Circular economy - foundament of challenges for business environment

Gabriela DOBROTĂ
Constantin Brâncusi University of Targu Jiu, Gorj, Romania
gabi.dobrota@yahoo.com

Dan DOBROTĂ
Lucian Blaga University of Sibiu, Sibiu, Romania
dobre97@yahoo.com

Valentin PETRESCU
Lucian Blaga University of Sibiu, Sibiu, Romania
valentin.petrescu@ulbsibiu.ro

ABSTRACT

Circular economy is one of the fundamental pillars of sustainable development. The limited character of resources, the demographic explosion, the urban agglomerations and the high volume of waste have become extremely sensitive issues in the current period. As a result, the implementation of policies based on fundamental objectives such as material recycling, energy consumption from renewable sources and the design of products that meet the recycling and re-use requirements must be a priority for the worldwide. The paper aims to highlight the principles underpinning the circular economy and to identify the challenges faced by important areas in terms of the capacity to ensure their respecting, so as to achieve a real process of sustainable development. Also, a descriptive analysis of the situation of the circular economy indicators for the period 2000 - 2015, at the level of the EU28 and of some member countries is carried out. The findings from the study demonstrate the need for a complex waste management process and the implementation of clear action lines to change the current economy model, based on consumption and elimination, with another, based on rational consumption and re-use, amid on improvements of the technologies of the industrial field and in the implementation of business stimulus strategies. As a result, it is necessary to change the mentality of the business environment in order to ensure a healthy socio-economic development, even if the short-term profits are lower.

Keywords: sustainability, circular economy, business environment

INTRODUCTION

The concepts of durable development and sustainable development no longer represent a novelty in the literature of speculation and current language. If the issue of industrialization has been extensively analyzed in numerous papers in terms of the negative effects generated since the interwar period, the lack of concern of business environment and authorities for sustainable development was reported only after 1970. Thus, the model developed by Meadows et all in 1972 highlighted the difficulty of maintaining a system in which meeting the needs of a growing population is done without regard to the requirements of rational consumption of resources and the protection of the environment (Meadows et. al 1972). This idea was taken over and developed by Goldsmith and all, who pointed out that industrialized societies are targeting only unsustainable expansion (Goldsmith, 1987). Obviously, these works were only the beginning of debates and concerns for sustainable development, but it should be noted that in 1987 they gained more
legitimacy through the concerns of several governments and the United Nations, materialized in the Brundland Report (Brundtland Report, 2017).

Although it is definitely an important act in specifying the requirements of sustainable development, the reference to natural resources and the identification of an antagonistic relationship between sustainable development and economic development has forced the completion of the approach with the human side, the quality level of life and the implementation of certain measures to correlate the specific objectives of the two concepts. Debates on this issue were at the United Nations Conference on Sustainable Development - Rio de Janeiro (1992), the Special Session of the ONU General Assembly and the Millennium Goals (2002), the World Summit on Sustainable Development in Johannesburg (2002), the Commission European (2005, 2006, 2015, 2016) etc. Practically, it is considered necessary to abandon the linear model of economy that implies unlimited resource consumption and disposal of waste in nature and switch to a model based on rational use and re-use. In this sense, the concept of circular economy has become increasingly a central element of policies promoted by various governments or organizations, being and object of legislative provisions.

Thus, the irrational use of resources, amid the desire to obtain the highest profits, is considered by specialists a problem that can have extremely unfavorable consequences to the entire planet. In addition, production and consumption put their mark on the environment not only through the diminishing of resources but also through pollution and the destruction of biodiversity. In this sense, the increase of the volume of waste is extremely suggestive. In line with World Bank studies, a 70% increase in solid waste is projected, and especially in developing countries, with direct implications for the generated costs of them managing. The main objective of the paper is to highlight the need to apply ample measures to ensure the premises of the circular economy, considering the analysis of a set of indicators reflecting the situation of the productivity of the resources used for the economic activity between 2000 and 2015, both at the EU28 level, of some developed or developing countries, on the background of stimulating the business environment into the obtaining by profits generated by "green" activities. In this sense, sustainable socio-economic development can be achieved by implementing new business models and supporting economic operators willing to accept obtain lower profits in the short term. But, the authorities need to intervene more concretely with clear stimulus measures, but also with legislative changes that will lead to a change in the mentality of individuals, corporations and the whole of society in this direction.

In the context of the previous specifications, the paper is structured as follows: Revision of the specialized literature; Basic Circular Economy Principles - support for new business models; The circular economy between society and corporations; Conclusions, followed by bibliographic references.

LITERATURE REVIEW

The need for rational use of resources and of the protection of the environment were the basic components of sustainable development. But, it should be noted that, to these, have been added the requirements for ensuring a higher level of quality of life, both economically and socially (Dobrotă, G. 2013). Thus, the need to increase productivity in the use of resources with the lowest possible level of pollution must be combined with ensuring a high level of employment and ensuring access to resources for all communities. Obviously, these requirements can't be ensured without the involvement of the entire society, starting from the individual and to economic organizations, public institutions, authorities and political parties. However, rational use of resources is no longer sufficient. Thus, it was proposed to move from the cycle „resource-production-pollution” at "resource-products-regenerated resources" (Pearce & Turner, 1990). As a result, it is absolutely necessary the orientation for recycling and re-use, and, moreover, to design of technologies that make it possible to obtain recyclable products (Dobrotă, G., & Dobrotă, D., 2017). A simple analysis of the growth rate of population and urban agglomerations is sufficient to substantiate this orientation.
The European Commission has set a number of objectives to ensure the transition to the circular economy, requiring Member States even a rate of recycling, both at municipal waste (65 %) and at packagings (75 %) by the level of year 2030 (European Commission, 2017). More and more governments have begun to adopt legislative measures aimed at the principles of a circular economy. The first country to start implementing the European Commission’s provisions was Germany since 1996, aiming the waste management. This was followed by Japan, with “The Basic Law for Establishing a Recycling-Based Society” which has established quantitative targets at the level of recycling processes (Van Berkel et al 2009). It is noteworthy that in China the process of implementing the concept and principles of circular economy began in 1998, when a series of theoretical studies was performed in higher education institutions, being targeted the protecting the environment so as to ensure sustainable development. The 2002 - 2005 period was characterized by supporting the private initiative by the Ministry of the Environment to obtain products that respect the requirements imposed by a circular economy. But the difficulties encountered in providing the necessary resources to an extremely large population and environmental pollution problems have prompted the Chinese authorities to promote a law that would break the gap between economic development and the consumption of resources, respectively pollution, the circular economy being considered a component of Green economy (Zhu, 2017).

In 2010, the Ellen MacArthur Foundation was set, with the scope to accelerate the transition to the circular economy by applying appropriate strategies to two types of cycles: one biological (based on the reintroduction of non-toxic materials into the biosphere) and one technological (this involves reconditioning the products or their components and reusing them for as long as possible, and, finally, recycling them). In the year 2015, a at the level of this foundation was developed a methodology regarding "Circularity Indicators", based on pilot studies on some economic operators, that offer the opportunity to identify the position of a company between "linear" and "circular" (www.ellenmacarthurfoundation.org). An important step in ensuring the transition to the circular economy was the Paris Climate Summit, where an agreement was signed by 195 countries (even if the US has announced its withdrawal from this agreement, it is necessary to apply its provisions further), which targets a global plan of action to limit global warming.

In fact, France has set up the Circular Economy Institute in 2013, followed by Canada where, since 2014, is operating the Foundation of EDDÈC Institute for Circular Economy. Romania has developed a series of legislative provisions on the “Circular Economy Package” launched by the European Union in 2016 in order to create a favorable framework for this economic model. We believe that it is necessary for the authorities to act firmly in this respect, as Romania is the last one in the EU, being obviously the tendency toward waste storage (97 % of the municipal waste).

The analysis of the literature suggests that the circular economy is based on multiplying the value of resources through reuse in successive life cycles, in line with the requirements of sustainable development.

**BASIC CIRCULAR ECONOMY PRINCIPLES - SUPPORT FOR NEW BUSINESS MODELS**

In general, companies focus on ensuring short-term financial performance without taking into account the long-term needs of the society This situation could be avoided if it were tracked the creating a "common value", strategy that can "reconnect the development of the company with social progress" (Porter & Kramer, 2011).

What does the circular economy actually mean? The “3R” rule is based on statistics showing that over 60% of garbage is represented by packaging, of which more than half is recyclable. A fundamental advantage of the recycling process is the reduction of energy consumption, which has
become an extremely important issue in the context of the depletion of natural resources (oil, coal, natural gas). As a result, it is increasingly evident that the achievement of durable, on the one hand, and reusable and recyclable products, on the other hand, are fundamental requirements of a modern economy. In fact, it is considered that "the circular economy can be analyzed as a function of the form:

\[ Ec = F(p, a, g, c, d) \]  
(1)

where: \( p \) is the design; \( a \) - supply; \( q \) - production; \( c \) - the consumer; \( d \) - waste management” (Dobrotă, D., & Dobrotă, G., 2017).

In view of the previous relationship, a series of characteristics of the circular economy model can be distinguished:
- requires product redesigning in the sense to use of materials which can be re-use, so as to ensure the re-use and the reduce of energy consumption but and of the environmental pollution;
- it is based on replacing toxic materials for the environment;
- generates a reorientation of companies to contracts by the type "payment of service ", in detriment of the transfer of ownership of some goods through sale (especially for goods that are used for a short period but not only);
- favors obtaining of new products from waste recycling and processing, which is equivalent with value added as a result of obtaining new products, used in various production processes;
- determines the reduction of waste to the minimum possible.

Thus, the circular economy is based on a series of principles that result from the "3 R" rule, namely: ensuring economic development amid a reduction in resource consumption; substantiating the premises for the recycling and reuse of materials from the design phase; implementing new business models that avoid unnecessary consumption of resources for products that are used for a short period of time by consumers (for this is necessary to switch to the sale of services) or recycling and remanufacturing of used products; ensuring the acquisition of the necessary knowledge throughout the educational system (not only in higher education); Supporting innovation and implementing its results in production processes, etc. More and more companies have begun to apply new business models based on re-use and recycling, which have allowed them to enter new market segments or increase their profits. In this respect, it can be mentioned:

- Vodafone (with New Every Year / Red Hot and Buy Back); H & M (launched in 2013 a collection program for reuse and recycling);
- Philips (there is a shift towards both collection and recycling as well as the "pay for services" model, where consumers no longer pay for products but for the "lighting service");
- Tata Motors Assured (selection and manual reconditioning of second-hand machines, followed by a certification process);
- BMW (remanufacturing of products and selling at prices even with 50 % lower but with quality certification);
- Renault (recovers machine parts, and reconditioning them, which allows them to reduce their sales prices by 30-50 % and significant savings at energy, water, chemicals and others);
- Levi Strauss & Co has set up recycling baskets in many stores, offering a coupon of 20 % discount to customers who put pants or shoes in these;
- Dell has created supply chains with closed - loop (has started collecting old computers and reusing plastic, the positive effects being the 11 % reduction in carbon emissions from the company's work and production costs), etc. (Morioka et al 2005).

In fact, this closed-loop model corresponds to the 6R (Reduce, Reuse, Recycle, Recover, Redesign, Remanufacture) approach that allows multiple production cycles to be made on the basis of recovered material streams from waste products (Jawahir & Bradley, 2016). But, we believe that, in present, at the level of many companies it is possible to speak even of the 7R rule (at 6R mentioned above also adds regeneration, which involves the transformation of a used product into a raw material for a new product, with the same characteristics), as it results from Figure 1.
4. CIRCULAR ECONOMY BETWEEN SOCIETY AND CORPORATIONS

The implementation of circular economy principles is a requirement of the entire society. Regulations imposed by various bodies, international institutions or agreements can have long-term effects, as long as they are respected by the business environment.

The question is how much are corporations willing to accept resource efficiency requirements to the detriment of earning a short-term profit? The answer can be given by the analysis of a set of indicators (specific to the circular economy), indicating that the results can record certain limits, given the existence of a relativity dose regarding the data used. In this respect, we can mention the OECD indicators, represented by: the productivity of the resources used; Recycling rate; The volume of municipal waste per capita; volume of waste per GDP output.

Productivity of the resources used is an important indicator that highlights the relationship between economic growth and domestic consumption of materials. The relevance of this indicator is because it highlights the existence or non-existence of a decoupling between economic activity and consumption of resources. From the analysis of the data on the European Commission's website www.ellenmacarthurfoundation.org for the period 2000-2015 shows that in developed countries (such as Denmark, Czech Republic or Germany) and EU28, domestic consumption material has decreased (not only during the economic crisis), while in emerging countries it grew considerably: in Bulgaria by 73% and in Romania by 203,7 %, as shown in Figure 2.
This situation shows a poor productivity of the use of resources in the economic activity in the two countries (Romania, Bulgaria), also evidenced by the evolution of the Index of domestic material consumption. Thus, if the EU28 and the first three countries show a decrease in the mentioned interval, with year 2000 = 100 (EU28 – 88.8 %, Czech Republic – 90.1 %, Denmark – 87.5 %, Germany – 90.4 %), which is equivalent to a decoupling of economic activity from the consumption of primary resources, in Bulgaria and Romania the situation is opposite (146.1 % and 267.8 %, respectively).

As a result, the two countries demonstrate that they have applied consumption-based development policies, fact which also results from Table 1 and Figure 3. Moreover, a simple analysis of real economic growth data is sufficient to support previous assertions. Thus, the fluctuations and trends registered by the Index of domestic consumption are in accordance to those corresponding to the real growth rate (in Romania, in 2013, the economic growth rate was 3.5 % corresponding to a consumption index of 255.6 %; in 2014, the reduction of the growth rate to 3 % coincided with the fall in the consumption index to 243.5 %, the year 2015 was characterized by an increase of 3.8 % and the consumption index was of 267.8 %).

Regarding the recycling rate, there is a clear concern for Germany (46.3 % in 2015) and Denmark (66 % in the same year), above the EU-28 average (45 %). Romania, on the other hand, stands at the opposite pole, with a recycling rate of only 13.1% (Table 1).

| Country /region | I | 2001 | 2005 | 2006 | 2007 | 2008 | 2009 | 2013 | 2014 | 2015 |
|-----------------|---|------|------|------|------|------|------|------|------|------|
| **EU 28**       |   |      |      |      |      |      |      |      |      |      |
| Wr              | 104,3 | 106,4 | 106,4 | 107,8 | 117,1 | 122,6 | 132,9 | 136,4 | 131,7 |
| Rr              | 26,5  | 31,9  | 32,9  | 35,0  | 36,5  | 37    | 42    | 43,7  | 45    |
| Eg              | 2,2   | 2,1   | 3,3   | 3,0   | 0,4   | -4,4  | 0,2   | 1,5   | 2,2   |
| Idmc            | 99,2  | 104,1 | 106,3 | 109,6 | 108,6 | 95,8  | 87,7  | 88,7  | 88,8  |
| **BG**          |   |      |      |      |      |      |      |      |      |      |
| Wr              | 97,14 | 105,1 | 103,3 | 107,3 | 105,6 | 127,4 | 130,1 | 119,2 | 111,1 |
| Rr              | 16,1  | 18,3  | 19,1  | 20,6  | 19,4  | 19,9  | 28,5  | 23,1  | 29,4  |
| Eg              | 3,8   | 7,2   | 6,8   | 7,7   | 5,6   | -4,2  | 1,3   | 1,5   | 3,0   |
| Idmc            | 109   | 123,5 | 136,3 | 140,8 | 151,8 | 121,3 | 126,4 | 138,8 | 146,1 |
| **CZ**          |   |      |      |      |      |      |      |      |      |      |
| Wr              | 101,9 | 117,9 | 122,2 | 127,1 | 132,6 | 138,3 | 162,3 | 161,7 | 163,4 |
| Rr              | 0,9   | 6,2   | 7,4   | 10,1  | 10,4  | 12,4  | 24    | 25,4  | 29    |
| Eg              | 3,1   | 6,4   | 6,9   | 5,5   | 2,7   | -4,8  | -0,5  | 2,7   | 4,5   |
| Idmc            | 101,1 | 102,7 | 106   | 107,5 | 105,8 | 96,6  | 84,8  | 83,4  | 90,1  |
| **DK**          |   |      |      |      |      |      |      |      |      |      |
| Wr              | 103,08 | 95,13 | 93,06 | 97,54 | 101,6 | 117,3 | 122,8 | 124,9 | 127,9 |
| Rr              | 36,1  | 41,1  | 41,8  | 44,2  | 47,9  | 48,8  | 43,2  | 45,1  | 46,3  |
| Eg              | 0,8   | 2,4   | 3,8   | 0,8   | -0,7  | -5,1  | -0,2  | 1,3   | 1,0   |
| Idmc            | 97,8  | 112,3 | 119,3 | 114,9 | 109,6 | 90,3  | 90,1  | 90    | 87,5  |
| **DE**          |   |      |      |      |      |      |      |      |      |      |
| Wr              | 107,59 | 114,8 | 116,03 | 119,76 | 121,91 | 120,81 | 126,76 | 124,13 | 130,79 |
| Rr              | 52    | 60,9  | 62,1  | 63,2  | 63,8  | 63,1  | 63,8  | 65,6  | 66,1  |
| Eg              | 1,7   | 0,7   | 3,7   | 3,3   | 1,1   | -5,6  | 0,5   | 1,6   | 1,7   |
| Idmc            | 94,5  | 89,6  | 91,9  | 92    | 91,4  | 87    | 90,6  | 92,6  | 90,4  |
| **RO**          |   |      |      |      |      |      |      |      |      |      |
| Wr              | 66,50 | 68,13 | 68,34 | 61,37 | 51,83 | 61,32 | 62,93 | 63,39 | 64,26 |
| Rr              | 1     | 1,8   | 0,5   | 0,5   | 0,5   | 1,1   | 1,32  | 13,1  | 13,1  |
| Eg              | 2,4   | 4,2   | 8,1   | 6,9   | 8,5   | -7,1  | 3,5   | 3,0   | 3,8   |
| Idmc            | 158,8 | 194,2 | 209,2 | 248,9 | 319,7 | 251,1 | 255,6 | 243,5 | 267,8 |

Source: www.ellenmacarthurfoundation.org
Legend: Wr – productivity of resources; Rr – Recycling rate of municipal waste; Eg – real rate of economic growth; Idmc – index of domestic material consumption; I – indicators
The data summarized in the previous table unequivocally shows that the application of the model of the circular economy needs to be sustained more and more, especially at the level of developing countries. Otherwise, they risk becoming real landfills of waste and to be uncompetitive on international markets, in the context of inefficient use of resources and recording of high production costs. Unfortunately, without an active involvement of the authorities in this respect and without proper education, the results will be delayed. At the same time, the business environment must respond to the challenges of the circular economy and identify the optimal ways for doing economic activities in this direction.

CONCLUSIONS

The need to apply the principles of the circular economy is no longer a novelty. Demographic explosion, resource mitigation, and pollution are sufficient arguments to support this model, to the detriment of the linear economy. Research has shown that more and more companies have understood that they need to apply new business models that allow for profits at the same time as generating positive effects on the environment and the entire society. But the situation is different from one country to another. While in developed countries obvious an acceptance of the challenges of the circular economy by a growing number of companies, the situation in the emerging countries is different, the waiver on short-term financial performance proving to be difficult for the economic environment. The analysis of circular economy-specific indicators highlights the fact that the decoupling of activity from the consumption of primary resources is a major concern at the level of developed countries, while in the case of emerging countries the situation is the opposite.

Since the issue of sustainability involves broad horizons of time, we believe that it is absolutely necessary the implementation of educational programs even in the first cycles of education and to support scientific research in order to design products that meet the requirements of the circular model. In addition, the authorities can support the establishment of green companies by providing financial or fiscal incentives and can intervene much more strongly in promoting and enforcing legislative measures that support the circular economy model. Thus, healthy socio-economic development can become an achievable goal and not just a slogan by supporting rigorous requirements of competitiveness, innovation, eco-efficiency, sustainable production and consumption that allow a clear reduction and even elimination of the correlation between economic development - unlimited resource consumption - pollution and environmental destruction. Promoting of education in sustainable development domain, empowering citizens and the business community into use of resources can become real tools in providing process of the necessary resources to future generations.

REFERENCES
Dobrotă, D., & Dobrotă, G. (2017). An innovative method in the regeneration of waste rubber and the sustainable development, *Journal of Cleaner Production*, DOI: 10.1016/j.jclepro.2017.03.022.

Dobrotă, G., & Dobrotă, D. (2017). Research on the environmental pollution caused by waste recycling processes. In *Proceeding of The International Conference „Information Society and Sustainable Development”* Targu Jiu: Academica Brâncusi, 28-31.

Dobrotă, G. (2013). The economic components of sustainable development function at the level of the industrial enterprises, *Fiability & Durability Supplement*, 1, 381-86.

European Comission, (2017). Closing the loop - An EU action plan for the Circular Economy.

European Comission. Report of the World Commission on Environment and Development: Our Common Future. (Brundtland Report) http://www.un-documents.net/our-common-future.pdf, accesed on 15.05.2017

Goldsmith, A. A. (1987). Does political stability hinder economic development? Mancur Olson's theory and the Third World. *Comparative Politics, 19*(4), 471-480

Jawahir, I. S., & Bradley, R. (2016). Technological Elements of Circular Economy and the Principles of 6R-Based Closed-loop Material Flow in Sustainable Manufacturing. In Procedia Elsevier of *13th Global Conference on Sustainable Manufacturing - Decoupling Growth from Resource Use*. 40, pp. 103-108.

Meadows, D. H., Meadows, D. L., Randers, J., & Behrens III, W. W. (1972), *The Limits to Growth: a report for the Club of Rome's project on the predicament of mankind*, Universe Books

Morioka, T., Tsunemi, K., Yamamoto, Y., Yabar, H., & Yoshida, N. (2005). Eco-efficiency of advanced loop closing systems for vehicles and household appliances in Hyogo Eco-town. *Journal of Industrial Ecology* 9(4), 205-221.

Pearce, D.W., & Turner, R. K. (1990) *Economics of natural resources and the environment*. The John Hopkis University Press, Baltimore.

Porter, M. E., & Kramer, M. R. (2011). Creating shared value. *Harvard business review*, 89(1/2), 62-77.

Van Berkel, R., Fujita, T., Hashimoto, S., and & Geng, Y. (2009). Industrial and urban symbiosis in Japan: analysis of the eco-town. *Journal of Environmental Management*, 90, 1544-1556.

Zhu, D. (in press, 2017). China’s policies and instruments for developing the circular economy. *Europe’s world*.

http://ec.europa.eu/environment/circular-economy/index_en.htm, accesed on 29.05.2017

https://www.ellenmacarthurfoundation.org/assets/downloads/insight/Circularity-Indicators_Methodology_May2015.pdf, accesed on 28.05.2017