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Formation of mechanisms for creating innovative national polygons

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Formation of mechanisms for creating innovative national polygons

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Abstract. Currently, the issues of environmental protection and conservation are becoming very acute. The development strategy of the world community is determined by the UN Sustainable Development Goals. According to this document, one of the priorities is to eliminate the harmful effects of carbon fuel emissions. In the world, about 80% of the energy produced is produced by burning carbon, which leads to the release of greenhouse gases into the atmosphere. Annual CO_2 emissions reach 33.1 billion tons, causing irreparable damage to the environment. Our nature will continue to develop and evolve under these conditions, but the drastic climate change, global warming, and the mutation of flora and fauna are tasks that require immediate solutions. As a solution to these problems, we can offer the use of alternative energy sources. They represent promising ways to obtain, transfer and use energy from renewable sources, reducing the risk of harm to the environment. Also, to reduce harmful CO_2 emissions into the atmosphere, methods for reducing greenhouse gas emissions are proposed, including carbon dioxide sequestration technologies, which are implemented in the form of CC (U) S (carbon capture, utilization and storage) projects. Another solution to the tasks set can be the creation of carbon landfills and farms that will allow us to develop technologies for monitoring carbon emissions and runoff.

1. Introduction

The development strategy of the world community is determined by the UN Sustainable Development Goals. According to this document, one of the priorities is to eliminate the harmful effects of carbonic emissions. The appearance of the carbonic agenda in the discussions of the prospects for the economic development of states is the need to justify investments in the modernization and greening of production. The "green" economy defines a special development environment in which global business is focused on competitive production on the basis of an optimal cost mechanism, while of particular concern is the situation when the costs aimed at ensuring energy efficiency of production lead to an increase in the cost of production, without the predicted possibility of one hundred percent payback. Such a system of building economic relations for the development of industrial and industrial complexes often negatively affects the development of economic systems at different levels. Today various instrumental methods for reducing greenhouse gas emissions are being actively researched and tested, including carbon dioxide sequestration technologies which are implemented in the form of CC

(U) S (carbon capture, utilization, and storage) projects related to the capture, utilization and in some cases use of CO_2 [1].

Decarbonization is the reduction of the volume of emissions (carbonic footprint) in the production of products-has thus become a logical reason to interest business entities to modernize production complexes and sites [2]. Moreover, reducing the anthropogenic impact on the environment is a global task and a key priority of the Strategy of Scientific and Technological Development of the Russian Federation [3]. Most of the world's economies have outlined a plan for "green transformation" which allows changing the economy towards low-carbon and low-energy [4-6]. In general, the value judgments of the formation and implementation of decarbonization strategies in the global space confirm the stable long-term dynamics of the global trend towards low-carbon development [7].

Carbonic landfills and farms – a new industry, technological and economic prospects for Russia. A carbonic landfill is a special reference area where technologies for monitoring carbon emissions and runoff are developed. At such a test site, the sequestration potential of various types of territories and ecosystems, the rate of photosynthesis of various plants are studied, technologies for increasing the sequestration potential are developed, methods for calculating the carbon balance are developed, using modeling and forecasting techniques [8].

One of the main tasks of the formation and development of carbonic landfills is to train personnel with a completely new competence profile which determines their readiness for global economic transformation, for industrial functioning in the format of a green economy. Therefore, the formation of human resources for decarbonization processes is one of the priorities of regional policy.

2. Materials and methods

The Ministry of Science and Higher Education of the Russian Federation initiated a special project on the creation of carbonic landfills in the Russian regions for scientific justification, the formation of a strategic plan and testing of technical and technological tools for controlling the carbon balance [9]. The creation of carbonic landfills can be carried out on the terms of public-private partnership, combining the government, business and scientific potential of regional authorities.

The structural and functional system of transnational corporations (TNC) and internationally active banks has proven its effectiveness in the economy, in technology, in production, in integration, in cooperation, in science and in Research and Advanced Development practice. TNCs have removed a significant burden from the state budget for financing fundamental, applied and university Research and Advanced Development. Today, TNCs have become RECs (scientific and educational centers), bringing together regional authorities, international research centers, university science, training and retraining of personnel. RECs as research and educational centers demonstrate a system for interaction between federal state educational organizations of higher education and (or) scientific organizations with business entities, the business community which develop and implement scientific and practical innovative developments in real industries and production areas [10]. Research and educational centers in the regions are variable structures of public-private scientific partnership that integrate the educational community, university scientific structures, scientific organizations, and business entities to form an innovative regional base that determines the competitive advantages of the development of regional and industrial complexes. Currently, Russia has successfully operated research and educational centers in the Belgorod, Nizhny Novgorod, Kemerovo Regions, Perm Krai, and one interregional center-the Tyumen Region together with the Khanty-Mansi and Yamalo-Nenets Autonomous Districts. The centers were implemented within the framework of the national project "Science". The priorities of scientific and educational organizations are aligned with the priorities of the Strategy of Scientific and Technological Development [11]. The importance of implementing world-class research centers in Russia implies creating the necessary requirements for their functioning. For example, the subject should form new support tools, focus the existing ones on supporting REC projects. An important direction is the formation of an infrastructure system of the social sphere and engineering infrastructure to ensure the most comfortable employment of young researchers, technologists, engineers who prefer a comfortable urban environment. This is due to the

fact that young scientific personnel do not see prospects for work and the application of their competencies within the framework of regional RECs, practice shows that today the share of young researchers (under 40) is less than 45%, and if one does not manage the development of human resources in the field of research and development then by 2024 the situation will worsen [12]. The competitive program of the scientific and educational center is formed on the basis of a framework of several innovative and technological projects that are most significant for the regional economy. This will make it possible to change the structure of GRP in the long term, provide employment and increase the income of the population, and increase the market share of products and services selected as the target priorities for the development of RECs. The growth of this sector changes the environment, the economy of the region, and is a magnet for attracting talented young people [13].

To achieve the goal of the study, we will analyze the development of RECs in the Voronezh Region (table 1) using the SWOT analysis method which will allow us to determine the complex conditions for the development of RECs in the regions, identify potential threats, and identify internal reserves for the development of regional RECs.

Table 1. SWOT-analysis of the formation of conditions for the functioning of the scientific and educational center of the Voronezh Region.

Strong points	Weak points
- availability of labor resources for the development of RECs;	- insufficient understanding on the part of all participants of the prospects for cooperation;
- the key universities that provide the region with young intellectual personnel are represented in the region;	- high initial costs for creating RECs;
- favorable geostrategic location;	- insufficient branding and promotion of the region at the federal level;
- the developed engineering and transport infrastructure of the Voronezh region, the availability of air services;	- the lack of a sufficient number of modern means and technical capabilities for the functioning of RECs;
- availability of a well-developed service infrastructure;	- in rare cases, the business offers sponsorship, but not participation in the development and implementation of research projects;
- favorable environmental situation;	- there are no resources for the creation of scientific laboratories, the implementation of research projects;
- the interest of the regional authorities in the development of RECs;	- universities are not properly involved in the development of the region;
Opportunities	**Threats**
- availability of public-private partnerships;	- imperfection of the regulatory framework;
- opportunity for the development of innovative activities;	- Universities as participants of REC are not sufficiently in demand and are interested in the diversification development of the real sector of the economy.
- the use of an interdisciplinary innovative approach will expand the prospects of scientific discoveries;	
- the growth of the economic potential of the region on the basis of multi-specialty.	

Thus, the results of the SWOT analysis of the REC state in the Voronezh Region indicate that the conditions for the functioning of the scientific and educational center are not sufficiently formed.

3. Results

As a result of innovative activities, the regions plan to actively participate in the implementation of scientific and technical policy, the work of the educational sector and offer their own tools to support RECs. The personnel potential for the REC will be formed from students studying at regional universities that are part of this innovative structure. This will help to improve youth employment in the region [14]. The quality of the intellectual potential of the students ' personality will grow as a result of the application of their abilities [15].

In connection with the development of REC, business will also actively participate in the development of the scientific and technological sector in the regions and partially form the educational agenda, offering new vectors of scientific research. The effect of the REC will be cumulative in nature which can be strengthened through the revision of the role of the subject itself. In this regard, a software product for supporting universities "Priority-2030" has been developed, with a period of implementation until 2030. At least 100 universities will participate in this program, and it is assumed that most of them will be regional. The program is based on optimal cooperation between universities and scientific organizations, and the effectiveness of such associations will be evaluated by independent experts, including representatives of the business community. The program involves 20 subjects, more than 80 universities, 70 scientific institutes, 170 organizations of the real center of the economy [16]. The Priority-2030 program for supporting universities is aimed at developing the human resources potential of priority areas of scientific and technological development of the Russian Federation, economic and social sectors, developing and implementing breakthrough research and development, new creative and socio-humanitarian projects, as well as introducing high-tech technical and technological tools into the economy and social sphere. This program is designed for a promising direction in the form of career guidance, orienting potential labor resources to receive education that is in demand in the territories of their residence. An example of a successful REC is the creation of carbonic polygons, the territories of which are the place where the methodology for measuring the fluxes of major greenhouse gases is being developed [17]. Carbonic polygons are areas for measuring carbon uptake and emission and the total carbonic balance by ground-based sensors, analyzers, and digital technologies, using modeling and forecasting methods [18-19]. For the successful implementation of the activities of scientific and educational centers, it is necessary to identify the target indicators that are planned to be achieved within the framework of the implementation of the action program. The creation of carbonic landfills will allow controlling the carbonic balance in the country's territories, help improve the environmental situation and increase the economic benefits of business by producing more competitive products [20]. To determine the economic effect of the creation of innovative national educational centers in the regions (using the example of carbonic polygons), we apply the methodology of forming a system of indicators to assess the socio-economic effect of the creation of world-class RECs [21]. To do this, we will improve it considering the environmental component (figure1).

As a result of the use of RECs in the form of carbonic polygons, the economic effect in the region will exceed the planned costs for their creation and operation, despite the high cost of their creation. This will allow us to achieve a cumulative economic effect in the region through a symbiotic interaction of a synergistic nature, considering the requirements of the" green economy" and the growth of the innovative component in the form of scientific research.

4. Discussion

The experience of implementing RECs has indicated the formation of a cumulative effect which allows us to increase the potential for accelerating technological changes and the development of human capital and, as a result, the formation of a stable framework of spatial connectivity within the national technical, technological and economic systems.

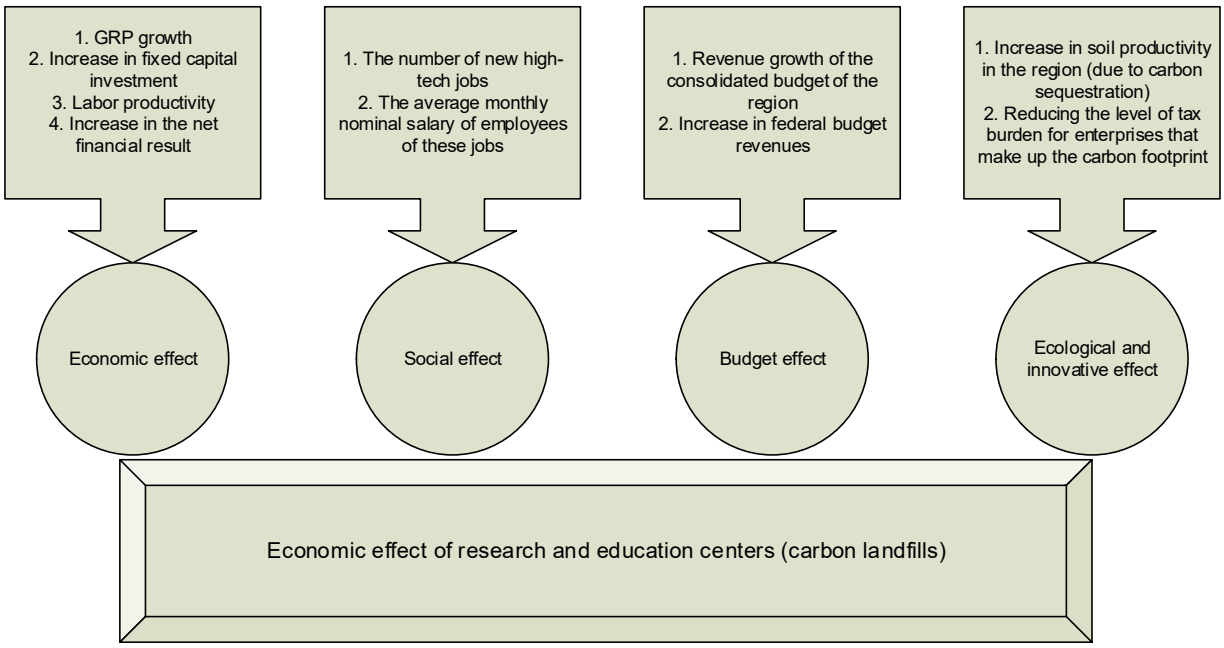

Figure 1. Mechanism for the creation of carbon landfills, taking into account the ecological component.

The implementation and implementation of joint research, the growth of the share of employed university graduates in the research and development sector and high-tech sectors of the economy is the main goal of creating innovative national educational centers (for example, carbonic landfills). Universities from 12 regions of Russia have applied for participation in the "Carbonic Landfills" program, aimed at forming a research platform for the adaptation justification of technological tools for monitoring and analyzing the ability of territories to capture and store carbon from the atmosphere. Carbonic polygons are a promising platform for the formation of a competence profile for students, postgraduates and researchers in such areas as hydrometeorology, mathematical modeling, ecology, biology, law and many others. In addition, carbonic polygons should become an objective instrumental basis for the implementation of scientific projects by young scientists.

5. Conclusion

The study showed that the creation of innovative national educational centers (on the example of carbonic polygons) will ensure the formation and development of innovative potential in the regions, will contribute to the effective integration of universities and academic institutions with the real sector of the economy. Science in the higher education institutions of the Russian Federation subjects should be aimed at the development of regional economies, and the participants of partnerships (RECs) should look for solutions that give a synergistic effect and increase the quality of national research. The focus on innovative development based on innovative national educational centers can change the structure of the regional economy and determine new priorities, making the scientific and educational complex a key lever for the long-term development of the region.

References

[1] Ilinova A A, Romasheva N V and Stroykov G A 2020 *Prospects and social effects of carbon dioxide sequestration and utilization projects* Retrieved from: https://cyberleninka.ru/article/n/prospects-and-social-effects-of-carbon-dioxide-sequestration-and-utilization-projects

[2] Safonov G V 2020 Decarbonization of the world economy and Russia. *Oil and gas industry* **21-22** 66-70

[3] *Decree of the President of the Russian Federation "On the strategy of scientific and technological development of the Russian Federation"* Retrieved from: http://www.consultant.ru/document/cons_doc_LAW_207967/491d0aad1a57443c712cfdf119c49c7d5291eab8/
[4] Stuchi Cruz, Silvia Regina and Paulino Sônia Regina 2015 Innovation in services related to public policies to reduce greenhouse gases: the clean development mechanism in landfills. *Journal of Innovation Economics & Management* **16** 171-193
[5] Stuchi Cruz, Silvia Regina, Paulino Sônia Regina and Paiva Delhi 2017 Co-Benefits Indicators for Carbon Market: Contributions to Service Innovation in the Solid Waste Sector. *Journal of Innovation Economics & Management* **23** 107-135
[6] Cruz Silvia and Paulino Sônia 2012 Innovation in services and sustainable development. Carbon Market on Landfills and Public Service Innovation. *Journal of Innovation Economics & Management* **9** 63-82
[7] Esekina B K, Safonov G V and Tuebekova Sh Zh 2017 Decarbonization of the national economy: strategies and scenarios. *Bulletin of the National Academy of Sciences of the Republic of Kazakhstan* **3(313)** 13-22
[8] Morkovina S S, Panyavina E A, Shanin I I and Avdeeva I A 2021 Economic aspects of organizing carbon farms on forest lands. *Actual directions of scientific research of the XXI century: theory and practice* **9 1(52)** 17-25
[9] Order of the Ministry of Education and Science of Russia dated 05.02.2021 N 74 "On landfills for the development and testing of technologies for monitoring carbon balance" Retrieved from: http://www.consultant.ru/cons/cgi/online.cgi?req=doc&base=EXP&n=767464&dst=100001#0017063706218096497
[10] Klyuev A K 2009 Structures of the development of the university: scientific and educational centers. *University management: practice and analysis* **5** 33
[11] *Decree of the President of the Russian Federation of December 1, 2016 No. 642 "On the Strategy of Scientific and Technological Development of the Russian Federation"* Retrieved from: https://www.garant.ru/products/ipo/prime/doc/71451998/
[12] Kuznetsova E A 2021 World-class scientific and educational centers as an indicator of the economic development of the region. *Modern economy: problems and solutions* **1(133)** 157-168
[13] Zakharova V V 2020 Scientific and educational center as a tool for the development of neo-industrial specialization of Russian regions. *Creative Economy* **14(5)** 763-774
[14] Tretyakova L A, Azarova N A and Nebesnaya A Yu 2020 Analysis of trends in the employment of human capital in the regional economy. *Bulletin of the Adyghe State University. Series 5: Economics* **1(255)** 38-46
[15] Lavrikova N I and Lavrikov V I 2020 Intellectual potential of the individual as a strategic resource of the information age. Modern science: from theory to practice: monograph. (Penza: "Science and Education" (IP Gulyaev G.Yu.) 5-15.
[16] Strategic Academic Leadership Program Retrieved from: https://psal.ru/
[17] Daggash H A, Heuberger C F and Dowell N M 2019 The role and value of negative emissions technologies in decarbonising the UK energy system. *International Journal of Greenhouse Gas Control **81** 181-198*
[18] Mohsin M, Rasheed A K, Sun H, Zhang J, Iram R, Iqbal R and Abbas Q 2019 Muhammad. Developing low carbon economies: An aggregated composite index based on carbon emissions. *Sustainable Energy Technologies and Assessments* **35** 365-374
[19] Sinha Rakesh Kumar 2019 A review on carbon emission reduction in industries and planning emission limits / Rakesh Kumar Sinha, Nitin Dutt Chaturvedi. *Renewable and Sustainable Energy Reviews* **114** 109304
[20] Panyavina E A 2021 Creation of forest carbon (carbon) polygons: economic component. *Actual*

directions of scientific research of the XXI century: theory and practice **9 1(52)** 26-34
[21] Pechatkin V V 2019 Formation of world-class scientific and educational centers in the regions of Russia as a tool for increasing the competitiveness of territories. *Economic relations* **9(4)** 3075-3086