Circular Economy in Developed and Developing Countries

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Circular Economy in Developed and Developing Countries: Perspective, Methods and Examples

EDITED BY

ELENA G. POPKOVA
Moscow State Institute of International Relations (MGIMO), Moscow, Russia

ALEKSEI V. BOGOVIZ
Independent Researcher, Moscow, Russia

United Kingdom – North America – Japan – India – Malaysia – China

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Preface

The Circular Economy as a New Modern Challenge for Developed and Developing Countries

At the beginning of the twenty-first century, the global society finally realized the importance of the problem of climate change and legally adopted the necessity for solving it through building the circular economy. This was reflected in Sustainable Development Goals, adopted by the UN in 2015. However, as a result of the practical implementation of Sustainable Development Goals in the first five years, very limited results are observed in 2020; also, we could see the vivid and increasing disproportions in the global circular economy, caused by domination of the circular practices in developed countries and preservation of the signs of the linear approach to economic activities in developing countries.

Thus, it is necessary to study the general regularities and specific features of building the circular economy in developed and developing countries, which have different conditions for implementing the ecological initiatives, different approaches to environment protection, and different effectiveness of the mechanisms of market self-regulation and state management of the process of implementation and institutionalization of the circular practices of economic activities.

This book studies the existing and formulates new conceptual provisions of the circular economy and its essential differences from the linear model of economic development. The anti-crisis potential of the circular economy and its differences in developed and developing countries are determined. A methodology of measuring and managing the modern circular economy in developed and developing countries is developed.

The authors perform an international case study of the latest tendencies, barriers, and perspectives of building the circular economy in developed and developing countries, determine specific features and regularities of building the circular economy in developed and developing countries, study and analyze the practice of building the circular economy in modern Russia, substantiate future perspectives of development of the circular economy, and offer complex recommendations for managing the process of formation and development of the circular economy in developed and developing countries.

The purpose of this book is to show integrity of the global environment, in which developed and developing countries implement their circular practices, to substantiate close interconnection between these categories of countries, to determine the level of similarity and the scale of their differences during formation of the circular economy, and to offer scientific recommendations that would be adapted to their specifics.

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List of Contributors

Aleksandr N. Abramov
Moscow Region State University, Mytishchi, Russia
e-mail: alex_nic_abramov@mail.ru

Ekaterina S. Alekhina
Institute of the Service Sphere and Entrepreneurship (branch) of Don State Technical University, Shakhty, Russia
e-mail: ket_as@mail.ru

Alexander A. Alekseev
Plekhanov Russian University of Economics, Moscow, Russia
e-mail: Alexeev_alexan@mail.ru

Nataliya S. Andryashina
Minin Nizhny Novgorod State Pedagogical University, Nizhny Novgorod, Russia
e-mail: natali_andr@bk.ru

Viktoria V. Arnold
Brandenburg University of Technology, Cottbus, Germany

Mikhail A. Ashkerov
Brandenburg University of Technology, Cottbus, Germany

Olga A. Babordina
Samara State Technical University, Samara, Russia
e-mail: olgababordina@rambler.ru

Anna V. Bodiako
Financial University under the Government of the Russian Federation, Moscow, Russian Federation
e-mail: anna.bodyako@inbox.ru

Aleksei V. Bogoviz
Independent researcher, Moscow, Russia
e-mail: aleksei.bogoviz@gmail.com

Igor V. Bulava
Financial University under the Government of the Russian Federation, Moscow, Russian Federation
e-mail: ibulava@mail.ru

Svetlana G. Bychkova
State University of Management, Moscow, Russia
e-mail: svetlana9569@gmail.com

Nadezhda V. Chernovanova
Volgograd State Agrarian University, Volgograd, Russia
e-mail: ch25nv@mail.ru

Yulia S. Chernysheva
Institute of the Service Sphere and Entrepreneurship (branch) of Don State Technical University, Shakhty, Russia
e-mail:julia_chern@mail.ru

Ljudmila I. Chistohodova
Moscow Region State University, Mytishchi, Russia
e-mail: george1978@mail.ru

Igor V. Chistov
"Military University" of the Ministry of Defense of the Russian Federation, Moscow, Russia
e-mail: ivchistov@mail.ru

Viktor I. Dobrosotskiy
Moscow State Institute of International Relations (University) of the Ministry of Foreign Affairs of the Russian Federation, Moscow, Russia
e-mail: dobrosotskiy@gmail.com

Elena A. Dynnikova
Volgograd State Agrarian University, Volgograd, Russia
e-mail: dynnikova85@yandex.ru

Ekaterina M. Egorova
Volgograd State Agrarian University, Volgograd, Russia
e-mail: egorowaem@yandex.ru

Tatiana.V. Epifanova
Rostov State University of Economics, Rostov-on-Don, Russia
e-mail: rostovshell@mail.ru

Elzata V. Erdnieva
Kalmyk State University named after B.B. Gorodovikov, Elista, Russian Federation
e-mail: erdnieva-el@yandex.ru

Lilia V. Ermolina
Samara State Technical University, Samara, Russia
e-mail: Ermolina@mail.ru

Natalia B. Ershova
State University of Management, Moscow, Russia
e-mail: natborer@mail.ru

Irina S. Ferova
Siberian Federal University, Krasnoyarsk, Russia
e-mail: iferova@sfu-kras.ru

Tatiana B. Fonina
Moscow Region State University, Mytishchi, Russia
e-mail: tb.fonina@mgou.ru

Nelly N. Galeeva
Ufa State Petroleum Technological University, Ufa, Russia
e-mail: nelli-galeeva@yandex.ru

Marina P. Garanina
Samara State Technical University, Samara, Russia
e-mail: garaninamarina@ya.ru

Ekaterina P. Garina
Minin Nizhny Novgorod State Pedagogical University, Nizhny Novgorod, Russia
e-mail: e.p.garina@mail.ru

Svetlana B. Globa
Siberian Federal University, Krasnoyarsk, Russia
e-mail: globasb@yandex.ru

Zhanna V. Gornostaeva
Institute of the Service Sphere and Entrepreneurship (branch) of Don State Technical University, Shakhty, Russia
e-mail: mypochta-09@mail.ru

Larisa A. Ilyina
Samara State University of Economics, Samara, Russia
e-mail: ilina.larisa.a@gmail.com

Tatiana A. Ilyina
Samara State Technical University, Samara, Russia
e-mail: tatiana.alexandrovna.ilyina@gmail.com

Olga G. Kantor
Ufa State Petroleum Technological University, Ufa, Russia
e-mail: o_kantor@mail.ru

Marina V. Karp
State University of Management, Moscow, Russia
e-mail: marvik-09@mail.ru

Elvira A. Khalikova
Ufa State Petroleum Technological University, Ufa, Russia
e-mail: ydacha6@yandex.ru

Tatyana N. Kochetova
Samara State Technical University, Samara, Russia
e-mail: tnkochetova@list.ru

Zhanna M. Korzovatykh
State University of Management, Moscow, Russia
e-mail: korzovatykh@yandex.ru

Taisiia I. Krishtaleva
Financial University under the Government of the Russian Federation, Moscow,Russian Federation
e-mail: TIKrishtaleva@fa.ru

Viktor P. Kuznetsov
Minin Nizhny Novgorod State Pedagogical University, Nizhny Novgorod, Russia
e-mail: kuzneczov-vp@mail.ru

Elena I. Larionova
Financial University under the Government of the Russian Federation, Moscow, Russian Federation
e-mail: larionova_len@mail.ru

Tatyana B. Leybert
Ufa State Petroleum Technological University, Ufa, Russia
e-mail: lejjbert@mail.ru

Svetlana A. Litvinova
Russian Presidential Academy of National Economy and Public Administration, Moscow, Russia

Svetlana V. Lobova
Altai State University, Barnaul, Russia
e-mail: barnaulhome@mail.ru

Leonid F. Malinovskii
Moscow Region State University, Mytishchi, Russia
e-mail: mlf49@yandex.ru

Alexander V. Malofeev
Volgograd State Agricultural University, Volgograd, Russia
e-mail: malofeev_1981@mail.ru

Olga P. Maslova
Samara State Technical University, Samara, Russia
e-mail: ol-mas108@yandex.ru

Larisa A. Melikhova
Volgograd State Agricultural University, Volgograd, Russia
e-mail: melihova.l@yandex.ru

Igor E. Mizikovsky
National Research Nizhny Novgorod State University N.I. Lobachevsky, Nizhny Novgorod, Russia
e-mail: core090913@gmail.com)

Nadezhda G. Morozova
State University of Management, Moscow, Russia
e-mail: Mng14@mail.ru

Aleksandr V. Nemchenko
Volgograd State Agricultural University, Volgograd, Russia
e-mail: volgsnemchenko@mail.ru

Inga V. Nikulkina
North-Eastern Federal University, Yakutsk, Russia
Financial University under the Government of the Russian Federation, Moscow, Russia
e-mail: inga123456@yandex.ru

Ekaterina A. Orlova
State University of Management, Moscow, Russia
e-mail: e_a_orlovaguu@mail.ru

Lyudmila D. Orlova
Dimitrovgrad Engineering Institute of Technology – Branch of National Research Nuclear University of MIFI, Dimitrovgrad, Russia
e-mail: ldorlova@mail.ru

Vladimir S. Osipov
"Moscow State Institute of International Relations (University) of the Ministry of Foreign Affairs Russian Federation", Moscow, Russia
e-mail: vs.ossipov@gmail.com

Yuliya A. Panteleeva
Samara State Technical University, Samara, Russia
e-mail: juliya063@mail.ru

Valentina V. Poliakova
State University of Management, Moscow, Russia
e-mail: plvv@yandex.ru

Svetlana V. Ponomareva
St. Petersburg State University of Economics, St. Petersburg, Russia
e-mail: ponsvetlana@mail.ru

Elena G. Popkova
Moscow State Institute of International Relations, Moscow, Russia
e-mail: elenapopkova@yahoo.com

Larisa V. Popova
Volgograd State Agrarian University, Volgograd, Russia
e-mail: lvpopova@bk.ru

Oksana A. Revzon
State University of Management, Moscow, Russia
e-mail: revzonoks@yandex.ru

Anastasia M. Rogacheva
Ufa State Petroleum Technological University, Ufa, Russia
e-mail: izabo@bk.ru

Elena V. Romanovskaya
Minin Nizhny Novgorod State Pedagogical University, Nizhny Novgorod, Russia
e-mail: alenarom@listl.ru

Tatyana V. Romantsova
Kutafin Moscow State Law University (MSAL), Moscow, Russia
e-mail: etvr@mail.ru

Yulia R. Rudneva
Ufa State Petroleum Technological University, Ufa, Russia
e-mail: julrud1976@yandex.ru

Yuliya R. Rudneva
Ufa State Petroleum Technological University, Ufa, Russia
e-mail: julrud@yandex.ru

Natalia A. Rykhtikova
Krasnogorsk Branch of Russian Presidential Academy of National Economy and Public Administration, Krasnogorsk, Russia
e-mail: nar.prof@yandex.ru

Inna N. Rykova
Research Institute of Finance of the Ministry of Finance of the Russian Federation Moscow, Russia
e-mail: rycova@yandex.ru

Tatiana P. Satsuk
Emperor Alexander I St. Petersburg State Transport University, St. Petersburg, Russia
e-mail: stp13@mail.ru

Galina N. Semenova
Plekhanov Russian University of Economics, Moscow, Russia
e-mail: Sg6457@mail.ru

Tamara P. Shamonina
Ufa State Petroleum Technological University, Ufa, Russia
e-mail: shamonina@bk.ru

Sergei V. Shkodinsky
Research Institute of Finance of the Ministry of Finance of the Russian Federation Moscow, Russia, Moscow Region State University, Mytishchi, Russia
e-mail: sh-serg@bk.ru

Dmitry L. Skipin
University of Tyumen, Tyumen, Russia
e-mail: d.l.skipin@utmn.ru

Anna A. Skomoroshchenko
"Kuban State Agrarian University named after I.T. Trubilin", Krasnodar, Russia
e-mail: skomoranna@yandex.ru

Sona L. Sumbatyan
State University of Management, Moscow, Russia
e-mail: ssumbat@mail.ru

Anton N. Sunteev
Samara State Technical University, Samara, Russia
e-mail: SunteevAN@yandex.ru

Yury L. Talismanov
Russian Presidential Academy of National Economy and Public Administration, Moscow, Russia
e-mail: Talismanova606@yandex.ru

Vladimir S. Tikhonov
Samara State Technical University, Samara, Russia
e-mail: leasingagro@mail.ru

Natalia G. Tregulova
Institute of the Service Sphere and Entrepreneurship (branch) of Don State Technical University, Shakhty, Russia
e-mail: ntregulova@mail.ru

Tamara T. Tsatkhlanova
Kalmyk State University named after B.B. Gorodovikov, Elista, Russian Federation
e-mail: tsatkhlanovat@mail.ru

Lubov I. Vanchukhina
Ufa State Petroleum Technological University, Ufa, Russia
e-mail: BUA1996@yandex.ru; bua1996@mail.ru

Bogdan S. Vasyakin
Plekhanov Russian University of Economics, Moscow, Russia
e-mail: Vasyakin.BS@rea.ru

Natalia G. Vovchenko
Rostov State University of Economics, Rostov-on-Don, Russia
e-mail: nat.vovchenko@gmail.com

Elena V. Yagupova
Volgograd State Agrarian University, Volgograd, Russia
e-mail: Yev26@mail.ru

Sergey E. Zakutnev
"Military University" of the Ministry of Defense of the Russian Federation, Moscow, Russia
e-mail: szakutnev@yandex.ru

Elena Y. Zolochevskaya
Russian Presidential Academy of National Economy and Public Administration, Moscow, Russia

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Part I

The Conceptual Provisions of the Circular Economy and Its Essential Differences from the Linear Model of Economic Development

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Chapter 1

Criticism of the Linear Model of Economic Development and its Opposition to the Model of the Circular Economy

Larisa A. Ilyina, Yuliya A. Panteleeva, Vladimir S. Tikhonov and Olga A. Babordina

JEL Codes: D91; E01; F42; F43; F64; Q01; Q15; Q56; Q57; O13; O41; O43; O44; O47

1. Introduction

In the modern global economy, the interests of economic growth contradict the interests of environment protection more and more. Ecological costs are at the brink of advantages from economic growth or even exceed them, and the signs of climate change could be seen everywhere. The importance of this contradiction was reflected in the adopted sustainable development goals, in which the main attention is paid to environment protection.

The ideas of sustainable development are embodied in the model of the circular economy, which allows decreasing the ecological costs of production and consumption, thus overcoming the contradiction of economic growth and environment protection. Despite the long and thorough scientific elaboration and a large theoretical and methodological basis, the model of the circular economy is not widely used. An argument in favor of refusal from it – for preserving the traditional, linear model of economic development – is the uncertainty of the investment component of circular projects.

Firstly, the clear influence of the state of environment on population's level of happiness has not been scientifically proved. As social advantages cannot be forecasted precisely, circular project is not too attractive for the state, which prefers

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the projects with more profits for society. The long-term character of investments in circular projects and lack of transparency of the perspectives of their return – caused by the fact that the circular economy generates not economic but public benefits – hinders the inflow of private capital. Without financial support, circular projects – like any others – cannot be realized.

Secondly, under the pressure of philosophy of consumer society, there formed an official (proclaimed and acknowledged by the state) belief that economic growth defines population's happiness. Business's aggressive marketing confirms this idea. Tough there are no scientific proofs of that, the state does not require them, showing loyalty to business, which lobbies its own interests. As the circular economy is associated with limited economic growth, it is treated negatively.

Thirdly, there is a popular idea – without any scientific substantiation – that increased resource efficiency limits the possibilities of production and consumption and reduces economic growth, raising the quality of life, shared by all economic subjects – state, business, and society. A logical result of this idea, which is treated as risk, is measures of risk management, aimed at restraining the circular economy and preventing its development.

The purpose of this chapter is to scientifically verify the existing argument in favor of the linear model of economic development and to overcome the uncertainty regarding the model of the circular economy.

2. Materials and Method

The general issues of economic growth and development, based on the linear model, are studied in the works, such as Ermolina and Ilyina (2017), Ilyina and Brazhnikov (2016), Ilyina, Brazhnikov, and Khorina (2017), Ilyina, Ermolina, and Sunteev (2018), Popkova (2018), Popkova and Alferova (2019), Popkova and Sukhodolov (2017), Ragulina (2019), Ragulina, Alekseev, Strizhkina, and Tumanov (2019a), Ragulina, Semenova, Avkopashvili, Dmitrieva, and Cherepukhin (2019b), Sergi (2003, 2019), Sergi, Popkova, Borzenko, and Przhedetskaya (2019), and Sergi, Popkova, Sozinova, and Fetisova (2019). Certain conceptual settings and methodological recommendations for organizing the model of the circular economy are given in the works, such as Batista, Gong, Pereira, Jia, and Bittar (2019), Blomsma et al. (2019), Franco (2019), Frolov, Popkova, Strekalova, and Marushchak (2017), Inshakov, Bogachkova, and Popkova (2019), Petrenko, Pritvorova, and Dzhazykbaeva (2018), Popkova, Poluyufta, Beshanova, Popova, and Kolesnikova (2017), Sergi, Popkova, Borzenko, and Przhedetskaya (2019a), Shakhovskaya, Petrenko, Dzhindzholia, and Timonina (2018), Termeer and Metze (2019), and Zhang et al. (2019).

The overview performed on the existing literature sources showed that they do not provide a sufficient scientific basis for clear opposition of the linear and the circular economy or a comprehensive idea of the model of the circular economy. The authors use the method of comparative and correlation analysis of statistical data for filling this gap in the system of scientific knowledge. The research objects are top 10 countries from G20, which had the highest number of population and the largest volume of economy's waste in 2019 (Fig. 1).

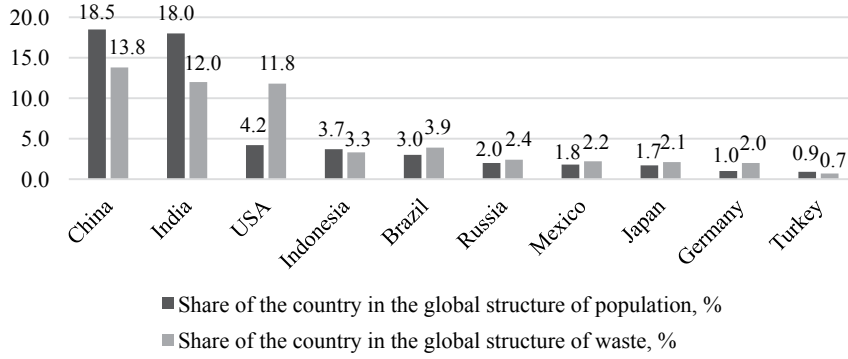

Fig. 1. Top 10 Countries of the World in 2019 by Population and Waste. *Source*: Compiled by the authors based on Verisk Maplecroft (2019).

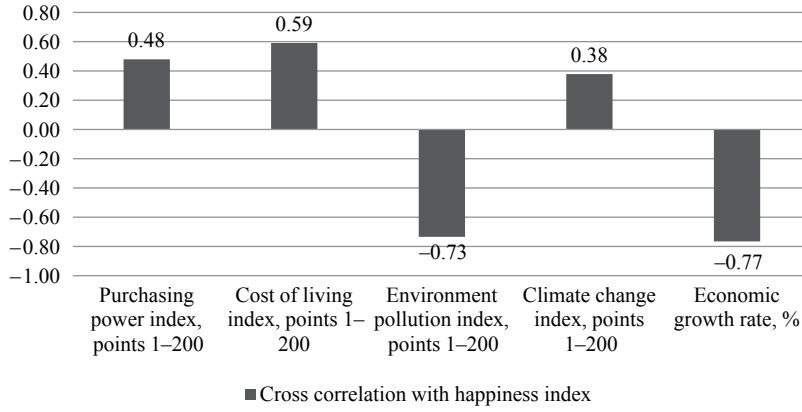

Fig. 2. Cross Correlation of the Indicators of Linear and Circular Development and Economic Growth with Happiness Index in Top 10 Countries by Population and Waste (2019). *Source*: Calculated and built by the authors.

As shown in Fig. 1, the number of population does not always define the volume of economy's waste. This contradiction is most vivid in the United States; it accounts for 4.2% of the world population, with 11.8% in the global volume of waste. The selection of statistical data that are used during the research is shown in Table 1.

3. Results

Cross correlation of the indicators of linear and circular development and economic growth with the happiness index in top 10 countries of the world in 2019 by population and waste is shown in Fig. 2.

As shown in Fig. 2, the economic indicators show moderate connection with the happiness index. Cross correlation of the index of population's purchasing

Table 1. Statistics of the Circular Economy and Economic Growth in Top 10 Countries of the World in 2019 by Population and Waste.

Country	Index of Population's Purchasing Power, Points 1–200	Cost of Living Index, Points 1–200	Environment Pollution Index, Points 1–200	Climate Change Index, Points 1–200	Happiness Index, Points 0–10	Rate of Economic Growth, %	Consumption of Electric Energy, kWh per Capita	Production of Renewable Energy, %	Alternative and Nuclear Energy, % of Total Usage of Energy
China	63.93	40.54	81.24	78.91	5.191	6.6	3,927	23.93	5.1
India	61.73	25.14	75.55	65.77	4.015	7.0	805	15.34	2.7
United States	119.10	70.95	35.76	76.75	6.892	2.9	12,994	13.23	11.9
Indonesia	31.01	36.86	64.39	63.76	5.192	5.2	812	10.65	0.8
Brazil	36.31	42.64	56.10	94.25	6.3	1.1	2,620	73.97	10.8
Russia	43.69	38.59	63.49	42.82	5.648	2.3	6,603	15.86	8.2
Mexico	47.05	34.29	66.88	87.55	6.595	2.0	2,157	15.39	3.5
Japan	97.57	85.52	36.78	85.29	5.886	0.8	7,820	15.98	3.1
Germany	111.99	66.57	28.42	82.80	6.985	1.4	7,035	29.23	12.9
Turkey	44.44	35.66	68.63	93.26	5.373	2.6	2,847	31.96	6.7

Source: Compiled by the authors based on Helliwell, Layard, and Sachs (2019), Numbeo (2019), and World Bank (2019).

power and the happiness index equals 0.48, and of the cost of living index equals 0.59. The indicator of circular development – environment pollution index – showed much higher connection with the happiness index: −0.73. It should be noted that another indicator of circular development – index of climate change – showed moderate connection with the happiness index – 0.38.

This shows that ecological factors have stronger influence on the levels of happiness of population than economic factors. However, the influence of ecological factors is too differentiated, as they are felt by the society to a different extern. For example, production waste is seen in the growing number of dumps, and climate change is less vivid. Rate of economic growth showed negative cross correlation with the happiness index (−0.77). This means that economic growth is connected to population's happiness level, but in the reverse way – the higher the rate of economic growth, the lower the level of happiness.

Cross correlation of the indicators of energy efficiency with the rate of economic growth in top 10 countries by population and waste (2019) is shown in Fig. 3.

As shown in Fig. 3, the indicators of energy efficiency have negative cross correlation with the rate of economic growth, which constitutes −0.42 for electric energy consumption per capita; −0.36 for production of renewable energy; and −0.50 for alternative and nuclear energy. This means that certain manifestations of the circular economy – in particular, optimization of production and consumption of energy – restrain economic growth, at least within the current technological mode and the current organizational and managerial approach.

The basic conceptual model of the circular economy is shown in Fig. 4.

As shown in Fig. 4, the specific feature of the circular economy is observing the "3R" principle. According to this principle, the structure of resources is dominated by renewable (alternative) resources. Production reduces resource intensity

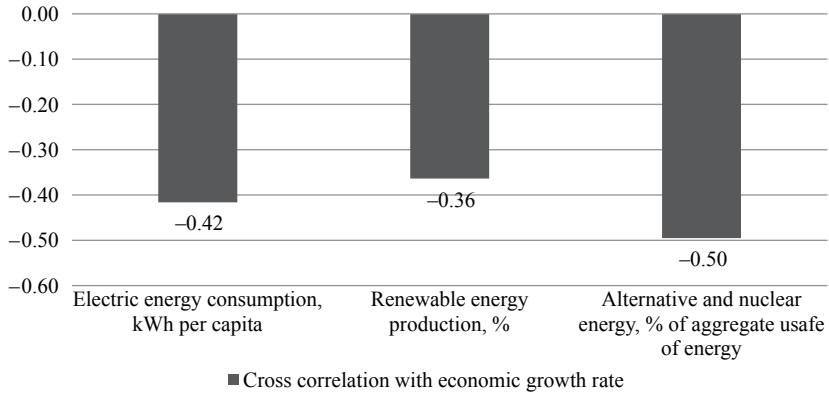

Fig. 3. Cross Correlation of the Indicators of Energy Efficiency with the Rate of Economic Growth in Top 10 Countries by Population and Waste (2019). *Source*: Calculated and built by the authors.

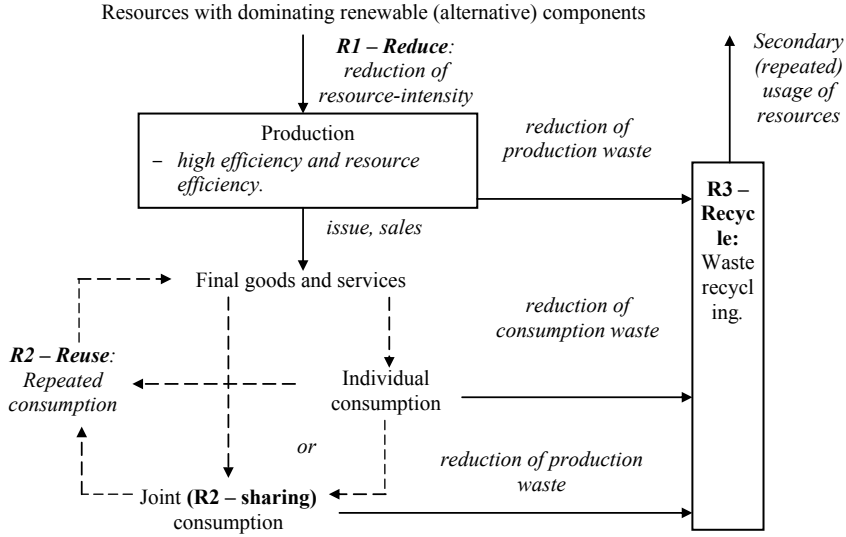

Fig. 4. The Basic Conceptual Model of the Circular Economy.
Source: Developed and compiled by the authors.

(R1) and showed higher efficiency and resource efficiency. Final goods and services are consumed individually, then jointly (R2), and then repeatedly (R2) – in Fig. 4 the alternative character of the variants of consumption is shown by dotted lines. Waste of production and consumption is reduced and recycled (R3), and it is sent to production again.

4. Conclusion

It is substantiated that the existing arguments in favor of the linear model of economic development are not persuasive and justified – from the scientific point of view; on the contrary, this model does not stand scientific criticism. High rate of economic growth contradicts public interests, and economic factors (population's purchasing power and cost of living) have small influence on the level of happiness in society.

The circular economy is more preferable; for environment protection, the reduction of ecological costs of production and consumption is manifested along the whole cyclic chain of added value. Ecological factors – in particular, reduction of production waste – largely stimulate the increase in the level of happiness in society. However, the measures of increasing the energy efficiency lead to the limitation of economic growth. This could be caused by insufficient scientific elaboration and incomplete implementation of scientific and technological progress in this process – this problem should be solved in further studies.