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# CIRCULAR ECONOMY: OPPORTUNITIES FOR DEVELOPMENT OF RUSSIA'S ARCTIC REGIONS

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### *Abstract*

The paper considers the advantages of the “circular economy” aimed at the preservation of the main reserves, technological changes that contribute to the reduction of the volume of produced products as much as possible. The study is related to the peculiarities of geopolitical factors that make it necessary to adjust the economic priorities of regional development by searching domestic economic reserves, innovative approaches to the economic potential of the regions. Social guidelines of the economy, which are gaining momentum around the world, impose additional requirements to production activities by identifying and preventing negative effects in order to improve the efficiency of economic and environmental systems as well as social security. The circular economy model can solve most of these social requirements. The study considered the possibilities of introducing the elements of circular economy in one of the Arctic regions – Murmansk Region. The specificity of this Arctic region is determined by single industry, special sensitivity to any socio-economic reforms, ecological “fragility”, discomfort of the population, as well as geographical proximity to Nordic countries possessing an extensive experience of using the principles of circular economy. The potential for the development of new economic activities of the region through the processing of fisheries and fish farming wastes, mining and processing was identified. The social and economic effects of introducing the elements of circular economy into the established economic system of the regions of the Arctic Zone of the Russian Federation were determined.

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**Keywords:** Circular economy, industrial waste, innovative development, region, the Arctic Region.



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## 1. Introduction

Tough geopolitical situation makes it necessary to adjust the economic priorities of the regions, to find internal reserves for development, which can be solved as part of the stimulation of the introduction of various areas of circular economy. The circular economy has great scientific, technical, economic and social potential. In modern domestic and foreign sources, there is no unambiguous interpretation of the concept of “circular economy”. It is important to note that the circular economy is not limited to the end-of-life waste treatment; it gives impetus for technological, organizational and social innovation across the value chain, starting with environmental product design and waste prevention.

The principles of circular economy were applied in the human practice during different periods of economic functioning of different countries. Without delving into the historical survey of this issue, we will indicate that there is an interesting and rich experience of the Soviet economy in the field of collection, recycling, use of multi-trip packaging, organization of waste management and disposal. Today there is a new wave of appealing to the opportunities of the circular economy. It was the problems of waste management as opportunities for resource reutilization that formed the basis of the concept of a circular economy.

For over 10 years, such countries as China, the United States, and South Korea have been supporting research programs at the state level to promote and attract circular economy tools for reuse and conversion of emerging waste. Today, the EU can be called a leader in the implementation of the circular economy model. Thus, according to the EU action plan adopted by the European Commission on 26 January 2017, the transition to a more circular economy requires measures throughout the life cycle of the product: from production to the creation of markets for “secondary” (produced from waste) raw materials. The objectives of the action plan are waste management for areas where increased waste prevention, reuse and recycling are available and needed.

## 2. Problem Statement

At present, there is no holistic approach to the recognition of a single model of circular economy at the state level, the attention is mainly focused on the management of domestic waste. This situation leads to blurring of the functionality of the authorized waste management bodies, misunderstanding of the population of the main directions and possibilities of the circular economy, and as a result of the inertia of the public position, as well as the lack of interest of industrial waste owners. Thus, it is necessary to create clear rules, a control system and incentives at all levels of government in order to progressively incorporate the principles of circular economy into the current model of economic life.

Besides, the ambiguity of concepts and targeting of circular economy models makes it difficult to develop and use this concept: “regenerative design” (Lyle, 1994), “closed-loop economy” (Stachel, 2013), “from origin to origin” or “from cradle to cradle” (Braungart & McDonough, 2002), “biomimicry” (Benyus, 2003). Many researchers use the term “circular economy”.

Circular economy is not limited to the end-of-life waste treatment; it gives impetus for technological, organizational and social innovation across the value chain, starting with environmental product design and waste prevention. It is necessary to find the optimal combination of elements of both

models based on the real opportunities and realities of a particular state at a particular stage of its development. What directions of business development can be implemented within the system of circular economy? The main generally recognized and most feasible direction is the recycling of domestic and industrial waste. The introduction of business models of circular economy in Arctic territories is actually an essential argument for reducing risks of non-diversified economy of the Russian Arctic. Murmansk Region – the region of the Arctic Zone of the Russian Federation (AZRF) was chosen to study the possibilities of introducing the elements of the circular economy.

### 3. Research Questions

Today, the Russian Federation has formed a relatively extensive base of legislative, regulatory and legal documents of various levels and directions in the field of waste management, environmental design, evaluation of quantitative environmental information, as well as standards. These norms are fragmented, sometimes contradictory, and do not form a unified state approach to the circular economy model at the conceptual and strategic levels. All this leads to both positive and negative aspects:

1. Positive – almost complete freedom of creativity and activity of regional and municipal authorities to develop and implement their own projects following the principles of circular economy.
2. Negative – lack of unified classification of waste (governed by different regulations and legal acts), difficulties in establishing a unified statistical base of waste at all levels of management (waste accounting system), poor efficiency of economic incentives and instruments, difficulties in creating productive infrastructure due to expensive investments, etc.

It shall be noted that the studied economic model in the modern Russian Federation finds itself in a state that can be defined as “testing the waters”. In order to create the mechanisms of circular economy, appropriate targeting and formulation of state position to this type of economic relations and their integration into the existing model of economy is required. In fact, the norms of the approved *Industrial Development Strategy for Processing, Recycling and Neutralization of Production and Consumption Wastes for the Period up to 2030* (No. 84-r of 25 January 2018) repeat the approaches, principles and mechanisms of the circular economy model, but only in terms of waste management. The main business models not related to waste processing (longer service life, etc.) are not considered.

Today, there are dozens of organizations of various legal status in Murmansk Region that have the necessary license for waste management activities and operation in this field. However, according to the authors, only 10–15 % of them work with industrial wastes and even less carry out decontamination of wastes or their processing, producing new products from recyclable materials. The vast majority of companies are involved in the disposal of household waste. At the same time, industrial waste in the region is hardly processed.

In terms of processing municipal (household) waste in Murmansk Region, similar to many other regions, active work is under way to create processing facilities. In 2013 the Government of Murmansk Region concluded the concession agreement with JSC Waste Management concerning the system of municipal infrastructure – system of processing and utilization (burial) of municipal solid waste in the territory of Murmansk Region. In accordance with the agreement, JSC Waste Management took up its duties in April 2018 having received the status of a regional operator for waste management for 10 years

in the following areas: collection, transportation, processing (sorting and selection of useful fractions), disposal and decontamination of wastes of I–IV classes. The company operates within the framework of the pilot Russian project ecotechnopark. This project is implemented first in AZRF. At the same time, the project concept implies the creation of an integrated system of municipal waste management on the principles of recycling, i.e. from reloading stations and landfills to garbage handling and processing organizations (TASS, 2018).

Considering the possibilities of introducing the model of circular economy in AZRF regions it is necessary to talk about the directions of processing of production wastes, on the basis of which it is possible to create new jobs, which will reduce social and economic tension for northerners being at risk of becoming unemployed, unite and involve all actors and stakeholders. At the same time, the talent pool for the presented directions of development of the circular economy exists in reality and, if necessary, can be restored (created) quite quickly at the expense of available opportunities of secondary and higher educational institutions of the region.

#### **4. Purpose of the Study**

The purpose of the study is to assess the possibilities of introducing the principles of circular economy in the regions of the Arctic Zone of Russia, as well as to identify administrative, organizational, structural and economic barriers that prevent the introduction of various business models of circular economy to the main economic entities of the AZRF regions at the present stage, to identify its “growth points”. The principles of circular economy implemented on the basis of individual features of natural, social, institutional and technological potential of the AZRF regions requires terminological and conceptual development.

#### **5. Research Methods**

The research was conducted with the use of general scientific methods, methods of statistical analysis, economic comparison, expert reviews.

#### **6. Findings**

At present, there are no unified approaches to the introduction of the circular economy in the regions of the Russian Federation. This provides all actors of regional economic development with a wide range of possible combinations of different business models, methods and economic instruments for the circular economy. At the same time, it is necessary to rely on the basic features of the circular economy highlighted in the works of domestic and foreign scientists (MacArthur Foundation, 2013; Pakhomova et al., 2017):

- 1) enhanced control of natural reserves and sustainable balance of renewable resources to preserve and maintain sustainable natural capital;
- 2) optimizing consumption processes by developing and distributing products, components and materials that meet the highest recycling levels;

3) identifying and preventing negative external effects of current production activities with a view to improve the efficiency of economic and environmental systems.

The features identified need to be complemented by the current conditions of regional economic systems:

4) strengthening the role of natural-like technologies and environmental standards;

5) changing the vector of the economy towards general social well-being on the basis of the common interest of all actors of economic activity;

6) decoupling of economic development;

7) eliminating structural imbalances for resource-oriented territories.

Thus, the circular economy is oriented towards the secondary use of resources, manufactured goods, raw materials, waste and satisfaction of public needs, especially social and environmental requirements. The maximum effect of the introduction of circular economy principles is the creation of technologies and the transition to waste-free production. The scientific literature refers to distinctive features of the analyzed model (Avramenko & Gorbachev-Fadeev, 2015): practical orientation; measurability; scalability; bottom-up approach. Let us propose an extended interpretation of these features of the circular economy.

1. Practical orientation implies the real achievement of practical goals and objectives in the field of economic and environmental development.

2. Measurability allows using a set of quantitative indicators characterizing the state of the circular economy in the industry or territory. Such indicators include changes in GDP, GRP; change of the unemployment state (creation of new jobs); changes in the income level of the population; change of tax revenues; change of the level of business credit; change of waste level; change of investment level.

3. Scalability – it seems that this feature can be expressed in several directions: geography of distribution of the model of circular economy, including by regions of the Russian Federation; industry feature of the circular economy model, including taking into account the cross-sectoral segment; circle (structure) of involvement of various actors (population, power, business, public organizations); cultural vector, i.e. dissemination of propaganda and formation of relevant behavioral pattern.

4. Bottom-up approach – in this case, it may be a vector of initiative and management of the introduction and dissemination of the principles of the circular economy model.

Circular economy is not limited to the end-of-life waste treatment; it gives impetus for *technological, organizational and social innovation* across the value chain, starting with environmental product design and waste prevention. Table 01 shows fundamental differences of linear and circular economy by main economic features.

**Table 01.** Comparison of circular and linear economies

<b>Feature (field of comparison)</b>	<b>Linear economy</b>	<b>Circular economy</b>
Purpose	Profit maximization	Social and ecological equation
Economic capacity	Increase	Reduction
Consumption	Increase	Reduction / increase of life time
Resources	Primary	Implicative
Result	Waste accumulation	No waste, emergence of new fields

Type of production	Labour-intensive	High-tech, use of minor cycles, innovations
Social partnership	Force business to take social responsibility	Initiative business responsibility
Product life-cycle stages	Maximum efficiency only at the beginning of the product lifecycle	Maximum efficiency of every process within the product (service) lifecycle
Technologies	Nature exploitative	Nature-like

The possibilities and necessity of introducing different business models of circular economy in the territories of the Arctic Zone of the Russian Federation are determined by their bio-socio-economic factors. The economy is represented by resource industries with a high degree of waste production. The Arctic society is represented by quite a large number of highly qualified and “soft skills” specialists, and the biosystem is most vulnerable to various impacts, which requires a special environmental approach. At the same time, the practice of processing industrial waste in Murmansk Region indicates low level of circularity of the economy. Traditionally, the region’s economy is based on the development of natural resources or their primary processing. Within GRP industry (mining and processing) and fishery, in fact the second most important industry in the economy of the region, take the largest share. Wastes are also distributed by economic activity according to GRP (Table 02).

1. *Mining and processing wastes* occupy a leading place in the structure of wastes by types of economic activities of Murmansk Region. On the one hand, this type of waste carries a serious environmental threat, on the other hand, has a huge potential for recycling. Taking into account the huge volume of mining wastes it seems rational after additional recovery of valuable components to use the component by processing into construction and technical materials. The use of secondary raw materials in such material-intensive branches as industrial, civil and road construction and production of construction materials significantly reduces the volume of special development of non-waste raw materials deposits, as well as contributes to reducing the environmental burden.

**Table 02.** Waste structure by type of economic activity, Murmansk Region, 2016<sup>1</sup>

Nature of business	Waste generation over the reporting year		Waste management	Waste treatment
	tons	%		
A – agriculture, forestry, hunting, fishery and fish farming	79 407.576	0.04	64.6	0.13
B – extraction of mineral resources	151 289 911.567	75.80	36.59	0.0
C – manufacturing	47 952 795.492	24.02	1.18	0.0
Other	269180.445	0.14	–	–
Total	199591295.080	100	–	–

According to experts, magnesium and iron hydrosilicates such as serpentines, hydrochlorites, etc., play a leading role in the composition of barren mineral tailing. There are also such carbonates as calcite, dolomite, ankerite (Ivanova et al., 2018). Serpentine-containing wastes can be used in the following directions: production of wall materials, production of tiles – facing, facade, flooring (Table 03).

<sup>1</sup> Source: <http://rpn.gov.ru/opendata/7703381225-rpnstatf2tpperVEDshort>

**Table 03.** Main possibilities of mining waste treatment

Type of waste	Impact on the environment	Application
Copper-nickel wastes	Oxidation of sulphides, (contamination with harmful components through vapour solutions)	Industrial, civil and road construction and production of construction materials. Production of wall materials, production of tiles (facing, facade, flooring). Production of plumbing and ceramic products.
Apatite-nepheline wastes	Fine slurries, air pollution (dust storms)	
Dumps of nonmetallic (spoil heaps) wastes		

2. *Fishery and fish farming wastes* also have great potential for the development of new directions of economic activity in Murmansk Region. On the one hand, the waste of aquaculture enterprises is a biological pollutant, on the other – a valuable resource for chemical industry, feed industry. Today in AZRF of the North-West region of the Russian Federation there are no enterprises receiving collagen proteins from fish raw materials. The fishing industry is as important in the region's economy as mining, manufacturing and energy and accounts for more than 11 % GRP (Government of Murmansk Region). Recyclable wastes and non-standard fish products account for up to 25 %, but can be used as a source of raw materials for the production of biologically active substances, thus contributing to the construction of a waste-free process, as is the case in Asian countries. Systematic use of bio-technologies will contribute to spatial development of the region and inter-industry innovations thus bringing together enterprises and organizations from different industries, creating an additional vector of development of the fisheries complex of the region, will serve to strengthen chemical and food clusters, create a medical and pharmaceutical cluster in the region thus contributing to innovative development of the region. The main directions of p fishing wastes processing are presented in Table 04.

The necessary conditions for the creation of these industrial clusters and the development of the circular economy model include development and implementation of an integrated management system (administrative resource, legislative field, financial system, interaction of all actors and stakeholders) and the development of a system of consumer culture and environmental education.

**Table 04.** Main opportunities for fishing wastes processing

Type of waste	Impact on the environment	Application
Food waste (heads, cartilages, bones, dried spinal cord, milk, etc.)	Putrilage, risk of fire hazard, sanitary and epidemiological threats. Total recycling averages 15 %	Chemical and food production, medical and pharmaceutical production, biomedical development, feed industry (import substitution of animal collagen)
Non-food waste (scale, skin, fins)		
Non-standard fish (non-commercial, rough)		

## 7. Conclusion

The expected effects of the proposed industrial clusters include:

1. Development of small businesses in the field of processing – softening the non-diversified nature of the region, introduction of new technologies, creation of products with new consumer properties, expansion of sales markets. At the same time, it is advisable to form economic ties on the basis

of a cluster approach with the involvement of small business entities, which is characterized by a high degree of mobility compared to the backbone enterprises of the region.

2. Innovative orientation of the region's economy – creation of new processing technologies, development of cognitive technologies through the interaction of business, education and science. Cross-industry development in the field of processing (production and improvement of equipment, adaptation of existing technologies), establishment of new industry relations and use of digital technologies in the system of waste databases, control systems, control algorithms, etc.

3. Attraction of investments, including domestic investments – development of government programs on targeted domestic loans to finance investments into processing, securing by warrant (region, municipality) on loans for business operating in the field of recycling, grants for newly organized enterprises, individual business entities and other measures, which will contribute to domestic generation of cash flows.

4. Development of interregional cooperation – utilization of experience of Finland and Sweden. Fortum (Finland) operates in Russia (mainly beyond the Urals), and in 2018 invited the Government of the Murmansk Region to implement a project on the construction of a new boiler house using biofuels.

5. Development of social partnership – understanding and voluntary participation of companies in waste processing activities, introduction of technologies based on environmental safety, increase of product lifecycle, etc.

6. Introduction of consumer culture – development, introduction of fundamentally different consumption and production models.

7. Creation of new jobs and growth of incomes of the population, which will reduce socio-economic tension for northerners who are at risk of becoming unemployed. At the same time, the talent pool for the presented directions of development of the circular economy exists in reality and, if necessary, can be restored (created) quite quickly at the expense of available opportunities of secondary and higher educational institutions of the region. Preservation of the living environment of the indigenous peoples of the North.

8. Competitiveness enhancement of the AZRF regions, forming an additional multiplier of regional development in the form of economic diversification and increasing socio-economic and environmental sustainability, as well as additional revenues of the regional budget.

Barriers to the introduction of the circular economy: lack of recognition of the principles of the circular economy at the legislative level and, as a result, lack of a unified approach in the sphere of state regulation to stimulate the introduction of the circular economy; blur of the functions of the authorized waste management bodies, which in turn is a consequence of the above-mentioned provision; high cost of investing in capacity and technology; lack of interest of industrial waste owners and lobbying their economic interests in power structures; passivity of thinking of the majority of the population according to the need for separate collection of waste; lack of work in the field of culture of consumer responsible behavior.

Necessary conditions for the development of the circular economy: development and implementation of an integrated management system (administrative resource, legislative field, financial



system, interaction of all actors and stakeholders); development of consumer culture and environmental education; creation of eco-parks (partially implemented).

Summing up, it is possible to focus on the universal character of the proposed directions of the circular economy in the resource-producing traditional economy of the AZRF regions – absoluteness of processing, use of any types of waste, complexity of obtained effects, variety of forms and business models. The authors believe that it is the model of circular economy that can become the driver of evolutionary economic development that allows preserving not only the conditions of biological survival and human security, but also ensuring creative, humanitarian and technological breakthrough of social development.

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