

# SUSTAINABLE CITIES: AN OVERVIEW

~ Ph. D. Student **Nicoleta T. Petrică** (*The Bucharest University of Economic Studies, Bucharest, Romania*)

**E-mail: [nicoleta.petrica92@yahoo.com](mailto:nicoleta.petrica92@yahoo.com)**

**Abstract:** *The purpose of this paper is to analyze and highlight the essential role and importance of sustainable development in harmony with the environment, in accordance with all approvals in place without endangering the integrity of the environment, natural protected areas, natural habitats, wild flora and fauna. It is increasingly evident that various challenges facing urban areas - economic, climatic, social, demographic and environmental - are closely interlinked and success in urban development can only be achieved through an integrated approach. Most cities produce countless current energy waste and inefficiency. For cities to find a place in the future of the Green Planet, they must transform into pure entities. Among the many actions that a city can take are: urban planning to ensure a moderate density and air quality, efficient public transport system that can replace the individual car, promotion of culture and traditions, integrating disadvantaged people and stimulate people that have potential, encouraging sustainable businesses and restricting large polluters, etc. In 1994, many European cities have signed the Aalborg Charter of European Cities & Towns Towards Sustainability, which respects the principles of Agenda 21 and have the objective of creating the framework for sustainable development of urban areas.*

**Key words:** sustainable development, integrated approach, promoting culture, sustainable business, smart city

**JEL: O1, O44, R11, Q01, Q56**

## 1. Introduction

Until now, economic growth was synonymous with the use of natural resources. This led to a “resource crisis” that could lead to shortages and rising prices. Their excessive use also determined the amplification of the pollution phenomenon. The society reacted. This is how new concepts and relationships among them have emerged, such as ecological economy, green economy, corporate citizenship, social responsibility, smart and sustainable city, sustainable development, or circular economy (Toma, 2008; Marinescu, Toma and Constantin, 2010; Toma, Stanciu and Irimia, 2011; Zainea, et al, 2020), but also solutions to the multiple problems of humanity, which is constantly looking to strategically solve them in a period of continuous change (Toma and Marinescu, 2015). An example is how to build a green economy in connection with sustainable, green, and innovative business models (Toma, Marinescu and Grădinaru, 2016; Tohănean and Toma, 2018; Toma and Tohănean, 2019). Decisions must be made taking into account the total cost, not just the financial cost of an activity. Therefore, let’s see the whole, not just the part (European Commission, 2015).

For an even clearer picture, this paper will try to resort to a detailed research. In a “brown” economy, the cost of cutting down a forest includes only the costs of purchasing land, hiring labor, buying equipment, and manufacturing the final product. In the green economy, however, the total cost of cutting down a forest includes, in addition to the economic cost, the environmental cost and the social cost.

Our consumption of energy and food, buildings and transport has a negative impact on the environment. Improving the construction and use of buildings - for example - could reduce our final energy consumption by 45%, greenhouse gas emissions by 35% and water consumption by up to 30% (NIST, 2014).

Information is important, because more and more citizens of the planet are migrating to cities, so they need houses. Today, 60% of the Earth’s population lives in urban areas. By 2025, 34 cities around the world will have more than 10 million inhabitants. There are currently 26 such cities in the world, and 15 are in developing countries. The United Nations Environment Program (UNEP, 2017) informs us that cities:

- ⊙ occupies 3% of the Earth’s surface
- ⊙ consumes 75% of natural resources
- ⊙ produces 80% of the world’s gross domestic product
- ⊙ produce 50% of the world’s waste
- ⊙ releases 60 to 80% of greenhouse gases into the atmosphere.

The aim of this paper is to illustrate the sense of a term that is gaining in popularity: the sustainable city. This paper explores the literature through definitions and methodology and shows an overview of the main solutions towards a sustainable city or community.

## 2. Literature review

In 1972, the Stockholm Environment Conference (Sohn, 1973) raised, for the first time and in a serious matter, the issue of environmental degradation as a result of human activities. In 1983,

following a resolution adopted by the United Nations General Assembly, the World Commission on Environment and Development (WCED), headed by Gro Harlem Brundtland, began its work. In 1985, the hole in the ozone layer above Antarctica was discovered, and a year later, the Chernobyl catastrophe occurred.

In 1986, the WCED Brundtland Report was published, entitled „Our Common Future“, which also gave the most cited definition of sustainable development – „Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs“. The document acknowledged that economic development could not be stopped, but announced that strategies needed to be changed so that they were in line with the planet’s limited resources. The documents try to reconcile two human aspirations: economic and social development, respectively environmental protection. The conclusions of the meeting can be summarized in several ideas:

- problems should be treated as close as possible to where they occur
- every decision must be modifiable, reversible
- the needs of the current generation must not compromise future generations
- it is better to prevent, instead of waiting for it to happen (Brundtland Report, 1987).

The present research explored in this section the history behind sustainability terminology. In the following sections, it is presented the evolution of this conceptualization to its particular applications involving a diversity of insights from experts. Such an accentuation helps to better understand deployment of the concept which recently is seen as a basis of what it “should be”, more of an idealistic, untouchable action-plan, rather than a framework on the actualities of “what exists” case study that are empowering and can be used as good practices.

### **3. Research and methodology**

This paper describes different methods and solutions for a sustainable city by having a holistic approach with a focus on transitioning to a smart city. Urban cities face many challenges, especially when a city has a dense population for which is needed a local strategy. Certain elements contribute to the scientific research, but further analysis is required for a broad economical, social and environmental perspective in order to be considered and included in municipalities as concrete projects/targets.

### **4. The solutions proposed by the „green economy“ concept**

A study initiated by the World Wide Fund for Nature shows that in Europe (2009), green economic activities provide 3.4 million jobs, compared to 2.8 million in polluting industries: mining, oil and gas, electricity from fossil fuels, cement, metalworking.

For urban development, the green economy proposes and supports:

- replacement of energy from fossil fuels with renewable energy sources
- green buildings with partial or total energy autonomy (BREEAM, etc.)
- wastewater recycling and rainwater collection
- waste management (prevention, reuse and recycling)

- transport (development of public transport and alternative options; use of alternative fuels)
- land management: creation of green areas; regeneration of abandoned areas (Babonea and Joia, 2012).

In 1994, several European cities signed in Aalborg, the „Charter of European Municipalities and Cities for Sustainability” which respects the principles of the Local Agenda 21.

#### 4.1. Sustainable waste

Between 1990 and 1995, the amount of waste generated in the European Union increased by 10% according to OECD sources. Most waste is incinerated or deposited in landfills (67%). Both methods are harmful to the environment. The OECD estimated that compared to 1995, in 2020 45% more waste was generated. That is why the EU has set waste management, prevention, reuse, recycling, recovery („waste hierarchy”) and monitoring objectives. Every year, the EU throws away 5.5 billion euros worth of recyclable waste, such as paper, bottles, plastic, aluminum and steel. If they were recycled, the production of 148 million tonnes of carbon dioxide would be avoided annually. In Europe, more than 500,000 jobs would be created if state members recycled 70% of the waste they produce (Institutul de Economie Mondială, 2019).

#### 4.2. The compact city

The compact city has a higher population density per unit area. Thus, if we compare two large metropolises, Vancouver (11,413 inhabitants / km<sup>2</sup>) and Paris (48,208 inhabitants / km<sup>2</sup>), we can see that the French city is developed vertically and not horizontally. Hence the attribute of „compact city”. The density of Canadians is only 23% of that of the French.

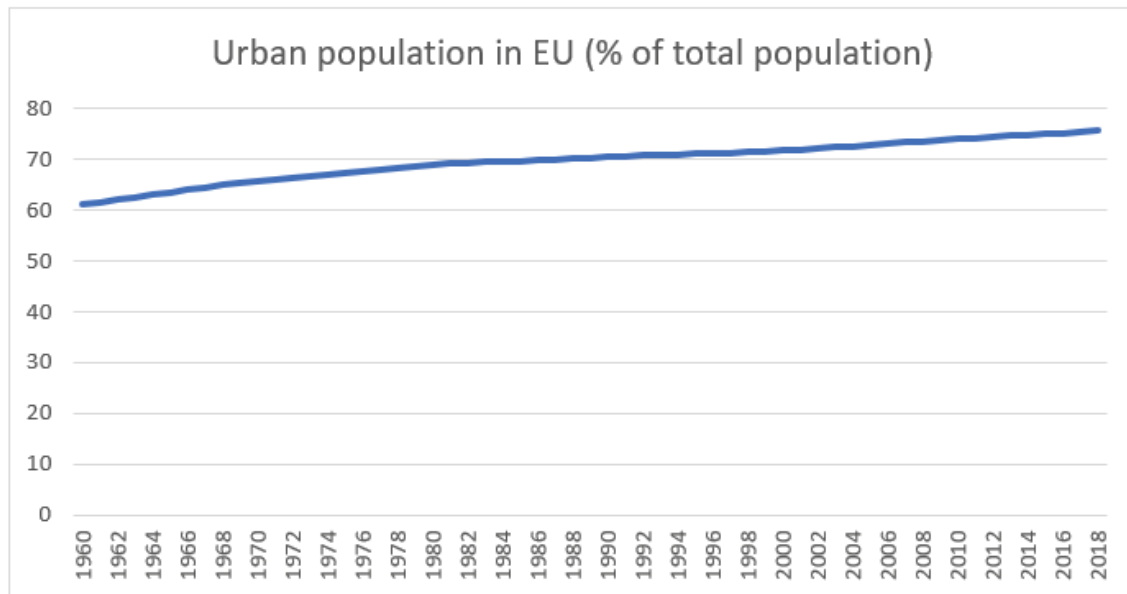
We can also analyze the urban concentration and the area around it. Athens has 3.4 million inhabitants, on a total area of 1,704 km<sup>2</sup>, but only 432 km<sup>2</sup> (25%) is the core of the metropolis. On the rest of the surface, the population density is very low. The same fact, even worse, we find in the case of the city of Atlanta which has 4.6 million inhabitants, a total area of 9,613 km<sup>2</sup>, of which 3,787 km<sup>2</sup> (40%) is the crowded area (OECD, 2016).

#### 4.3. Smart cities and intelligent communities

The smart component of a city has evolved rapidly in recent years from a possibility to a need, included in urban development strategies. Statistics and forecasts of experts in demography and urbanism predict that the world’s population will double by 2050, so starting from this premise we see more and more efforts to transform systems and communities through smart solutions in response to problems related to scarce resources, obsolete networks, limited capacities, urban agglomeration, safety, the need for an integrated management system, etc.

In Europe, there is an ascendent trend related to urban population. In the below figure (Fig. 1.) we can see that starting from 1960 to 2018, the population has shifted from rural areas to urban ones.

Figure 1. Level of urban population % in EU, 1960-2018



Source: Authour's own processing, data provided by Index Mundi, 2021

According to Index Mundi, the urban population in EU was in 1960 at its lowest value of 61.21%, whereas in 2018 was of 75.67%.

In the context of increasing urbanization, the EU and the Member States consider cities to be “laboratories for a more dynamic and digital Europe”, in which measures can be taken to generate growth accompanied by employment and social development. Based on these statements, cities and local communities need to start thinking ahead and planning on how to become environmentally friendly, citizen-oriented, how to use resources rationally, how to generate revenue in parallel with the implementation of smart projects. From this point of view, IT&C technology is one of the few options that can help cities become sustainable, efficient and modern.

Although there are several definitions of the concept of smart city, conceptual variants are common with alternative synonyms to „smart“: „intelligent“, „digital“, „tech“. A few of these definitions are reported in Table 1, where different meanings are given to the „smart city“ concept.

Table 1: Definitions of smart city

Definition	Author
Smart community – a community which makes a conscious decision to aggressively deploy technology as a catalyst to solving its social and business needs – will undoubtedly focus on building its high-speed broadband infrastructures, but the real opportunity is in rebuilding and renewing a sense of place, and in the process a sense of civic pride. [ ... ]. Smart communities are not, at their core, exercises in the deployment and use of technology, but in the promotion of economic development, job growth, and an increased quality of life. In other words, technological propagation of smart communities isn't an end in itself, but only a means to reinventing cities for a new economy and society with clear and compelling community benefit.	Eger, 2009
A city well performing in a forward-looking way in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self-decisive, independent and aware citizens. Smart city generally refers to the search and identification of intelligent solutions which allow modern cities to enhance the quality of the services provided to citizens.	Giffinger, et al., 2007
A city connecting the physical infrastructure, the IT infrastructure, the social infrastructure, and the business infrastructure to leverage the collective intelligence of the city.	Harrison, et al., 2010
Smart city [refers to] a local entity - a district, city, region or small country-which takes a holistic approach to employ[ing] information technologies with real-time analysis that encourages sustainable economic development	IDA, 2012

Sources: Eger (2009), Giffinger, et al. (2007), Harrison, et al. (2010), IDA (2012)

Beside the technological and digital criteria, definitions incorporate other dimensions: environmental protection, governance, sustainable economy, and others. The top 10 smartest cities governments in the world for 2018/19 are presented in Table 2. This collection of the Top 10 Smart City Governments details the development of smart cities from a city government's perspective. It comprises a set of 10 effective elements that municipalities have found to be useful in the creation of smart cities, details the thoughts on how these tools are being used differently to achieve a range of results, and outlines the achievements of 10 leading governments that have guided their smart cities further.



Table 2: Top 10 smart city government rankings 2018/2019

Ranking	City	Total Score	Vision	Leadership	Budget	Financial Incentives	Support Programmes	Talent-Readiness	People Centricity	Innovation Ecosystem	Smart Policies	Track Record
1	London	33.5	3.1	4	3	4	3	3.1	3	4.1	3.1	3.1
2	Singapore	32.3	3	4	3	4.1	3	3.1	2	3.1	4	3
3	Seoul	31.4	3.1	3	3	2.2	3	3	4.1	3	3	4
4	New York	31.3	3	3	3	3.1	3	3.1	3	4	2	4.1
5	Helsinki	31.2	3	2	4	3.1	3	4	3	3.1	2	4
6	Montreal	30.1	3.1	3	3	4	3	2	3	3	3	3
7	Boston	29.6	3	3	3	2.1	3	3.1	3.1	3.1	3.1	3.1
8	Melbourne	29.5	3	3	3	2.1	3.1	3.1	4	3.2	2	3
9	Barcelona	29.4	3	3	3	2.1	2	3.1	3	3.1	3.1	4
10	Shanghai	29.2	3	3	4	3.1	3	2	2	3	2.1	4

Source: Eden Strategy Institute, 2020

There were selected 140 cities globally; the methodology were analyzed from existing city rankings, news articles, research articles and websites, thus, from 140 cities, Smart City Government ranked 50 best performing cities, in the present articles being presented the top 10 smartes cities based on three dimensions: scope, scale, integration. From these three dimensions, ten pathways derived to rank the Smart City Governments:

- ⊙ Vision: a well-defined plan for construction a „smart city“
- ⊙ Leadership: Town leadership that is committed to smart city initiatives
- ⊙ Budget: Enough funds for smart city projects
- ⊙ Financial: financial incentives are needed to succesfully enable private sector participation (grants, rebates, competitions, etc)
- ⊙ Support Programmes: Private actors are encouraged to collaborate by in-kind programs (e.g. incubators, events, networks)
- ⊙ Policies: A favorable policy climate for the growth of smart cities (e.g. data governance, IP protection, urban design)
- ⊙ Ecosystems: To keep innovation going, there needs to be a diverse group of people involved
- ⊙ People-centricity: people-centered vision
- ⊙ Talent-readiness: training programmes to equip people with smart skills
- ⊙ Track record: launching active smart city initiatives

In addition, interviews with city planners (mayors, city projects managers, etc) were conducted to validate information and ensure the study’s fairness.

#### 4.3.1. Smart city core components

According to the relevant literature, we need to take into account the six verticals in accordance with the sustainability strategy of a city. Smart government, smart living, smart mobility, smart people, smart economy and smart environment.

- Smart Government uses the available technologies and coordonates the activities carried out by other municipalities by collaborating with interested parties, and equally, meets the needs of its own citizens, in order to improve both public services and trust in public institutions.

- Smart Economy is considered when the sector gathers innovation and productivity to adapt to the market. At the same time, it improves new business models capable of running both locally and globally.
- Smart Mobility aims to provide the most efficient, clean and fair transport networks for people, goods and data. Available technologies are used to collect and provide information to users, planners and transport managers, enabling the remodeling of urban mobility models, planning mechanisms and improving multimodality by improving the coordination and integration of different modes of transport.
- Smart Living is designed to facilitate the ICT technologies and focus on improving the accessibility for users, and is close to the needs of citizens (tourism, culture, medical services, security, etc.).
- Smart People: a growing, sustainable, smart city needs smart people. It is essential the existence of capable, involved people in the urban life and be adaptive to the new technologies which offer creative solutions and diversity to their communities.
- Smart Environment collects data from utility networks, users, as well as the city's air, water and other resources, to establish the main areas of action in urban planning and urban infrastructure planning. It also has the role of informing urban service managers in order to achieve a more efficient and sustainable development of the urban environment while improving the quality of citizens's life.

#### 4.3.2. Alba Iulia – an example of good practices in Romania

The municipality benefits, among others, from internet in public spaces, medical services (doctors answer the phone non-stop and offer advice), applications through which citizens can send notifications in real time, while on the education side, 18 educational institutions received tablets, and students and parents will have free access to school information. LEDs have been installed on the poles, which have reduced consumption, while the air is monitored, and people can orient themselves to buy homes in less polluted neighborhoods. Smart solutions have also been found for the business environment. By having dedicated people and a solid base in the implementation of smart solutions, the pilot project Alba Iulia Smart City passes into a post-pilot stage, in which European projects in the area of innovation, digitalization, energy efficiency have already begun to be written and funded.

For example, POCA funding implements "e-Alba Iulia" (content management web platform and push notification beacons scattered throughout the city), "Digital Administration" (digital public services) and "Intelligent Administration" (through which will be developed a new urban development strategy, smart city strategy and participatory budgeting platforms and public barometer). Romania's largest fortress becomes a Tech City through the Tech Generation programs, which train young people in the city in the basics of digital administration and programming, under the guidance of mentors from all over the country.

All of these initiatives illustrate the evolution of the Alba Iulia Smart City pilot project to a new stage, in which most of the established solutions are widely implemented and begin to deliver the desired outcomes for people, who are the primary recipients of smart solutions (Smith, 2018).



## 5. Results and discussion

The concept of smart city has an ambiguous side, therefore current literature investigates a wide array of generating initiatives and projects in changing an ordinary city to a smart city. In order to take into consideration a sustainable city or a smart city, we need to look through the SDGs (Sustainable Development Goals) „lens”, meaning a set of indicators that measure the implementation of these targets. The current research presents limitations in this regard by not analyzing each indicator nationally or by regions (Benedek, et. al., 2021, for further assessment). The second limitation is represented by lack of statistical analysis.

## 6. Conclusions

A thorough review of the literature showed that the definition of a sustainable city is complex. People and community qualities, as well as ICTs, are now used in sustainable, intelligent cities. Attempts to construct all-encompassing indexes have been looked into. However, the aim of this paper was not to provide a new paradigm for determining a city’s smartness, as the author believes that such an analysis should be adjusted to a given city’s vision. Defining a universal fixed structure can be difficult with the diverse characteristics of cities around the world. If the policies and strategies have at their core the six components, it is an open path towards a sustainable, smarter city.

---

## REFERENCES:

1. Babonea, A.M. and Joia, R.M., 2012. Trecerea la o „Economie Verde” – o provocare și o soluție pentru economia mondială în contextul crizelor multiple. *Economie Teoretică și Aplicată*, XIX(10), pp.90-10.
2. Benedek, J., Ivan, K., Török, I., Temerde, A. and Holobâcă, I. H., 2021. Indicator-based assessment of local and regional progress toward the Sustainable Development Goals (SDGs): An integrated approach from Romania. [online] Available at: <<https://onlinelibrary.wiley.com/doi/full/10.1002/sd.2180>> [Accessed 16.06.2021].
3. Brundtland Report, 1987. Report of the World Commission on Environment and Development: Our Common Future. International Institute for Sustainable Development. [online] Available at: <<https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>> [Accessed on 12.02.2021].
4. Eden Strategy Institute, 2020. Top 50 smart cities government rankings. [online] Available at: <<https://www.smartcitygovt.com/>> [Accessed 30.03.2021].
5. Eger, J. M., 2009. Smart Growth, Smart Cities, and the Crisis at the Pump A Worldwide Phenomenon. *I-Ways*, 32(1), pp.47-53.
6. European Commission (EC), 2015. Economia verde. [online] Available at: <[http://ec.europa.eu/environment/basics/green-economy/index\\_ro.htm](http://ec.europa.eu/environment/basics/green-economy/index_ro.htm)> [Accessed 10.03.2021].
7. Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovic, N., and Meijers, E., 2007. Smart Cities: Ranking of European Medium-sized Cities. Vienna: Centre of Regional Science.

8. Harrison C., B. Eckman, Hamilton, R., Hartswick, P., Kalagnanam, J., Paraszczak, J., and Williams, P., 2010. Foundations for Smarter Cities. *IBM Journal of Research and Development*, 54(4), pp.1-16.
9. IDA Singapore, 2012. iN2015 Masterplan. [online] Available at: <<http://www.ida.gov.sg/~media/Files/Infocomm%20Landscape/iN2015/Reports/realisingthevisionin2015.pdf>> [Accessed 05.02.2021].
10. Index Mundi, 2021. Urban population. [online] Available at: <<https://www.indexmundi.com/facts/european-union/urban-population>> [Accessed 10.03.2021].
11. Institutul de Economie Mondială, 2019. Politici de mediu. [online] Available at: <<http://www.iem.ro/fisiere/Sinteze-comunic%C4%83ri/politici-mediu.pdf>> [Accessed on 15.09.2020].
12. Marinescu, P., Toma, S.-G. and Constantin, I., 2010. Social responsibility at the academic level. Study case: the University of Bucharest. *Studies and Scientific Researches- Economics Edition*, 15, pp.404-410. [online] Available at: <<http://sceco.ub.ro/index.php/SCECO/article/view/147/147>> [Accessed 27.04.2021].
13. NIST, 2014. The SmartAmerica Challenge- Smart America. [online] Available at <<https://www.nist.gov/el/smartamerica-challenge>> [Accessed on 10.03.2021].
14. OECD, 2016. Compact City Policies: A Comparative Assessment. [online] Available at: <<http://www.oecd.org/greengrowth/greening-cities-regions/compact-city.htm>> [Accessed on 12.02.2021].
15. Sohn, L.B., 1973. The Stockholm Declaration on the Human Environment. *The Harvard International Law Journal*, 14(3), pp.423-428.
16. Smith, L., 2018. Smart City Alba Iulia: solutions for a digital city. [online] Available at: <<https://hub.beesmart.city/city-portraits/alba-iulia-smart-city-solutions-for-a-digital-city>> [Accessed 11.10.2020].
17. Tohănean, D. and Toma, S.-G., 2018. Innovation, a key element of business models in the Fourth Industrial Revolution. *Network Intelligence Studies*, VI(12), pp.121-130. [online] Available at: <[http://seaopen-research.eu/Journals/articles/NIS\\_12\\_6.pdf](http://seaopen-research.eu/Journals/articles/NIS_12_6.pdf)> [Accessed 24.04.2021].
18. Toma, S.-G., 2008. Social responsibility and corporate citizenship in 21st century. *Amfiteatru Economic*, 10(23), pp.80-85.
19. Toma, S.-G., Stanciu, C. and Irimia, E., 2011. Landmarks in the evolution of the social responsibility of organizations in the twentieth century. *The International Scientific Session CKS 5th edition 2011*, Nicolae Titulescu University, pp. 1352-1360. [online] Available at: <<https://core.ac.uk/download/pdf/25886981.pdf>> [Accessed 27.04.2021].
20. Toma, S.-G. and P. Marinescu, P., 2015. Strategy and change. *Manager*, 21(1), pp.145-150. [online] Available at: <<http://manager.faa.ro/en/article/Strategy-and-Change~818.html>> [Accessed 1 April 2021].
21. Toma, S.-G., Marinescu, P. and Grădinaru, C., 2016. The age of sustainable business models. *Strategii Manageriale*, 34(4), pp.128-132. [online] Available at: <[http://www.strategiimanageriale.ro/images/images\\_site/articole/article\\_b89736d00f761fcd313daf8b083bf127.pdf](http://www.strategiimanageriale.ro/images/images_site/articole/article_b89736d00f761fcd313daf8b083bf127.pdf)> [Accessed on 01.02.2021].
22. Toma, S.-G. and Tohănean, D., 2019. Green business models: The case of a German automaker. *Quality - Access to Success*, 20 (S 2), pp.635-640. [online] Available at: <[https://www.srac.ro/calitatea/en/arhiva/supliment/2019/Q-asContents\\_Vol.20\\_S2\\_March-2019.pdf](https://www.srac.ro/calitatea/en/arhiva/supliment/2019/Q-asContents_Vol.20_S2_March-2019.pdf)> [Accessed 03.04.2021].
23. United Nations Environment Program (UNEP), 2017. Resilience and resource efficiency in cities. [online] Available at: <[http://www.unep.org/pdf/GI-REC\\_4pager.pdf](http://www.unep.org/pdf/GI-REC_4pager.pdf)> [Accessed on 22.02.2021].
24. Zainea, L. N., Toma, S.-G., Grădinaru, C. and Catană, Ș., 2020. Social entrepreneurship, a key driver to improve the quality of life: The case of TOMS Company. *Business Ethics and Leadership*, 4(3), pp.65-72.
25. World Wide Fund for Nature (WWFN), 2009. Going green is where the jobs are: new study. [online] Available at: <<https://wwf.panda.org/?167022/Going-green-is-where-the-jobs-are-new-study>> [Accessed on 01.02.2021].