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IMPLEMENTATION OF CIRCULAR ECONOMY PRINCIPLES ACROSS COUNTRIES

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ABSTRACT

The purpose of the study is a comparative analysis of foreign experience in implementing the principles of a circular economy.

Methodology. To achieve the purpose of the study, the methods of analysis of literary sources, comparative analysis, content analysis were used. The World Bank classification of countries by income was applied.

The originality / value of the research. The originality of the work lies in a comparative analysis of the circular economy principles implementation among 15 foreign countries, which were selected and divided into three groups according to the 2021 World Bank income classification of countries. Measures to promote and achieve the circular economy were researched and analyzed, including government strategies, national programs, projects, successful cases and others.

Findings. This article analyzed government programs and policies, regulations, and case studies of countries in three groups in terms of per capita income: high, upper-middle, and lower-middle income. Based on the experience of foreign countries of the world, measures for the introduction of a circular economy were investigated and classified.

Keywords: circular economy, waste management, sustainable development, comparative analysis, cross-country analysis.

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INTRODUCTION

In the era of global challenges, the traditional linear take-make-waste approach is giving way to a new development strategy – a circular economy. If a linear economy uses resources indefinitely to produce products that will be discarded after use, then the circular economy, on the contrary, follows the 3R model (reduce, reuse and recycle) of encouraging the reuse of products and raw materials, and preventing the release of waste into the environment as much as possible.

A number of developed countries have begun active consolidated work on the transition to circularity: laws are being adopted, government programs are being developed, roadmaps are being approved, platforms are being created at the international level [1]. However, the scientific component of the concept of a circular economy in the world remains largely unexplored. Despite the understanding of the importance of moving to circularity, there are no clear systematic actions in developing countries around.

Therefore, this article aims to show what measures have been taken in different countries in moving towards a circular economy, while making a comparison between experiences of 15 countries with different income level.

There are 2 research questions in this study:

Research Question 1: What are the differences in circular policy measures in different countries according to income level group?

Research Question 2: What recommendations can be made for middle- and low-income countries?

MAIN PART

Literature review. The term «circular economy» (CE) was first used by scholars Pearce and Turner [2]. The Ellen MacArthur Foundation offered one of the most widely used definitions, according to which CE is described as «restorative or regenerative in its intention and design» [3]. A number of scholars consider CE as a paradigm associated with sustainable development [4]. Despite the fact that initially the CE focused on the problems of recycling, over time, scientists began to consider rethinking the strategic goals of production and consumption at multi-levels and assessing the effectiveness of progress in achieving circularity through indicators [5].

In 2018, during the World Economic Forum, the international PACE platform was launched to accelerate the transition to CE. In their analytical report the key elements of circulation are presented: eco-design, use of digital technologies, multiple and co-use of existing products, transformation of business models, use of resources, quality of resources. Thus, it is possible to make a conclusion about the evolution and expansion of the basis of the concept under consideration.

In the Scopus database, over 14 000 publications are indexed on «circular economy» keyword, 91 % of them were published after 2015. If, only 9 articles on the topic of circular economy were published in 2002, the corresponding number for only 2019 is 2152, which is another proof of the relevance of this concept. At the country level, the circular economy concept takes the form of concrete measures and initiatives. A number of developed countries, such as Germany, France, the United Kingdom, Japan, the United States, Sweden, and Denmark, have begun to actively promote policies aimed at supporting the closed-loop economy [6; 7; 8].

In 2015, the European Commission developed a plan for the transition to a circular economy [9]. In China, there was a special law on the promotion of the principles of circularity [10]. In Finland, the first «World Circular Economy Forum – 2017» was held, which was attended by more than 1 600 participants from more than 90 countries [11]. Thus, we see consolidated efforts to transform the world economy.

Methodology. Figure 1 provides a graphical map of research design, which we used in this study. The research process consisted of several steps. Firstly, a preliminary literature review was conducted to get more knowledge about the theoretical background of state support measures for the circular economy, emphasizing key factors and main regulatory spheres. Exploratory literature review provides information about the lack of studies on state support measures for the circular economy in developing and low-developed countries. After identifying the research gap, we referred to the World Bank's classification of countries by income level – high-income, upper-middle income and lower-middle income [12]. We decided to choose 5 for each specific group to further analysis, making it 15 countries in total.

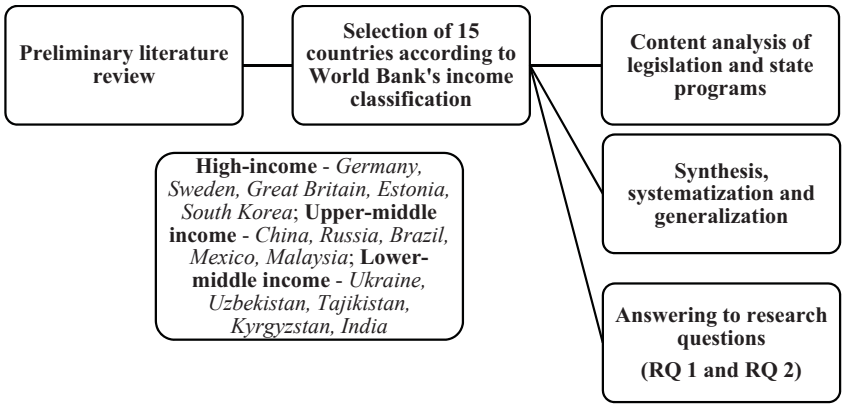

Figure 1 – Research design

Note – compiled by authors

For comparative analysis these countries were taken, according to their income level: Germany, Sweden, Great Britain, Estonia, South Korea – for high-income countries; China, Russia, Brazil, Mexico, Malaysia –

for upper-middle-income countries; Ukraine, Uzbekistan, Tajikistan, Kyrgyzstan, India – for lower-middle-income countries. As an empirical method of scientific research, comparative analysis was chosen, which makes it possible to reveal theoretical considerations and develop a classification [13]. The content analysis took into account strategic documents, government programs, legislation, and local initiatives. Sources of information were scientific publications in domestic and foreign journals, analytical reports of international organizations and local authorities, articles by experts in the media, government programs, regulatory framework, etc.

A detailed consideration of the peculiarities of supporting circular economy's policies in each country and group made it possible to compile the classification presented in the results section and answer the research questions.

Results and Discussion. Cross-country comparison of CE development demonstrates a fairly strong variability, depending on many factors (Figure 2).

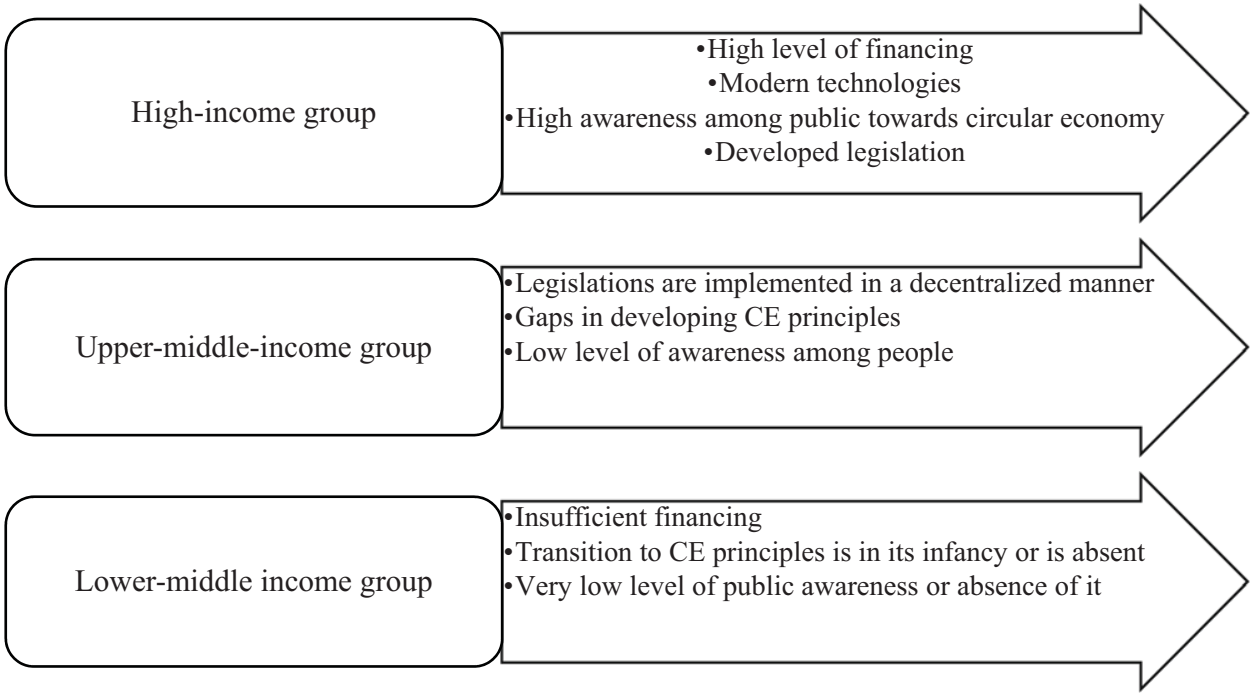

Figure 2 – The general description of circular economy's development depending on income level

Note – compiled by authors

After analyzing governmental measures to support and develop circular economy among 15 countries (Annex 1), we can compose the following answer to RQ1:

CE development trends in high-income countries

Countries with high per capita income are characterized by a more systematic and consistent government policy to form the foundations of a closed-cycle economy.

Germany's current closed economy can be more accurately described as "recycling-based waste management". The Circular Economy Act program mainly focuses on waste prevention, recycling and disposal. Closed-loop management is not only a contribution to environmental protection, but also a return on investment. The waste management industry has developed into a large and powerful sector of the According to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety Report, German economy: "Almost 270,000 people work in around 11,000 companies, with an annual turnover of around 70 billion euros. Around 15,500 units are helping to improve resource efficiency through recycling and recovery procedures. The high recycling rates of around 67 % for municipal waste, 70 % for commercial waste and 90 % for construction and demolition waste can show this fact" [14]. Among the institutional measures taken in Germany, it should be noted:

- Adopted regulatory legal acts:
• Enregiewende – Germany's transition to low carbon energy
• Circular Economy Act (2012)
• Resource efficiency program ProgRess I (2012)
• Climate Action Program 2020 (2014)
• Resource efficiency program ProgRess II (2016)
• Climate Action Plan 2050 (2016)
• German Circular Economy Initiative (CEID) 2019
• Roadmap for a circular economy for Germany
- *Economic instruments*: tax on gasoline, tax on transport (the more harm to the atmosphere, the more you pay), payment for emissions (PAYT). Also, the German government has invested heavily in the development and commercialization of electric vehicles [14].

Sweden is one of the leaders in the list of low-waste countries. A national circular economy strategy has been adopted, its main idea is to create a society in which all resources are used wisely and efficiently, replacing new materials. The main work focuses on – producing eco-design, sustainable use of products, materials and services, toxin-free and cyclical systems, and circular economy as a lever for promoting innovation and cyclical business models among the business sector and other participants in the economy. *Specific measures* – striving for products with a long lifespan, strengthening the innovation climate so that companies can grow in a circular economy, improving information for consumers in everyday life, creating a comfortable environment for the business sector so that they can share-repair-reuse products, development of policy instruments to promote the circular economy (supply and demand). Approximately 26,800 tons of materials and textiles were collected for reuse in 2018. Sweden has 583 recycling centers, which are visited by a total of 28 million people annually. In 2018, only 0.7 % of household waste was sent to landfills [15; 16].

The United Kingdom was one of the first countries to focus on preserving and protecting the environment. The Climate Change Act, which was adopted in 2008, obliges to reduce the level of greenhouse gases by at least 80 % by 2050, with implementation of five-year greenhouse gas emission ceilings called carbon budgets. This approach is now used as a model for action around the world and is reflected in the UN Paris Agreement [17].

Resources and waste strategy for England defines how to conserve material resources by minimizing waste, increasing resource efficiency and moving towards a circular economy in England.

The 25 Year Environment Plan determines what needs to be done to improve the state of the environment during the life of one generation. Goals:

1. Clean air.
2. Clean and abundant water.
3. Flourishing plants and wildlife.
4. Reduced risk of harm from environmental hazards such as floods and droughts.
5. More rational and efficient use of natural resources.
6. Increased interaction with the natural environment.
7. Mitigation of the effects of climate change and adaptation to it.
8. Waste minimization.
9. Management of exposure to chemicals.
10. Enhancing biosafety.

Clean Growth Strategy is an ambitious plan for a low carbon future for the United Kingdom [17].

Estonia has set a goal to develop a document and an action plan for the development of a circular economy by the end of 2021, which will allow the country to systematically establish a mindset and an entrepreneurial image based on a closed economy model by 2035.

In 2019, the Ministry of the Environment initiated the process of preparing a document on the development of a circular economy, starting with an examination of the future potential of the current situation, clarifying the waste disposal sectors and identifying the necessary measures. The study “Development of a methodology for drawing up a strategy of a closed economy” was carried out, during which an indicative monitoring framework and principles of a circular economy were established.

The study covers seven areas: construction, plastics, textiles, forestry and woodworking, food processing, services and waste management.

The results of the research work carried out are intended to be used as initial data in the preparation of the document and action plan for the development of the circular economy in Estonia, as well as to create conditions for the implementation of new measures of the EU structural funds, promoting sustainable development and supporting the competitiveness of enterprises. First of all, the analysis contained in the study should provide a basis for measuring, implementing and promoting the circular economy. A number of key research findings are reflected in the strategic program Estonia 2035.

If we talk about the modern elements of the CE in the country, then this is the introduction of a tax on waste disposal, which has been continuously increased since 2005. At present it is 30 euros per ton and it is levied on top of the waste collection fee. This measure led to the fact that the generation of waste in 2019 amounted to 20.21 million tons (less by 14.1 % compared to 2018), the generation of hazardous waste – 8.18 million tons (less by 25.5 % compared to 2018), waste disposal – 7.51 million tons (less by 25.9 % compared to 2018) [18; 19; 20].

South Korea is a country with limited resources and one of the largest energy consumers in the world. The shortage of its own natural resources in South Korea determines the strong dependence of the main sectors of the economy, such as the production of cars, steel and ships, etc. from the import of raw materials. South Korea is currently transitioning from the use of fossil resources and nuclear power to the use of renewable energy sources. The government also announced the Renewable Energy 2030 Plan, which is mainly aimed at increasing the share of renewables in the energy sector by 20 % by 2030. It should also be noted that South Korea is undergoing a transformation of the entire economy in response to new technological advances such as 3D printing, autonomous pilot driving, drones and renewable energies, which are often referred to as Industry 4.0.

To create a more sustainable and efficient resource circulation system at a fundamental level, Korea has adopted the Framework Resource Circulation Act (FARC). The main goal of the FARC (Framework Act on Resource Circulation) is to control waste generation with the efficient use of resources and to promote the recycling and proper disposal of waste, thereby minimizing the use of natural resources and energy, preserving the environment and creating a sustainable society. South Korea has recycled nearly 60 % of the city's waste, and the country currently recycles 95 % of its food waste [21; 22].

CE development trends in upper-middle-income countries

In countries with an average level of per capita income, reforms for the transition to the CE are, as a rule, at an early stage or are being implemented in a decentralized manner in different sectors.

China is one of the first countries in the field of transition to the R-principles of the circular economy, actively embarking on legislative initiatives since the 1980s. The changes introduced resulted in an extensive system of environmental laws. The first milestone was the adoption of the Law on the Promotion of the Circular Economy in 2008 [23; 24]. This Law focuses on development plans, extended producers' responsibility, supervision management systems for key enterprises with high energy and water consumption, circular economy indices. In general, China's circular economy policy includes command-administrative, tax, financial and price measures and is aimed at modernizing industrial structures, cleaner production, recycling and comprehensive use of waste [25].

The practice of China's circular economy is mainly implemented at the level of enterprises and regions. Preferential tax and financial incentives are applied. Preferential tax rating is applied at enterprises engaged in waste recycling and integrated use of resources. Price measures are used to regulate industries with high energy consumption [26].

At the regional level, in eco-industrial parks, industrial relations between enterprises are formed in the form of industrial metabolism and symbiosis.

Today, the country has seen the growth of the solar photovoltaic manufacturing industry, the development of renewable energy sources (excluding hydropower), the transport sector (hybrid and electric transport), forestry and eco-tourism [27].

China's Closed-loop Economy goals for 2025 [27]:

Increased resource productivity by 20 % compared to the 2020 level.

· Reduction of energy and water consumption per unit of GDP by 13.5 % and 16 %, respectively, compared to 2020 levels.

· Achieving the utilization rate of 86 % of crop stems, 60 % of solid household waste and 60 % of construction waste.

· Recycling of 60 million tons of wastepaper and 320 million tons of steel scrap.

· Production of 20 million tons of recyclable non-ferrous metals.

· Increasing the volume of production in the recycling industry to 5 trillion yuan (773 billion US dollars).

In addition to these goals, there are also three key points that should be achieved during this period:

• Creation of an industry-wide recycling system and improvement of resource efficiency

• Creation of a waste recycling system and development of a recycling-oriented society

• Deepening the development of the closed-loop agricultural economy and the creation of closed-loop agricultural production.

Achieving these goals will require transformations across society and the economy, since China itself emitted 27 % of greenhouse gases worldwide in 2019 [27]. It should be noted that China has great opportunities to solve the accumulated environmental problems by switching to a circular economy.

In **Russia**, the transition to a circular economy began recently. The Ministry of Industry and Trade published in 2018 the «Strategy for the development of industry for the processing, utilization and disposal of industrial and consumer waste for the period up to 2030» [28].

The Strategy describes the basic and relevant principles of the circular economy: waste recycling, reuse and the principle of reducing or preventing waste generation.

The key point of the strategy is the creation of ecological technology parks that will follow the principles of a circular economy, i.e. wise use of resources and recycling of products from secondary raw materials.

According to the Federal Service for Supervision of Natural Resources (Rosprirodnadzor): “There are 5-7 billion tons of generated waste in the country annually. In 2018, most of the waste (66 %) was associated with the extraction of fuel and energy minerals (mainly at coal enterprises), 22.6 % was associated with the extraction of metal ores, 1.9 % – with metallurgy, 0.6 % was associated with the chemical industry and 8.9 % was associated with other sectors, including housing and utilities. Solid domestic waste (MSW) accounts for 1-2 % of all waste More than 90 % of waste in Russia is disposed of in landfills” [29].

Now in Russia there are more than 80 % waste processing plants. However, the load on them is only 30-40 % due to the lack of raw materials. The level of waste recycling is quite low and amounts to 5-7 %. The national project «Ecology», which was launched in Russia in 2019, is called to improve the situation. Within the framework of this project, it is planned to build 200 waste processing plants in the country by 2024, and at the same time it is necessary to organize a separate collection of waste, which will be the raw material for these plants.

Russian legislation is mainly aimed at waste disposal, namely storage and disposal, or contains the most general provisions for their disposal and recycling. Thus, the transition to a cyclical economy in Russia is mainly associated with waste disposal, since over the past 30 years the topic of waste disposal has become an extremely important and urgent problem, especially in large cities [30].

Back in 2011, it was stated that **Mexico** is far from any semblance of a circular economy, and it was also noted that the transition to CE would require not only changes in recycling and reuse of waste, in production and consumption, but also in institutional systems: in legislation, education, knowledge transfer, environmental awareness and entrepreneurial culture.

Of particular concern is the generation of waste, which has reached over 44 million tons of waste per year, and is expected to reach 65 million by 2030 [31]. Each year, Mexico produces about 8 million tons of plastic waste, 32 % of which are recyclable, and for the plastic category 01-PET this figure reaches 56 %. Despite the fact that the country has a National Program for the Prevention and Integrated Management of Waste [32], which aims to increase the value of waste and minimize the impact on the environment and, in particular, on human health, as well as the fact that Mexico has international obligations on waste management and chemicals as a global priority, it was only in January 2019 that Mexico presented the concept paper “National

Vision for Sustainable Management: Zero Waste". In essence, the document is a roadmap for moving towards a circular economy. This document puts forward 6 guiding principles:

1. Sustainable development.
2. Circular economy.
3. Commitment to anti-corruption and transparency in public administration.
4. Caring for vulnerable groups of the population, including social justice.
5. Reducing risk and impact on health and the environment.
6. Social security and reducing inequality.

In Mexico, there is also a trend of involvement of large players in the creation of a circular economy, which are implementing standards of the level of developed countries in a single policy with the UN Sustainable Development Goals (SDGs).

Brazil's public policy in the circular economy is at an early stage, but the elements of the CE concept are decentralized in various laws, plans, programs and projects. For example, the National Solid Waste Policy strengthens the responsibility of waste producers, including the entire chain involved: producers, importers, distributors and traders [33]. Thus, this policy has established the principle of shared responsibility for the product after consumption, within which the various stakeholders have their share of responsibility for the proper disposal of the product and for ensuring that it can be reused after consumption or recycling. Also, within the framework of the National Policy, a waste hierarchy is defined: the elimination of waste generation, reduction, reuse, recycling, solid waste treatment and, finally, environmentally sound waste disposal. Thus, landfilling is the last and undesirable alternative [34].

In Brazil, circular opportunities dominate the construction sector, which accounts for 7 % of GDP and 9 % of the labor market, and more than half of the waste sent to landfills in Brazilian cities comes from demolition and construction.

Additionally, the steel industry is successfully adopting circular economy practices. Products in this industry can be reused, recovered and recycled without loss of performance. Cars, refrigerators, fittings and other steel products are collected at the end of their service life and sent back to steel mills to be used in the production of steel of the same quality [34].

Today, only about 50 % of PET bottle material is recycled after use, and about 17 % is mishandled – thrown away or openly burned.

Thus, in Brazil, there is an unevenness in the introduction of cyclical production across different sectors and industries [35].

The circular economic model in **Malaysia** is in its infancy, although steps have been taken to promote it. In particular, Malaysia has developed a National Plan for Sustainable Consumption and Production for the period from 2016 to 2030 [36]. According to the plan, all types of waste will be managed in an integrated manner using a life cycle approach, rather than through disposal [37].

The recycling rate in Malaysia was 28.1 % in 2019 and is projected to reach 40 % in 2025 [38]. In addition to recycling consumer and household waste, the focus is also on encouraging firms to reduce industrial waste generated from manufacturing activities. In order to limit waste generation, the government provides targeted incentives to companies whose activities are aimed at sustainable use of the environment, in particular the processing of toxic and non-toxic waste, chemicals and recycled rubber. These companies can be exempted from income tax of 70 % for 5 years. Also, companies can receive a tax deduction of 60 % of capital expenditures incurred over 5 years.

Nowadays, recycling facilities are scattered across the country, which geographically limits the ability to recover valuable waste and components that can be recycled. To solve this problem, an initiative (Waste Eco Park (WEP)) was developed to bring together recycling companies from different industries in one place. Due to these initiatives, it is possible to form a circular approach to waste management in order to achieve zero waste generation.

CE development trends in lower-middle-income countries

For countries with low per capita income, the transition to CE principles is in its infancy or is absent. Also it should be noted that there are insufficient funding and low level of knowledge about CE among population of these countries.

As income per capita grows, there is also an increase in institutional activity on the part of the state in the transition to the principles of CE.

At the moment, the second stage of the National Waste Management Strategy is being implemented in **Ukraine**. The first phase to implement this strategy began in 2017-2018, the second phase covers 2019-2023, and the last third phase is planned for 2024-2030.

The implementation of this strategy is designed to ensure that waste is recycled by at least 15 % by 2023 by introducing waste sorting lines and launching appropriate plants. It is also planned to increase the number of the population that deliberately collects household waste to at least 23 %. In 2030, these indicators are expected to grow up to 50 %. To consistently implement the planned measures, it is necessary to build new centers for the reception and collection of waste, in the amount of 250-300, as well as 90 waste sorting lines. The number of landfills intended for the disposal of garbage and other waste should be reduced from 5 thousand to 100-150. It is reported that these will be modern facilities that meet all safety rules and EU standards. Today, the bulk of waste in Ukraine is disposed of in controlled landfills [39].

As in many countries of this level, there are problems associated with the collection of waste, namely plastic. It's all about the minds of people – people simply do not want and do not sort garbage, so recycling companies often have to buy garbage from neighboring countries for millions of dollars. It is obvious that the awareness of the population plays an important role in the formation of a circular economy today.

According to experts, the transition of Ukraine to the CE will be long and difficult, because despite the existence of programs and laws, this process is still accompanied by the absence of a unified system and tools that would allow creating effective management methods, as well as the lack of financial support for the necessary measures. Enterprises that do not have sufficient financial resources to carry out the reorganization and modernization of production are waiting and looking for potential sources of funding [40].

In **Uzbekistan**, National programs for waste management (Solid Waste Management) are not technically equipped to cope with the current waste situation. In regions outside the capital of Uzbekistan, SWM programs are very limited, often it is just the removal of solid waste to inappropriate landfills, in which they remain lying. As for the regions and villages, the management of solid waste is almost completely absent. According to statistics, the efficiency of collection of solid waste in regions and rural areas is less than 50 %. In the cities of Uzbekistan, recycling is only in its infancy, and its efficiency is unofficially estimated at less than 10 %. In rural areas, processing is practically non-existent.

In the future, it is planned to implement the «Innovative Uzbekistan» project, the purpose of which is to provide an opportunity for civil society organizations to promote their proposals on the use of cost-effective management methods in Uzbekistan. The target result of the project is aimed at:

• Introduction of circular economy approaches, which will lead Uzbekistan to an increase in the standard of living of the population, including in remote regions of the country.

• Strengthening the consolidation between local authorities and civil society organizations, so that through joint efforts to protect the environment and improve the economic situation in different regions of the country.

• Increasing the capacity of civil society and environmental organizations through professional training, learning from international experience and developing innovations in the field of sustainable production and the circular economy [39; 41].

A system of environmental quality standards has been preserved in **Tajikistan** since Soviet times. Today, there are the following laws, programs and documents aimed at the development of a circular economy:

• Law No. 44 «On Production and Consumption Waste», 2002.

• Law No. 1002 «On Radioactive Waste Management», 2013

• Law No. 705 «On Environmental Information», 2011

• Law No. 760 «On Environmental Protection», 2011

• «Concept of environmental protection in the Republic of Tajikistan», approved by the Government of the Republic of Tajikistan on December 31, 2008 (No. 645)

• National concept for the rehabilitation of uranium ore processing waste for 2014-2024.

• National Development Strategy of the Republic of Tajikistan for the period up to 2030 (2016).

Tajikistan joined the "Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal 1989" in 2016.

Also worth mentioning is the 2008 Dushanbe Solid Waste Management Project. The objectives of the project were to assist the city of Dushanbe in rehabilitating the existing landfill and collection points, supplying new equipment for the landfill; also provided for the supply of new cash collection equipment, containers and equipment. Other goals included helping the city reorganize and improve the collection and disposal of solid waste in Dushanbe. There are no official statistics on waste management in Tajikistan [42; 43].

In the **Kyrgyz Republic**, the transition to a circular economy is at an insufficient level. Every year in this country the amount of waste is increasing. This is evidenced by official UNDP statistics and other sources. The amount of household waste in this country reaches approximately 20 % annually. There are various programs to address these problems, but these initiatives are not regulated enough and remain only on paper. All existing landfills where waste is dumped do not comply with international safety standards for nature and humans [44; 45; 39].

To this day, the population of **India** occupies 18 % of the world's population, and in terms of world waste, its percentage fluctuates around 12 %. Due to the fact that the number of people in India is only growing every year, there are forecasts for a corresponding increase in waste. Waste management facilities in India are under-equipped and therefore ineffective. According to experts, this can lead to both global problems and problems within the country, which makes the transition to the CE – a necessary strategy for the country.

At this stage, the Ministry of Environment and Forestry of India has begun to implement a waste management system to make it easier to manage this area, as well as to digitalize the economy. As of June 2021, the United Nations Development Program (UNDP) Plastic Waste Management Program in India has helped recycle 83,900 metric tons of plastic waste. The plan is to recycle 85,000 metric tons of plastic waste and reach over 50 cities by 2024 [46].

Also, according to experts, attention should be paid to the construction sector, which generates more than 8 % of India's GDP, as it is expected to expand further to meet the demand for new housing. Obviously, the circular economy criteria applied to buildings under construction can help create sustainable cities and enable material circulation and reuse of building components at the end of a building's life [47].

The following lessons can be taught for developing and least developed countries in terms of providing effective state support policy for the circular economy (RQ2):

1. Provide effective initiatives for financing companies and offer loans and other incentives for the governmental and non-governmental organizations to become more close-looped.
2. Improving public attitude and knowledge towards circular economy.
3. The formation of a national strategy for the circular economy.
4. Using the speed of diffusion of modern technologies, there is a potential for dynamic development of the CE in all countries, the government of which is ready to consistently provide institutional support and implementation of circular economy principles. At the same time, market incentives should become prevalent for economic agents – pioneers in the transition to the CE.

CONCLUSION

The policy of state support for the circular economy should ensure the creation of a favorable legal and regulatory framework aimed at supporting the development of the circular economy. Nowadays, the implementation of such governmental policies differs in many countries, depending on various factors. In this article, we considered three groups of countries selected by income level. This article contains several examples of successful adoption of supportive government programs and creative initiatives at the national level. The experience described in this document will certainly help systematize current practice in different countries and explore general patterns for further research. This study provides a rationale not only for supporting more effective policy development, but also for collecting and disseminating information on best practices that can help stakeholders in developing countries find better solutions for implementing circular economies.

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ЦИРКУЛЯРЛЫ ЭКОНОМИКА ҚАҒИДАЛАРЫН ЖҮЗЕГЕ АСЫРУДЫ МЕМЛЕКЕТАРАЛЫҚ ТАЛДАУ

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АҢДАТПА

Зерттеу мақсаты – циркулярлы экономика принциптерін жүзеге асырудағы шетелдік тәжірибені салыстырмалы талдау.

Әдіснамасы. Бұл зерттеуді жүргізу кезінде әдеби дереккөздерге шолу жасау, салыстырмалы талдау, мазмұнды талдау әдістері қолданылды. Дүниежүзілік банктің елдердің кіріс классификациясы қолданылды.

Зерттеудің бірегейлігі / құндылығы. Жұмыстың ерекшелігі 2021 жылғы Дүниежүзілік банктің елдердің кіріс жіктемесі бойынша іріктеліп алынған және үш топқа бөлінген 15 шет мемлекет арасындағы циркулярлы экономика қағидаттарының жүзеге асырылуын салыстырмалы талдау болып табылады. Айналмалы экономиканы дамыту және оған қол жеткізу шаралары, сонымен қатар мемлекеттік стратегиялар, ұлттық бағдарламалар, жобалар, сәтті қадамдар және т.б. зерттеліп талданды.

Зерттеу нәтижелері. Бұл мақалада жан басына шаққандағы табыс деңгейі бойынша үш топқа: жоғары, орташа және орташадан төмен елдердің мемлекеттік бағдарламалары мен саясаттары, ережелері мен мысалдары талданды. Шет мемлекеттердің тәжірибесіне сүйене отырып, айналмалы экономиканы енгізу шаралары қарастырылып, жіктелді.

Түйін сөздер: циркулярлы экономика, қалдықтарды басқару, тұрақты даму, салыстырмалы талдау, мемлекетаралық талдау.

Алғыс. Зерттеу Қазақстан Республикасы Білім және ғылым министрлігінің Ғылым комитетінің қаржылай қолдауымен (грант № AP09259851) жасалған.

МЕЖСТРАНОВОЙ АНАЛИЗ РЕАЛИЗАЦИИ ПРИНЦИПОВ ЦИРКУЛЯРНОЙ ЭКОНОМИКИ

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АННОТАЦИЯ

Цель исследования – сравнительный анализ зарубежного опыта по реализации принципов циркулярной экономики.

Методология. При проведении данного исследования были использованы методы обзора литературных источников, сравнительный анализ, контент-анализ. Была использования классификация Всемирного банка стран по уровню дохода.

Оригинальность / ценность исследования. Оригинальность работы заключается в сравнительном анализе реализации принципов циркулярной экономики среди 15 зарубежных стран, которые были отобраны и разделены на три группы согласно классификации по доходу стран World Bank 2021 года. Были исследованы и анализированы меры по продвижению и достижению циркулярной экономики, включая государственные стратегии, национальные программы, проекты, успешные кейсы и другие.

Результаты исследования – в данной статье были проанализированы государственные программы и стратегии, нормативно-правовые акты, и кейсы стран в трех группах по уровню доходности на душу населения: высокий, средний, и ниже среднего. Исходя из опыта зарубежных стран мира, были исследованы и классифицированы меры по внедрению циркулярной экономики.

Ключевые слова: циркулярная экономика, управление отходами, устойчивое развитие, сравнительный анализ, межстрановой анализ.

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Annex 1

Comparative analysis of state measures for supporting and developing circular economy across countries

№	Country	Legislative framework, state programs, strategic documents	Successful cases on CE
	High-income group		
1	**Sweden**	National strategy for the transition to a circular economy, July 2020 The New Comprehensive Plan for Umeå Municipality (2018) Swedish government's letter of December 2015, "Politics for sustainable businesses" Waste Incineration for the Future, 2019	Wrights Recycling Machinery Ltd - manufacturing the cable stripping machinery, granulators and shredders for waste, etc. NIVUS GmbH - water industry, especially in measurement system. Weda AB - Elleta Group – water industry, especially in underwater cleaning solutions. IKEA - Continuously working to expand the use of both renewable and recyclable materials Developed materials made entirely from recycled wood and recycled PET bottles
2	**Germany**	Enregiewende – Germany's transition to low-carbon energy Circular Economy Act (2012) Resource efficiency program ProgRess I (2012) Climate Action Program 2020 (2014) Resource efficiency program ProgRess II (2016) Climate Action Plan 2050 (2016) [BEROC, 2018] Circular Economy Initiative Deutschland (CEID) 2019 Circular Economy Roadmap for Germany	Rhinopaq – paper industry, especially in reusable shipping packaging boxes. RadiciGroup – recycled product which can be used in many industries. ReNewTex - Circular Economy for Textiles. Van Werven Plastics Recyling – plastic industry, recycling plastic to high-quality materials.
3	**Great Britain**	Resources and waste strategy for England (2018) 25 Year Environment Plan (last update in 2019, first published in 2018) Clean Growth Strategy (2017, updated in 2018)	Good Club - Zero Waste store, delivering products in reusable boxes. CauliBox – food packaging. A Good Thing – donation of items to charity.

4	**Estonia**	Circular economy conference (2018,2019,2021) Estonian Circular economy strategic document and action plan (2021) Strategy «Estonia 2035»	Ragn-Sells - collects, treats and recycles waste and residual products from businesses, organisations and households. Rohepakend – food packaging.
5	**South Korea**	Framework Act on Resource Circulation (FARC) 2016 Waste management Act (1986) Act on resource saving and recycling promotion (1992) Act on encouragement of purchasing Green Products (2004) Act on resource circulation of electrical, electronic equipment and vehicles (2008) First Master Plan on Resource Circulation (Resource Circulation Plan) 2018-2027 The Master Plan on Resource Development (2020-2029)	Granutech-Saturn Systems - recycling equipment systems. KB Corporation – battery and electronic scraps. Samsung - Samsung's Galaxy Upcycling program
	Upper-middle-income group		
6	**Russia**	Fundamentals of state policy in the field of environmental development of the Russian Federation for the period up to 2030 National project «Ecology» (2018) International Conference «Cyclical Economy as a Context for Innovation in the 21st Century» (2015)	Sberbank - ESG- direction (ESG = (Environmental) + (Social) + (Governance)) Polymetal - Gold mining company MTS – telecommunications company Sibur – Petrochemistry company
7	**Mexico**	National Programs for the Prevention and Integral Management of Waste National Vision Towards Sustainable Management: Zero Waste (2019) National Strategy for Sustainable Production and Consumption (2012) The Low Carbon and Circular Economy Business Action in Mexico	Heineken N.V.(beer) - production waste and unused secondary resources are transferred to neighboring enterprises for reuse Hellmann's mayonnaise - sold in packaging made from 95 % recycled PET plastic
8	**Brazil**	REDE Candonga Initiatives (2020) National Solid Waste Policy (Law No. 12,305/2010) Incentive Program for Alternative Electricity Sources (PROINFA) was created by Law No. 10,438/2002 The National Water Resources Policy (Law Bill (PLS) No. 58 of 2016) New Forest Code (Law No. 12,651/2012)	Rede Asta – recovering materials from waste. Natura - cosmetics industry.
9	**Malaysia**	National Plan for Sustainable Consumption and Production Waste Eco Park (WEP)	Sphera – risk management software and eco-friendly services. Landustrie Sneek BV - field of water and wastewater management.
10	**China**	Guidance of the State Council on Promoting the Development of Circular Economy 2005 Circular Economy Promotion Law 2008/2009 11th Five-Year Plan Development Plan for the Circular Economy in the 14th Five Year Plan Period[1] China's inaugural Circular Economy Roadmap	Telecom – recycles used mobile phones. Guigang – Eco-Industrial Park Fushan village – the case of an integrated ecological Farm

	Upper-middle-income group		
11	**Tajikistan**	Law No. 44 On Production and Consumption Waste of 2002. Law No. 1002 «On the Management of Radioactive waste» 2013 Law No. 705 «On Environmental Information» 2011 Law No. 760 «On Environmental Protection» 2011 «Concept of environmental protection in the Republic of Tajikistan», approved by the Government of the Republic of Tajikistan on December 31, 2008 (No. 645) National Concept for Rehabilitation of Uranium Ore Processing Waste Tailings for 2014–2024. National Development Strategy of the Republic of Tajikistan for the period up to 2030 (2016) In 2016, Tajikistan joined the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal 1989.	Project “Candied fruits” - Production and sale of candied fruits
12	**Uzbekistan**	Law of the Republic of Uzbekistan On Waste (2002) RI strategy for solid waste management in RI for the period 2019-2028 Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 787 «On measures to further improve the efficiency of work in the field of household waste management» (2018) Resolution of the President of the Republic of Uzbekistan dated No. P-3730 «On measures to further improve the system for handling household waste» (2018) Decree of the President of RU No. PP-2916 «On measures to radically improve and develop the waste management system for 2017-2021» (2017) Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 295 «On approval of the Regulation on the procedure for the implementation of state accounting and control in the field of waste management» (2014)	«Ecotrans» - Bicycle rental service centers. Consumers can use a dedicated app for payment and security. «Green Roofs» - The aim of the project is to green roofs, create recreation areas and sports on the roofs of residential buildings and business centers.
13	**India**	The Forest Conservation Act, 1980 The Environment (Protection) Act 1986 The Wildlife Protection Act, 1972 Air (Prevention and Control of Pollution) Act, 1981 Air and The Indian Forest Act, 1927 and Water (Prevention and Control of Pollution) Act, 1974. National Environmental Policy, 2006	Binbag Recycling – recycling and collecting e-waste. Namo eWaste Management - technology industry. Saahas - recycling waste and creating new products.
14	**Ukraine**	Sustainable Development Strategy «Ukraine - 2020» (January 2015) Energy Strategy of Ukraine - 2035, Small and Medium Business Development Strategies - 2020, State target program for the development of the agricultural sector - 2020, changes are made to the Environmental Strategy - 2020, work has begun on the Low-Carbon Development Strategy - 2050 and the Industrial Complex Development Strategy - 2025	Polygreen - plastic goes through a full cycle of processing and purification of polymers

15	**Kyrgyz Republic**	Law of the Kyrgyz Republic on Environmental Protection 1999 Law of the Kyrgyz Republic on Production and Consumption Wastes 2001. The program for the development of a green economy in the Kyrgyz Republic for 2019-2023 The concept of environmental safety of the Kyrgyz Republic 2007. The procedure for handling production and consumption waste in the Kyrgyz Republic in 2015 Sustainable Development Goals 2030 in Waste Management State Program on Sustainable Waste and Secondary Resources Management for 2019-2023	«Ecocomplex» is the only company in Bishkek for disposal of hazardous waste (medical and carbon-containing waste, plastics, waste batteries, electrical equipment and office equipment) «Warm Windows - Warm Home» - A service for insulating and restoring wooden windows using the Swedish EuroStrip technology, which is unique in several features and is still not available on the Kyrgyz market.
Note – compiled by authors			