

Innovation Security of Coastal Areas in Western Borderlands of Russia

Vasilisa V. Gorochnaya^{1,2} and Andrey S. Mikhaylov^{1,3,*}

¹ Immanuel Kant Baltic Federal University, 14 A. Nevskogo Street, Kaliningrad, Russia

² South Federal University, Academy of Psychology and Educational Sciences, 105 Bolshaya Sadovaya Street, Rostov-on-Don, Russia

³ Saint Petersburg Electrotechnical University "LETI", 5 Professor Popova Street, Saint-Petersburg, Russia

*corresponding author

Keywords: innovation security, coastal region, border region, Western Russia, innovation cluster.

Abstract: The article deals with the issues of innovation security of Western Russia's coastal areas. The aim of the research is to point out the specific problems associated with their cyclic dynamics, as well as the mechanisms to reach innovation security in the Western Russia. The study analyzes the problems of innovation development in the context of regional and global cycles of innovation generation being dependent on the initial conditions of reproduction cycle. Comparative analyzes on the dynamics within each of consequent stages of innovation cycle and their interconnectedness is based on statistical data for the coastal areas of South-West and North-West Russia. Differences in the strategy for overcoming innovation insecurity and disconnection of the stages of innovation cycle are found between southern and northern coastal regions. The study offers a new approach to study innovation security of a region, basing on the concept of synchronous and asynchronous generation and diffusion of innovations in relation to regional, national and global technological and reproduction cycles. Particularities of innovation security of a coastal border region are given. Innovation economic clusters in the regions are found to be the major resource to maintain the innovation security by integrating into global and national innovation cycles. The results of the research can be used in regional governance and innovation development policy for the coastal border regions of Russia. The findings and proposed approaches support the development of the instruments for evaluation and diagnostics of innovation security of the coastal regions of the European part of Russia.

1. Introduction

The economic security of coastal regions is of great importance as they are strategic resource for development of the national economy. In the most part of cases coastal areas perform the advanced pace of development [1], [2]. Being the cross-points of maritime trade lines, migration and information flows, they accumulate tacit knowledge and experience of cross-border communication, becoming the territorial attractors and generators of new technologies and innovations, giving birth

to new enterprises, mutual projects and clustering processes. But, on the other hand, being areas of active development coastal zones are regions of high risks. As they evolve in correlation with multiple trends and cyclic oscillation at various (regional, national, global) levels, they are deeply integrated into the international division of labor and become dependent on external factors [3], [4]. The recent situation of geopolitical and geo-economic turbulence complicates international economic communication and disturbs technological and productive chains of added value. As a result, it leads to high risks for the innovation development of all the interrelated sides. That is why the current state of innovation security of coastal regions needs evaluation and diagnostics. The problem of innovation security is of significant importance due to the need to maintain global competitiveness and deal with new challenges of the modern economy.

Innovation security is the topic of high prominence for both researchers and policy-makers. In relation with spatial development of Russia this issue is well studied by T. A. Achkasova, V. L. Baburin, K. Y. Voloshenko, N. V. Zubarevich, V. V. Ivchenko, Yu. Yu. Rosich, M. P. Feldman. Their research based on the general innovation theory, are followed by B. T. Asheim, M. S., Gertler, S. P. Zemtsov, I. V. Pilipenko, A. N. Pilyasov, et al., who developed the regional domain of innovation system. The concept of innovation security of Russian regions is developed by the researchers of Ural school (A. V. Bagryakov, I. M. Golova, A. A. Kuklin, A. L. Myzin, N. L. Nikulina, A. I. Tatarkin), and scholars of the Immanuel Kant Baltic Federal University (A. A. Mikhaylova, A. S. Mikhaylov); they systematically identified the components of innovation security as the set of conditions for scientific and technical activity and development, and pointed out the threshold values of the indicators with the use of the methods of modeling and the use of empirical evidence of Russian and world practice.

2. Research Design: New Challenges in the Conceptualization of Innovation Security

Recent studies have identified innovation security as an individual type of security that stands along the all-embracing notion of economic security [5], [6]. The most of studies in this sphere are derived from the methodological set of analysis and assessment of general economic security. They are presented by sets of indicators – common for the most of authors or individual, related to the specific situation or vision of the innovation system's structure. But, as the existing approaches are mostly aimed to provide the complex diagnostics of the current state of regional innovation security in statics, at the present time the study apparatus should be extended in the direction of analysis of dynamics and cyclic mechanisms and interdependences between various stages of innovation process. This is especially urgent for coastal regions which develop in strong correlation with various external cycles.

The need for a new methodological apparatus is due to a number of reasons. Firstly, it is caused by the intensive growth in temps of socioeconomic dynamics. The new conditions of the changeable environment make it not enough to use the traditional binary categories such as 'security – insecurity', 'threat – protection', 'internal state – external situation', etc.

Secondly, not only the trends of innovation and market environment but also the criteria, interests and priorities of regional innovation development can change before such system of stability is built according to the previous needs of a region. At the present time, there is a growing number of researchers who pay special attention to the issues of security as the systems' quality that depend on its changeable interests in a greater extent than on external factors as they are [5]. The same factors can be eliminated as potentially or actually dangerous, neutral or even positive, as the criteria change in correlation with both market situation and its vision by particular regional society and its managers.

Thirdly, not the speed of economic, technological and social development itself, but the disparity of dynamics causes the most problematic dangers with far-reaching consequences. As it happens in the sphere of physical processes where the difference of velocities leads to turbulence [7], the local and cross-border vortexes of instability reflect the picture of inequality in temps and directions of innovation development [8]. Generation of innovations, as well as their implementation, updating and improvement need synchronization in both time and space dimensions. Otherwise, the synergy of cross-regional and international cross-border network will not be reached.

All these theses are urgent for coastal regions as they are involved into multi-scale innovation and market cycles that dictate them the velocities of changes and updating. Reaching the maximal coherence of these cycles is one of the main conditions of innovation security. It means that security in both economics and innovation development can be conceptualized not only as the situation of minimal dangers nor the institutionally organized system to struggle with external and internal threats, but as the complex of adaptive qualities of a region that enables it to deal with challenges and work with risks accordingly to current and strategic priorities via the mechanisms of self-organization. That is why another binaries appear to be more urgent for the issues of security, they are: ‘risk – economic potential’, ‘internal priority – external opportunities’, ‘institutional lag inertia – self-organizational adaptation’.

For the innovation security of coastal regions, it means that the prior attention should be paid not only to the current values of its indicators but to their cyclic dynamics in comparison with one of regional, national and global production and market cycles. The current study is designed to trace the coherency and incoherency between the key stages of innovation and economic processes. So the empirical study is based on the analysis of statistic data on the each of consecutive stages of innovation process: the number of R&D organizations and organizations-innovators, the technologies produced, the innovations submitted to be patented and technologies and utility models patented, the technologies used, the volume of production of goods and services with the use of innovations. The comparison of the vectors of this dynamics gives not only the picture of the innovation security dangers in various coastal regions but also the vision of whether there is direct dependence between the stages as they are (taking into account the lag effects).

3. Innovation Security Dynamics: Divergence of South-West and North-West or Divergence of the Stages of Innovation Process?

The conditions of geo-economic turbulence and the situation of economic sanctions change dramatically the structure and the current trends of innovation-technological and socio-economic processes. Suffering from the loss of previous links with subcontractors and the organizations of promotion system, the coastal enterprises, on the one hand, tend to restructure their activities and reduce innovation development in order to focus on the most urgent problems and to save their market share in the unstable situation. On the other hand, they need the substitution of innovation import, so they tend to form new research and development departments in their own structures or cooperate with existing domestic ones.

By tracing the dynamics of scientific and technological development in the coastal regions of Russia the diversity becomes obvious. As for the main, the core stage of the innovation process (which is indicated by the number of innovation technologies produced), the coastal regions of South Russia have been performing high growth rates since 2014, while the Northern coastal regions have the vice-versa trends (Fig. 1).

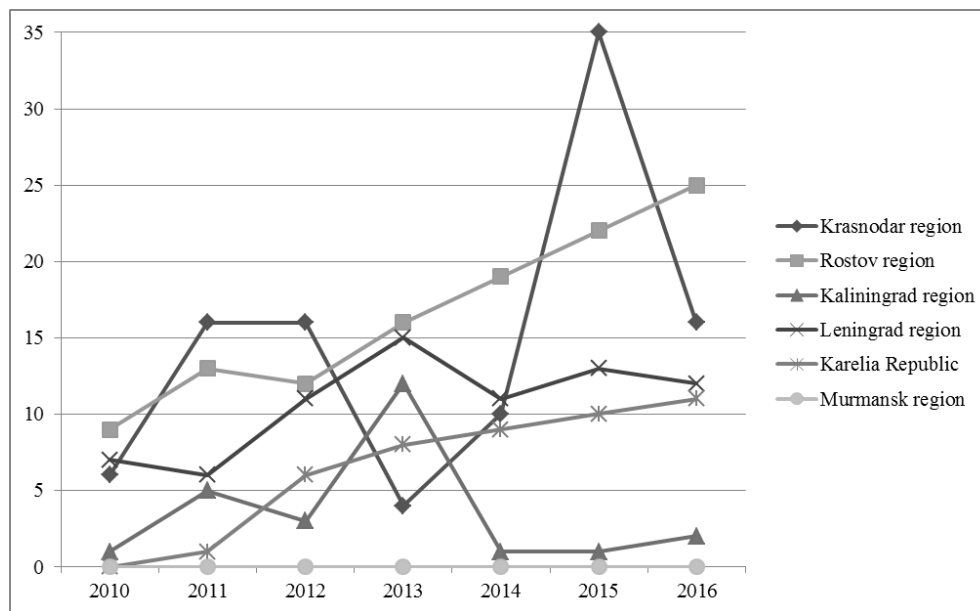


Figure 1: Dynamics of advanced technologies produced in the coastal regions of Western Russia, Source: compiled by the authors accordingly to official statistic data [9]

The decline in Kaliningrad region is caused by the fact that this coastal area is to a greater extent integrated into the European and global space. Its main centers – the cities of Kaliningrad and Gusev, are included in the technological production chains of international scale [10]. The organizational mass of the region is not enough, and the exclave region has no neighbor Russian regions that would make it easier to find a domestic partner. The negative dynamics in Leningrad region is partly compensated by the role of Saint-Petersburg as the powerful center of science, technologies and production (the data for Saint-Petersburg as federal city in Russian Federation is not shown in the graphic because its innovation development is determined by another factors, especially associated with the federal status of the city). The only exception of all the North-West coastal regions is Karelia Republic where takes place not rapid but stable growth in technologies. It is caused by both internal potential of the region and the external aid from the federal center due to the strategically important role of the region; the federal and regional target programs take place.

Southern coastal regions, on the contrary, are generally performing positive dynamics. This trend is in correlation with the general economic dynamics of these regions as they perform the growth of producing and international trade turnover, using the current situation to increase their role of exporters and reorienting on both internal demand from another Russian regions and demand from abroad. Innovation generation grows, being interrelated with the production processes and led by them. The other aspect of the rising innovation producing is the substitution of previously imported technologies (unlike the Kaliningrad region, the regions of South Russia have sufficient internal potential).

The same trends take place in the dynamics of innovation technologies used in the regions (Fig. 2). The situation seems to be obvious, but the data on other related stages of innovation cycle processes demonstrate vice-versa trends.

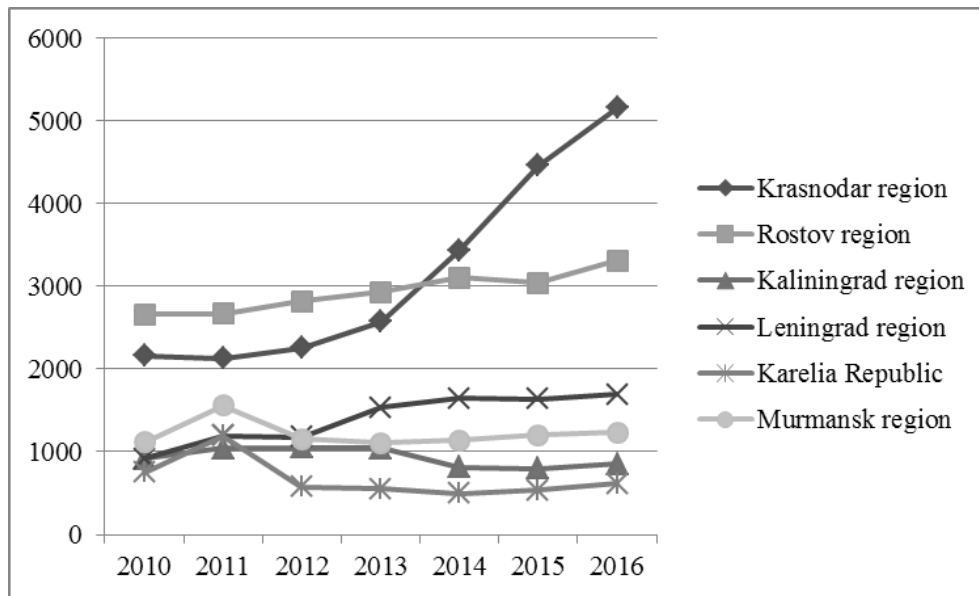


Figure 2: Dynamics of advanced technologies used in the coastal regions of Western Russia, Source: compiled by the authors accordingly to official statistic data [9]

As for the first stage of innovation generation processes, which is reflected in the number of organizations and personnel involved into R&D processes, all of the coastal regions of North-West perform positive dynamics, while in Rostov region there takes place significant reducing of personnel and slow unstable reducing of innovative organizations. During the period 2010-2016 in Kaliningrad region the number of research organizations the performed 36% growth, the statistics of R&D personnel – 11%; in Karelia Republic – 50% and 29%, in Murmansk region – 28% and 8% correspondingly; in Leningrad region the number of organizations was unstable, while the number of personnel performs 12% growth. In Rostov region there takes place 16% decline in the number of research organizations and 36% decline in personnel, while Krasnodar region performed 98% and 20% growth in this indicators [9].

The same trend takes place for the next step of innovation producing which is patenting. In Rostov region, unstable dynamics of patent applications (it grew during 2010-2013 from 887 to 1002 and reduced to 895 in 2016) take place along with the decline in granting patents (their number reduced from 758 to 677 during the period studied). In Kaliningrad region in 2011-2014 the figures of granting patents grow (from 63 to 79) and then fall (to 59 in 2016) at the background of radically falling number of patent applications (from 112 to 79 during all the period). The patenting situation changed in Leningrad region after 2015, as figures on patent applications after a long decline (from 286 in 2010 to 122 in 2015) started growing (150 in 2016) and granting patents – vice versa (the falling was continued in 2016 reaching 75 after 124 – in 2010 and 91 in 2015). In the Murmansk region the number of patent applications grew in 2010-2012 (from 59 to 81) and then felt (to 45 in 2016) as well as the number of patents granted (in 2013 it reached 66 and felt to 35 in 2016). The patent dynamics is positive in the Karelia Republic (applications increased more than twice: from 39 to 95, and patent granted from 26 to 50 during 2010-2016) and unstable in the Krasnodar region – the number varies in the ranges 700-900 and 540-680 correspondingly [9].

A glance at the results of the innovation cycle (the volumes of goods and services produced with the use of innovation) can give the picture which summarizes other stages. It doubles the situation of growth in generating innovations in South-West coastal regions (in Rostov region during 2010-2016 this figure has increased seven times, reaching 133792,6 mln. RUR; in Krasnodar region it

increased 14 times, reaching 71752,6 mln. RUR) and instability in the North-West regions (e.g. in Leningrad region there was 60% decline in 2012, 185% growth in 2013 and 132% in 2014, reaching the amount of 32776,6 mln. RUR with the further 53% decline in 2015). But there takes place significant growth of innovative production in Kaliningrad region (it dropped from 850,3 to 395,9 in 2013 and then increased to 1271,4 in 2015) that seems to be not in accordance with the general negative trend [9]. Even taking into account the time lag between the consequent stages of the innovation process, it becomes obvious that they cannot perform vice-versa trends for a long time period, so it means the disconnection between the stages of the innovation process as they are.

4. Economic Clusters Increase Innovation Security

The most important clustering processes take place in those regions where self-organization becomes the main resource to develop in the situation without federal support and interest. North regions and Leningrad region are dependent on large technological centers and federal programs, and the Krasnodar region had the additional support while being included into the cycle of building infrastructure objects before 2014 that caused innovative development. The most of self-organizing processes take place in the Rostov and the Kaliningrad regions.

In the Rostov region clustering has more than 15-years evolution, growing up at the basis of the main competitive advantages of the region and its basic industries (agriculture, food production and a bit later, in 2006-2009 – machinery). But primarily it fairly associated with innovation activities. Most of the clusters are productive but not innovative ones. At the turn of 2014-2015 mutual initiatives came from private enterprises, educational and research bodies of the region and regional administration. The impetus to this was the need for import substitution, especially in the spheres of transportation and science-intensive engineering, maritime technologies for the domestic fishery, biotechnologies and chemistry, communication and software hi-tech. The universities in Rostov became the basis for most of the clusters, as did the R&D enterprises in Taganrog [11]. Creation of new innovative products in the leading industries helped the Rostov region to maintain and enforce its role of exporter, as well as its positions at the domestic market. On the other hand, the production, research and educational processes still do not use their real potential for interconnection. Being integrated in a deeper way, they are still not synchronized in one cycle. And the current reducing of researchers and education personnel (that seems to be the source for optimization for the HEBS) is the danger for the future innovation development.

After the financial and geopolitical crisis of 2014, automotive, maritime, semiconductor, furniture and other industry clusters of the Kaliningrad region had to freeze their ambitious investment plans and focus on elaborating the survival development strategies. The major competitive advantage remains the Special Economic Zone – the tax free regime for import of inputs for further processing. Giving a significant drop in the exchange rate of the national currency, local enterprises have focused on searching new suppliers, increasing the share of value added, as well as entering new markets and value chains (predominantly as subcontractors for multinational corporations; e.g. Ikea, H&M). Of all the traditional sectors of the regional economy, tourism is the one that has experienced growth, predominantly due to the FIFA world cup. A significant impetus is given to high-tech industries and IT in particular. Being less limited by the barrier function of the border and receiving a cost competitive advantage due to lower level of pay, IT has gained increasing attention from regional government and foreign counterparts. Software development and GameDev are among the most rapidly growing sectors in the region, highly competing with the Belarus.

5. Conclusions

Thus, the empirical evidence proves the thesis that various stages of the innovative process in the coastal regions of Western Russia are at the present time disconnected with each other and integrated into various external cycles. In the conditions of stability such system works and exists without serious problems, but in the conditions of turbulent changes that disturb technological, production and promotion chains there appear the situation of insecurity, because the separate stages do not form the single system and lose their potential.

While the statistics is able to give the superficial diagnostics of the innovation security, the research needs not only quantitative but also qualitative analysis of the internal and external factors and institutions that help to overcome the disintegration and ones that cause positive dynamics. In the current situation, such analysis shows that innovation economic clusters become the powerful instrument for the coastal regions not to lose their productive and market positions and to enforce local potential of innovative organizations.

Being located at the national frontier, both coastal and border regions are the first ones to experience the changes in the socio-economic and geopolitical context. Having limited authority with respect to international relations, there is always a time lag before the reaction of the federal government. Moreover, the protective measures of the national (economic, social, innovation, food, military, etc.) security taken do not necessarily coincide with the interests of the regional community (e.g. the import substitution policy). Therefore, regional policy on innovation security has to be preventive, creating sustainability via mutual interdependencies and benefits, strategically synchronizing the stages of innovative cycle via supporting self-organizational mechanisms and developing cluster management.

Acknowledgements

The reported study was funded by RFBR according to the research project No. 19-010-01083 “Problems of Innovation Security and Mechanisms of Cluster Economic Development of the Border Regions of the European Part of Russia”.

References

- [1] Druzhinin, A., Gorochnaya, V. (2016). *Economic clusterization and complexions: the specificity of the coastal zones of the south of Russia. Journal of Applied Economic Sciences*, 11(6), 1017-1025.
- [2] Mikhaylov, A.S., Mikhaylova A.A., Savchina, O.V. (2018). *Innovation security of cross-border innovative milieus. Entrepreneurship and Sustainability Issues*, 6(2), 754-766. [https://doi.org/10.9770/jesi.2018.6.2\(19\)](https://doi.org/10.9770/jesi.2018.6.2(19)).
- [3] Druzhinin, A.G., Gorochnya, V.V., Fedorov, G.M., Dets, I.A., Mikhaylov, A.S. (2018). *Large business localization as economic development factor of coastal territories. SGEM2018 Conference Proceedings*, 5(4.1), 59-67. [ONLINE] Available at: <https://sgemworld.at/ssgemlib/spip.php?article6950> [Accessed 31 January 19].
- [4] Mikhaylov, A.S., Mikhaylova, A.A., Kuznetsova, T.Yu. (2018b). *Coastalization effect and spatial divergence: segregation of European regions. Ocean & Coastal Management*, 161 (July), 57-65. <https://doi.org/10.1016/j.ocecoaman.2018.04.024>
- [5] Tatarkin A.I., Kuklin A.A. (2012). *Changing the paradigm of region's economic security research. Economy of region*, 2, 25-39.
- [6] Mikhaylova, A.A. (2016). *The role of human capital in providing innovation security of the region. Journal of Applied Economic Sciences*, 11 (8), 1724-1735.
- [7] Burlachkov, V.K. (2009). *Turbulence of economic processes: theoretical aspects. Voprosy ekonomiki*, 11 (Nov.), 90-97.
- [8] Gorochnaya, V.V. (2018). *Turbulence in geo-economics: methodical approach to modeling the impact on the economic dynamics of a border region. Economics of Sustainable Development*, 4(36), 136-142.

- [9] Rosstat (2017). *Regions of Russia. Socio-economic indicators. Electronic resource.* [ONLINE] Available at: http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/publications/catalog/doc_1138623506156 [Accessed 31 January 19].
- [10] Sebestsov, A.B., Zotova, M.V. (2018). *The Kaliningrad Region: Challenges of the exclave position and ways to offset them.* *Baltic Region*, 10 (1), 89-106. <https://doi.org/10.5922/2079-8555-2018-1-6>
- [11] Gorochnaya, V.V. (2018). *Cross-border clustering in the Black Sea region.* In Fedorov G.M., Zhindarev L.A., Druzhinin A.G., Palmovsky T. (eds.) *The Baltic region – the region of cooperation: problems and prospects of cross-border cooperation along the western border of Russia Materials of the international scientific conference.* Immanuel Kant Baltic Federal University, 74-84.