 2020. *Ten Lessons for a Post-Pandemic World*. New York, NY: W.W. Norton & Company.

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 216-222

Opportunities and challenges for communication and bureaucracy of public institutions

George-Alexandru ISTRATE
Valahia University of Targoviste, Romania
georgeistrate88@gmail.com

Abstract. *The communication of public institutions is constantly changing. The new coronavirus pandemic has brought new challenges to public administration. The bureaucracy within the public institutions is more and more cumbersome and produces unpleasant conditions among the citizens, but also among the civil servants. Employees have had to change their way of working and acquire new digital skills to implement in order to be able to work according to the new communication requirements and strategies. The use of ICT (New Information and Communication Technology) is implemented to facilitate the flow of information and to create opportunities for public institutions to increase their performance by simplifying their activities.*

Keywords: public institutions, bureaucracy, the use of ICT, challenges to public administration.

JEL Classification: D73, H10, L32, O30.

Introduction

Human experience provides in-depth coverage of the changes in institutional, policy and practical terms that took place during the pandemic. It offers a unique perspective on people's experiences and their impact on institutions and society in general.

The quality of public institutions is represented by the actions and services offered by civil servants to the external environment, in this case the citizens. The state in endless queues, wasted time waiting for documents that often proved to be erroneous for various reasons. The bushy bureaucracy has created anger and dissatisfaction among the citizens. Social networks have become a real benefit for public institutions, especially during the Covid-19 pandemic, practically helping citizens to communicate with public institutions. Social media offers both employees and the general public a great opportunity to quickly spread information to a large number of individuals. This is an effective way to increase the impact of information. Making a positive change within the organization is always welcome. Social networking sites such as Facebook, Twitter and Pinterest, Instagram, etc. are free to join and offer a range of features, including an opportunity to share information quickly. Joining a social network can provide facilities for the public institution. Social networks provide an excellent platform for disseminating information to the public, but also allow the public to reach the source directly. Public administration officials can play an extremely important role as reliable sources on social media to support the dissemination of new information as it becomes available and to address citizens' concerns.

Expert communication officials create the content of messages with concrete data in advance, which means that they have the opportunity to become a trusted source, to spread information and to build relationships with the public. Through social networks, civil servants can also share accurate information by providing links that provide concrete data to citizens. Communication strategies are essential in collaboration with the external environment, with citizens or with economic and social factors.

Strategic communication and crisis communication

Strategic communication and crisis communication are similar but different. A strategic communication plan is a communication strategy designed to strengthen an institution's reputation and help it succeed in a competitive environment. A crisis communication plan is a strategy designed to protect the public institution from or prepare for a crisis, such as a natural disaster, political scandal, the introduction of wrong products, financial or accounting problems. This type of communication is reactive, not proactive. The purpose of crisis communication is to limit the negative effects of a crisis on the public institution. Leadership must accelerate the dissemination of accurate and complete information about the crisis.

Information management means collecting and disseminating crisis information. At its most basic level, crisis communication means being aware of and responding to what is being said in the media and online, if necessary. It's also about what you should say as an organization. The key goal here is to manage the flow of information so that there are no

contradictions in the messages. Crisis communication has two elements: information management and meaning management.

Information management provides a framework for collecting and processing information to help make decisions. Internal information management consists of the internal collection, evaluation, storage and distribution of relevant materials. External information management involves two stages:

1. informing stakeholders about a danger and
2. communicating with these parties during periods when the crisis is active and disseminating responses (e.g. press releases, site and online announcements).

Crisis management planning helps an organization prepare for a crisis and manage risk by focusing on prevention and guidance before, during and after a crisis. Successful crisis management is associated with the organization's ability to build a credible image within the community and among its stakeholders. Crisis management plans may include the management of internal and external information, which helps to properly inform all stakeholders.

The role of good planning creates new opportunities in times of crisis. The Covid-19 pandemic has taken public institutions by surprise, but has also created new opportunities, both at the individual level of employees and as a whole, at the institutional level.

Covid-19 pandemic, opportunity or crisis for public institutions?

Communication is playing an increasingly important role in public institutions, creating professional connections between employees, and in turn, they add value to organizations. As we all know, in 2020 we were severely hit by the pandemic with the new coronavirus and the term social distancing was created, which restricted citizens from socializing, radically changing the design of people's lives. Public institutions were taken by surprise, as they did not have a contingency plan. Panic was the first to set in motion, which created an emotional crisis. The emotional crisis turned into a professional crisis. The pandemic has eliminated any other topic from the agenda, the only topic being how we manage to get out of this pandemic crisis or what are the levers to get over this virus.

One of the most important lessons of the last few years of research in crisis communication is that crisis response efforts should not be considered in isolation. One of the best attested findings in the crisis communication literature is that the classical hypothesis of a single universal strategy used during a crisis, the most appropriate according to the needs of each institution, is not enough. Possible crises and strategies during them must always be taken into account.

The economic and social effects of the pandemic have been devastating. Many countries have provided relief funds to help alleviate the burden, but it is important that public institutions take responsibility for their customers and employees, facilitating the tax filing process, managing business transactions and protecting their employees from financial insecurity.

Thanks to wireless communications, people around the world can stay connected during a pandemic. Communication is more important than ever, because without it, the world stops. During the Covid-19 pandemic, wireless technology helped employees stay connected so they could work from home. 5G technology is the new generation of connectivity. It is an opportunity that Romania must receive in order to achieve economic growth. The effect of the installation of such technology can support public institutions, thus helping citizens to have a more efficient collaboration by sending documents and receiving them in a very short time, thus managing to simplify the bureaucracy established over the years in public institutions.

Institutional bureaucracy. Negative effect on citizens

Bureaucracy has become a very common word used in our culture that refers to organizations and is often used negatively. It is increasingly being used as a way to describe an organizational structure that allows the government to extend its control over its citizens, with little or no input from its citizens. A group of German sociologists and economists, O. W. Schulz and H. Schmölders in the early twentieth century, began to deal with the phenomenon of bureaucracy, being especially interested in explaining the basics of differentiation within a state apparatus (O. W. Schmidt). The first economic analysis of the bureaucracy was made by Ludwig von Mises. He assumes that the public sector acts through bureaucrats who are given democratic elections and have a monopoly on coercion. In the words of Ludwig von Mises (1944), "The task of the bureaucrat is to ensure the maximum benefit from the available resources" and "It is not his task to ensure that – with regard to those uses for which he cannot be prevented from - as far as possible it is produced at the lowest cost" (quoted in Coyne, 2007, p. 11). Professor Gordon Tullock, known as one of the fathers of the economic analysis of the public election, has studied bureaucratic structures, especially in public and administrative organizations.

He focuses on bureaucracy, explaining how bureaucrats behave in bureaucratic structures. Tullock distinguishes between political and economic relations. Tullock's main question is about the nature of bureaucracy. He emphasizes the limitations of bureaucracies and argues that bureaucrats are not always self-service and play a crucial role. Bureaucratic behavior is seen as a matter of behavior rather than as the property of an organization (Buchanan and Tullock, 1995). The work of Buchanan and Tullock is relevant because it offers a different point of view from which public administration and organizations in general are perceived. In addition, their work helps to solve economic problems related to the organization of companies, such as: legitimacy and efficiency. Buchanan and Tullock describe the development of their theory of public choice, with the intention of specifying new directions of research in political science. In this description, researchers are trying to convince the public that their own theory is extremely effective and necessary. Equally important is the recognition of the work of others as relevant literature, which has paved the way for the perspective of public choice offered by them. Convenience and the public interest were two concepts that were applied in bureaucracy theories to explain the behavior of a bureaucrat. A bureaucratic model is usually presented as a producer who has to

maximize his production under the constraints of his limited resources. This type of model was first introduced by A. Downs and then by G. Tullock and A. Downs in the early 1970s.

The effect of bureaucracy in Romania

Bureaucracy is the name given to a certain method of creating, implementing and managing activities in organizations. The classic form of bureaucracy was proposed by Max Weber as a way to control the activities of a public institution. He argued that modern Western society was becoming more and more bureaucratic. Bureaucracy has therefore become a way of describing how people in a modern institution have organized themselves. According to Max Weber, bureaucracy was the most effective way to set up an organization.

Every day, in Romania, millions of people suffer because of bureaucracy. Romanian citizens are frustrated by the amount of bureaucracy they have to face in order to get things done. Research shows that it is almost impossible to get a simple building permit, or a document required in a short time, without having to wait another thirty calendar days. It is clear that at certain points in their work, public institutions face problems such as lack of motivation of employees. At such times, the bureaucratic system of public institutions causes a lack of cooperation between the institution and its external environment: citizens, investors, businessmen and other state institutions.

The main problems and effects generated by the bureaucracy that the Romanian institutional system faces are the following:

1. Lack of a communication strategy; this is the first problem in public institutions. Without a communication strategy, information can be transmitted in an erroneous way, on communication channels that the sender can master well, but the receiver does not.
2. Lack of digitization; the pandemic of the new coronavirus has forced public institutions to invest in digitization, as access to it has been restricted due to the virus. The lack of digitization of public institutions will create major frustrations to the detriment of citizens through hellish queues and long waits for documents that can be handed over via the Internet.
3. Lack of continuous training courses; Training courses play a particularly important role in public administration. These have to be done continuously because technology is evolving and according to it, the hired officials have to be in trend with it, but also with the laws which, in turn, also change quite often.
4. The circulation of documents is cumbersome; In most cases, many people, both employees and those who come into contact with them, are forced by the bureaucratic system in which they operate to travel with all kinds of documents and files from one department to another or from one state institution to another for different purposes, there is a risk that these documents will be lost or forgotten.
5. Lack of transparency; this is another problem for public institutions. Lack of transparency in public institutions can lead to corruption and, implicitly, to a decrease in mistrust. Access to information should be easy and accessible to anyone by posting on the notice board, on the official website or through the local media.

6. Employees' reluctance to use modern equipment; many employees of public institutions believe that the use of rudimentary techniques is the best way to perform daily tasks. Most of them are over 50 years old and consider that the new work techniques, computers and programs that have appeared are useless. This type of behavioral thinking leads to a decrease in efficiency, by delaying the performance of work tasks. They avoid using them due to maladaptation and unaware that these techniques, programs, and computers will improve their individual performance.

The effect of the pandemic on the new coronavirus has been to create opportunities for public institutions through online programs and platforms through which citizens can collaborate with public institutions and thus gain time and thus reduce the level of bureaucracy.

New normalcy

In this section, we review the wireless technologies that developed even more during the pandemic and can be used in the post-pandemic era. Mobile phones, e-mail and other wireless technologies have proven vital in organizing resources during the pandemic. These technologies will have a major impact on society in the post-pandemic era.

Digital communication is a huge industry. Understanding the basics of what it is and how it works will help employees communicate more effectively in business relationships. New technologies such as integrated internal communication programs or social networks are designed to support public institutions and to convey information in a secure and clear way. The information must be as secure as possible, and its transmission must be from a reliable source, given that confusion can be created today due to the lack of clarity of the information transmitted. Modern means of communication through the new information and communication technology must be official, promoted and respected by employees. Those official pages of websites, public institutions, e-mail addresses, social media pages are ways to convey information to the interested public. Any other sites or social media pages may be corrupted, as a result they may retrieve information and transmit it in an interpretable, defective, intentional or unintended manner.

Many institutions have implemented programs through which they can collaborate with each other, but also with citizens in terms of issuing documents in electronic form. This could be beneficial, eliminating the high level of bureaucracy, but also having a positive impact on the environment, as there is no need for a large volume of paper.

Conclusions

Obviously, bureaucracy is the biggest obstacle for Romania's economic development. It is a fact that any Romanian citizen can confirm. The bureaucracy is created and unchanged, so for this reason it cannot be as flexible and creative as it should be.

A document management system that will be able to: reduce the high costs of finding lost or damaged documents and reduce the waiting time from citizens, businesses and investors who obtain information from state institutions or departments.

In order to improve the functioning of state institutions, the document management system must be implemented, which will result in a reduction of the authorities' expenses by maintaining the existing documentation, rules and regulations relevant to specific cases. This also reduces the delay in obtaining information and services to citizens.

In conclusion, we strongly believe that the network of the future will play a significant role in winning the fight against pandemic disruption in everyday life. The need for advanced communication technologies is paramount. Notably, we see extraordinary opportunities for investment and development in this area. Our view is that funding should be aimed at developing a simple-to-use, conceptually flexible and interoperable wireless IP infrastructure, on which new applications can be added (pushed) and removed (pulled) progressively, as needed.

We believe that a bright future awaits us as long as we open our eyes to the possibilities. Wireless communication technologies have already proved crucial in addressing the immediate and day-to-day needs of government workers and officials, especially in the midst of a pandemic. Wireless communications opens new doors for the institutional community, enabling virtual education and conferencing, while providing a way to monitor activities.

The rapid development of communication technologies ensures a technological transformation in the future. Historically, the most notable technological development took place during the Covid-19 pandemic, where wireless communication technologies provided an effective framework for coordination between institutions, citizens and economic operators.

References

Buchanan, J.M. and Tullock, G., 1995. *Calculul consensului. Fundamente logice ale democraţiei constituţionale,* Expert, Bucureşti.

Coyne, C.J., 2007. *The Politics of Bureaucracy and the failure of post-war reconstruction,* Springer Science+Business Media, LLC.

Franc, I.V., Popescu, C. and Ristea, A.L., 2020. *Metodică în cercetarea ştiinţifică,* Expert, Bucureşti,

Goleman B., 2019; *Emotional Intelligence: For a Better Life, success at work, and happier relationships. Improve Your Social Skills, Emotional Agility and Discover why it can Matter More Than IQ.* (EQ 2.0), Independently published, London.

Maxwell, J.C., 2010. *Everyone Communicates, Few Connect: What the Most Effective People Do Differently,* Thomas Nelson.

DeVito, J.A., 2017. *The Interpersonal Communication Book,* 5th Edition, Pearson Publishing, New York.

Van Wart, M., 2017. *Leadership in public organizations: An introduction.* Taylor & Francis New York.

Theoretical and Applied Economics. Special Issue
Volume XXIX (2022), pp. 223-229

Marketing 4.0 in medical services

Roxana Gabriela VOICU
Bucharest University of Economic Studies, Romania
roxanna.voicu@yahoo.com

Abstract. *The rationale of this paper research concerns the evolution of standard marketing paradigm towards e-Marketing and the new mainstream of Marketing 4.0. A familiar account of marketing was about getting best products in the search of best satisfaction for consumers, but social and economic cutting age transformations pushed the market toward new marketing perspectives. Due to pandemics, economic paradigms have shifted, and medical services were to some extent a major field during the pandemic. Underlying this new approach could more integrate the concept of marketing 4.0 in medical services.*
Considering the evidence from this paper, this approach puts forward new highlights of marketing techniques for improving activities within medical field.

Keywords: marketing, medical services, medical care, paradoxes, netizens.

JEL Classification: A11, A12, B13, I31.

Introduction

Marketing evolved through time, and globalization, pandemics or other non-cyclical crises changed the perspective over the strategy of getting best products in the best manners towards customers. Objectives of analyzing marketing 4.0 applications for medical services leads to: identifying the advantages of marketing 4.0 in medical services in Romania; adapting the marketing mix to IT; identifying the new type of consumer in general, and the new consumer of health services in particular; analysis of the impact of connectivity, as well as the holistic theory of connectivity; understanding the marketing paradoxes applied to customer interconnectivity.

Social marketing could also be used as a part of Marketing 4.0 which is applied commercial strategies to provide public health or medical services. Andreasen (1995, p. 23) defines this concept as "application of proven concepts and techniques drawn from the commercial sector to promote changes in diverse socially important behaviors such as drug use, smoking, sexual behavior... This marketing approach has an immense potential to affect major social problems if we can only learn how to harness its power". Social marketing can use methods derived from health behaviour and marketing mix matrix. Social marketing could be integrated in general marketing mix in order to influence behavior customers for medical services. Communication techniques are paramount importance for this, as in communication channels for health information have changed greatly in recent years.

Marketing 4.0

The main purpose of this chapter is twofold: to reveal the evolution of marketing paradigm up to the point of evolution towards Marketing 4.0, as well to analyze applications for different field of services.

Automation of knowledge, mobile internet, object internet, cloud technology, advanced robotics, 3D printing technology has increased productivity, but it has also brought fears of losing jobs. Various social and economic side effects could increase: 3D printing can also be misused to produce weapons at home, and mobile phones can affect relationships because people no longer pay attention to their current environment. Moreover, they become able to manage huge networks of "friends" through social networks, but in fact they have lost empathy for family and close friends. These technologies mark the latest change in marketing from 1.0 to 4.0:

- Marketing 1.0 – product-based marketing.
- Marketing 2.0 – customer-centric marketing.
- Marketing 3.0 – human-centered marketing.
- Marketing 4.0 – combined online and offline interaction between companies and customers.

In the early days of marketing, companies focused on what to offer (product and price) and how to offer (place and promotion). Instead, in a connected world, the concept of marketing mix (the previous 4 Ps) should be redefined as the four C's (co-creation, currency, communal activation, conversation). Customers request access almost instantly, and

sometimes the products are owned by other customers (Airbnb, Uber) and their ratings are discussed on conversation platforms between prospective customers. The sales paradigm has completely changed. Customers are no longer just a passive target of sales techniques. Their share has increased by sharing market power (Kotler et al., 2017).

Connectivity changes the paradigm of the classic vision of the "brick-and-mortar store", i.e. the store as a physical space for meeting demand and supply. People choose and buy after a number of market shortcomings:

- Accelerate the pace of life.
- Decreased attention.
- Customers have difficulty concentrating.
- Exposure to too much of everything due to multiple online and offline channels.
- Confusion through advertising too good to be true.

To all this, the client responds by appealing to a social circle of friends and family. AIDA (attention, interest, desire, action) is a classic framework for understanding the path of clients. The ad campaign, after bombarding customers with high-volume ads, should have expected:

- Attracting attention.
- Initialization of interest.
- Emphasizing the need.

Application of the action Dereck Ruccker (Kellogg School of Management) proposed a modernization of AIDA to the four A's (Kotler et al., 2017):

- Aware – customers learn about the brand.
- Attitude – customers like or dislike the brand.
- Act – customers decide whether to buy it.
- Take action again – customers decide if the product is worth buying again.

The purpose of this AIDA update is to monitor customer behavior after purchase, as well as their loyalty and loyalty. It was pre-connectivity vs. Marketing 4.0: Individual customers have determined their own attitude towards a brand. In the age of connectivity, the appeal of a brand is based more on the community around customers. There is an increase in the social influence of the circle of trust of family and friends on the products.

In the pre-connectivity era, loyalty was defined mainly as retention and buying. Marketing 4.0 defines loyalty as the desire to support the brand and continue to recommend it. Clients are now connected to each other, active in forums, reviews, and sharing personal experiences. In the light of pre-connectivity vs. Marketing 4.0 analysis, AIDA turns into: Awareness – Call – Request (Ask) – Action – Advocacy. There are three main sources to drive customers from awareness to brand advocacy.

The decisions of the customers in the five A matrix take into account:

- Self-influence – personal preference, aspiration, education.
- The influence of others – it comes as a word of mouth, from family and friends and the different communities of which customers are part.
- External influence – comes from external sources, through advertising.

It can be controlled within the management process of the company. Customers are influenced by all three, albeit to varying degrees. But despite the education and the huge amount of money spent on advertising campaigns, in Marketing 4.0 customers rely mostly on the influence of others. Nowadays, between 85-90% of customers rely on family and friends as the most trusted sources, and 65-75% rely on feedback and evaluation from previous customers. The level of experience and the purchasing path of first-time buyers take the path of the entire five A matrix based on external influence. Buy based on brand advertising and high volume. Until they become experienced, they will rely mostly on others. And finally, after they finish the process of research, they will control their own purchasing decision.

Paradoxes within the marketing process

The paradoxes of digital marketing follow the following coordinates: Online interaction vs. offline interaction.

Online business will never be able to replace offline business. In an increasingly high-tech world, physical interaction still makes a difference: health services need face-public interaction, because health as service demands more empathy from the consumer. Also, there is an appeal and anti-advertising (Negative advocacy) versus positive advocacy. This way it is possible to analyze the way connectivity makes it easier for people to express their opinions:

1. Promoters – recommend the brand (medical institution).
2. Passive-neutral.
3. Detractors, haters, dissatisfied – unlikely to recommend, or worse, recommend avoiding the brand.

Supporting the promotion of medical services through the YWN (youth-women-netizens) concept "Y-Youth for mind share, women for market share and N-netizens for heart share". (Philip Kotler) YWN is the most influential stakeholder formula in the digital age of marketing. They represent a subculture whose beliefs are outside the mainstream, the classical paradigm. Stakeholders outside the mainstream are: cosplayers and Tik Tok users, homeschoolers, hackers. They come in overwhelming proportions from the youth, women or citizens who depend on the net and have life calibrated around it, called netizens (from citizens). They used to be considered minorities, but now the situation has changed. In the past, authority and power belonged to seniors, men and citizens with related civil rights, who had secure incomes and purchasing power. Now it is a diversion to a new audience of young people, women and netizens (YWN). YWNs are hard to impress, but once they are earned and impressed, they become pillars of supporting and promoting a medical institution for certain services (Hauben and Hauben, 1997).

Young people are now setting trends even for seniors, who have traditionally harmed health care consumers. Young people usually set trends for music, movies and other modern art, sports, fashion, technology. It is also related to technology that the habit of contacting medical services on the basis of IT can be dissipated from young people. The role of young people is to influence other consumers in a service market for the following reasons:

- Adopt the new very quickly.
- They are rebels and activists against the system, or in other words, they love what they hate adults, conservatives and older generations. They are eager for new experiences, trying new products and services that conservative consumers avoid because they find them unsafe and risky. Thanks to young people, the iPod has been successful since 2001, Netflix since 2010 and possibly some newer health services.
- They set the trends, or give substance to the new ones already existing (Trendsetters).
- They want everything, and they want it very quickly, or immediately. The use of information technology accelerates this impatience of theirs. They follow and develop trends so fast that the producers of those goods themselves do not keep up with them. (Kotler et al., 2017). And he generally aspires to a digital lifestyle and uses Facebook, Twitter, Spotify, Apple Music.
- They support change and are open to challenge (Game changers): young people's behaviors are usually associated with selfishness and irresponsibility. But today's young people are also maturing much faster, because they are responding quickly to changes such as globalization, non-cyclical economic crises such as the Covid-19 pandemic, and technological progress. These make young supporters demind-share.

Women, as Rena Bartos (1988) says in her book *Marketing to Women Around the World*, show the following market segmentation:

- Housewife.
- Housewife with promising professional activity.
- Employee.
- Career woman.

As can be seen, women are focused on work and family. They often have to look for a balance between them, but many women are successful in coping with multitasking and are better managers when it comes to complex activities, housework, complex tasks at work, or a little (Kotler et al., 2017). Women are usually the financial managers of a family, and this is because they have the patience to complete the time-consuming process of always finding the best offer or value for money. Men usually find this process difficult. That is why women become the basic members of the supply and recommendations for family, friends and relatives. The contribution of women in the selection of goods and services is essential. Women are also the ones who take care of their families' health. The role of women in influencing the consumption decisions of others (Sriram et al., 2006).

Women are usually the financial managers of a family, and this is because they have the patience to complete the time-consuming process of always finding the best offer or value for money. Men usually find this process difficult. That is why women become the basic members of the supply and recommendations for family, friends and relatives. The contribution of women in the selection of goods and services is essential. Women are also the ones who take care of their families' health. The role of women in influencing the consumption decisions of others is based on the following:

First of all, women collects information. A woman's decision-making process is generally different from a man's decision-making process. Men often focus on short-term goals and the simplest ways to achieve their goals in order to get things done as quickly as possible.

On the contrary, women study reviews and feedlots, information and prospects for use, request additional information from trusted people, family and friends, and do personal research to find the best products and services (Martha Barleta). The same principles apply to medical services.

Second, women are holistic buyers. Women buy for the whole face, the intimate circle, the close circle, not only for them.

Third, they are the managers of the household. The women control the finances, the purchases, the family goods. Almost everyone in society relies on women. Women take care of everyone, it is practical in their nature to open their home. These make women market share advocates. Netizens (Net + Citizen Word) are people who go beyond the physical boundaries of the market through the internet, work with it and support it, for the benefit of the whole world (Hauben and Hauben, 1997). Netizens are important because they don't need space, but at the same time they can get anywhere they want and do virtually anything they want, based on the fact that they can anonymously express their opinions and feelings about the goods and services of certain brands or institutions. They are the ones who get the ratings, comments and content posts that others read.

Netizens can be: inactive, viewers (watch and read content online), partners (use social media and are active on the net), collectors (use add tags on web pages, post tags on social media), criticisms (post ratings and online feedback), creators (create and publish content online).

Their role in influencing others in the market is given by the following facts:

- They are social connectors.
- They use Facebook, WhatsApp, Instagram, Twitter, LinkedIn in trusted groups, and then extend that trust to larger groups.
- They are evangelists of communication and good understanding: they are opposed to protesters, or internet bullies, who, under the umbrella of anonymity, can be very aggressive. But if netizens are transformed into the three 3-f-factors (followers, fans and friends), they can protect an institution, brand, from the attacks of cyberbullies, protesters.
- Post content and spread knowledge through the net.

Conclusions

In all, marketing 4.0 is coming open to a wide range of options in promoting most appropriates outcomes as goods, services or information to customers. Netizens will change to a large extent the impact of digital marketing. The pandemics made the target public to pay more attentions to medical services, as the scarcity of access to medical inventory and medical staff due to pandemics proved to be very challenging. Within the model of YWN women will keep one of the most influential pie, because along with the statute of chief financial officer of their families, they are also the chiefs of the medical staffs of their families, and the new menaces due to pandemics assign them new tasks.

References

Andreasen, A., 1995. *Marketing social change,* San Francisco, CA, Jossey-Bass.

Bartos, R., 1988. *Marketing to Women around the World,* Harvard University Press.

Hauben, M. and Hauben, R., 1997. *Netizens – On the History and Impact of Usenet and the Internet,* IEEE Computer Society Press, Los Alamitos, California.

Kotler Ph., Kartajaya, H. and Setiawan, I., 2017. *Marketing 4.0 – Moving from Traditional to Digital,* John Wiley & Sons Inc., New Jersey.

Sriram, S., Chintagunta, P.K. and Neelamegham, R., 2006. Effects of Brand Preference, Product Attributes, and Marketing Mix Variables in Technology, *Product Markets,* Vol. 25, No. 5, pp. 440-456.