

Local innovative ecosystems of "smart cities" in the context of effective development of the Arctic spaces of Russia

Gennadiy F. Detter
Arctic Research Center
Salekhard, Russia
detter@mail.ru

Abstract

Climatic, conjunctural and technological risks of Arctic development are serious challenges. The future opportunities of Russia's Arctic regions will largely depend on scientific and technological initiatives that will allow getting benefit from new technologies in the interests of business and society. At the same time, such initiatives are practically not taken by regional authorities, society and business. Very limited actions are being taken to improve the quality of life based on knowledge. The article will consider the possibilities of a complex transfer of "smart" technologies to the Arctic cities of Russia through the formation of local innovative ecosystems in them.

Keywords: Arctic, scientific and technological initiatives, local innovative systems, smart city.

1 Introduction

It was assumed that the development of the Arctic spaces in the coming decades would take place in the context of global economic dynamics, which, first of all, is determined by the conjuncture of world hydrocarbon markets, and the proceeds from their sale would become a financial and economic leverage for the development of the Arctic regions¹. At the same time, the question remains whether the development of new fields of the Arctic land and shelf will ensure economic growth of Russia and Arctic regions.

2 Innovative potential of Arctic regions of Russia

In connection with the activation of economic and political processes, the Arctic zone of Russia became an independent geo-economic macroregion in 2014². It includes 271 municipalities and 21 city districts. The area

Copyright © by the paper's authors. Copying permitted for private and academic purposes.

In: M.Yu. Filimonov, S.V. Kruglikov M.S. Blizorukova (eds.): Proceedings of the International Workshop on Information Technologies and Mathematical Modeling for Efficient Development of Arctic Zone (IT&MathAZ2018), Yekaterinburg, Russia, 19-21-April-2018, published at <http://ceur-ws.org>

¹The report of the Arctic Council "About the Assessment of the Status, Prospects and Consequences of the Development of Hydrocarbon Raw Materials in the Arctic" was made public at the International Conference "Arctic Frontiers". 21.01.2008. Tromso, Norway.

²About overland territories of the Arctic zone of the Russian Federation, Decree of the President of the Russian Federation of May 2, 2014 No. 296.

of the Arctic territories of Russia is 3.7 million km², where 1.5% of the population lives, while the share of GRP is 5.3% of Russia's GDP³.

The population of the Arctic regions has greatly decreased since the 1990's of the 20th century, especially in the northern territories. The share of high-tech and knowledge-intensive sectors of the economy in the GRP of the macroregion is 7.1%, while the average for Russia is 20.7%. The share of high technology innovative products in the total volume of shipped goods is 0.13%, which is 10 times lower than Russian⁴. These characteristics and various ratings [Tuk17] show that the Arctic regions of Russia do not have the technological capabilities, scientific and research potential, entrepreneurial initiative and the finances necessary for a scientific and technological breakthrough, and in rare cases are able to offer sustainable, advanced and in-demand scientific and technological solutions. The need to attract intellectual and financial capital from other regions of Russia and countries of the world is obvious. At the same time, the Arctic zone of the Russian Federation (the Russian Arctic) has a significant market and business environment in the extractive and processing industries. They, however, are not sufficiently interested in the problems of social and spatial development of northern cities. Cities need to learn how to generate scientific and technological initiatives and market solutions.

A new stage in the development of the Arctic takes place against the backdrop of the emerging big challenges. They include: a qualitative change in energy systems, exhaustion of economic growth opportunities based on extensive exploitation of raw materials, an increase in anthropogenic pressures on nature, food security, external and internal threats to national security. Active spread of the fourth industrial revolution, characterized by massive digitalization of industry and the public sphere, will also have a significant impact on the competitiveness and social stability of the Arctic regions [Det17/1].

In 2017, a new strategic cycle of scientific and technological development of the country was launched in Russia. The basic documents were the Strategy of Scientific and Technological Development of the Russian Federation⁵ and the state program "Digital Economy of the Russian Federation"⁶. The strategy defined the priorities of scientific and technological development, the state program outlined the directions for the formation of a new technological basis for the social and economic sphere of Russia. Within the framework of the digital economy, the National Technological Initiative⁷ is being implemented. This is a program of measures aimed at supporting the development of promising industries in Russia that will determine the markets of the future within the next 20 years. For the Arctic regions, the most important is the State Program of the Russian Federation, updated in 2017, "Social and Economic Development of the Arctic Zone of the Russian Federation", approved by the Decree of the Government of the Russian Federation of April 21, 2014 No. 366⁸. In the revised version of the program, the key mechanisms for Russia to achieve its strategic interests and ensure national security in the Arctic are support zones, which are complex projects for the social and economic development of the Russian Arctic, as well as the innovative infrastructure of the Arctic regions.

Proceeding from the scale of the great challenges and the geopolitical position of Russia, it seems expedient, along with the resource goal of developing the Arctic, to propose a spatial goal, that presupposes a scientifically based formation of the territorial structure of the Arctic regions, the creation of a supporting framework of the Russian Arctic and a homogeneously distributed settlement structure that provides the necessary conditions for the vital activity of the population and economic development. The creation of support zones in the first place should take place on the basis of existing Arctic cities. In the cities of the Arctic, the basic life infrastructure should be focused not only on city residents, but also on settlements and industries in the zone of influence. The small cities of the Arctic, the nodes of the supporting framework are affirmed as places of storage of experience, skills, incubators of intellect and competence, places of comfortable living of people preserving territory and nature for present and future generations, producing goods in the interests of Russia and the world [Det17/1].

³Rosstat.http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/accounts/ Accessed 30 April 2018.

⁴Rosstat. http://www.gks.ru/free_doc/new_site/region_stat/arc_zona.html. Accessed 30 April 2018.

⁵"Strategy of Scientific and Technological Development of the Russian Federation", approved by the Decree of the President of the Russian Federation of December 1, 2016 No. 642.

⁶Program "Digital Economy of the Russian Federation", approved by the order of the Government of the Russian Federation of July 28, 2017 No. 1632-r.

⁷National Technological Initiative, approved by the decree of the government of the Russian Federation of April 18, 2016 No. 317.

⁸State Program of the Russian Federation "Social and Economic Development of the Arctic Zone of the Russian Federation", approved by the Decree of the Government of the Russian Federation of April 21, 2014 No. 366.

3 Local innovative systems

Innovative systems contribute to the activation of economic activities and the socio-economic development of countries and regions. Arctic specificity enhances the role of innovative systems in the sustainable development of the Arctic regions, including local (urban) innovative ecosystems [Hal18]. Providing the vital activity of production and social systems, increasing their effectiveness in difficult natural and climatic conditions requires constant search and introduction of new knowledge and technologies [Inen18]. The economy of the Arctic regions cannot be successful without the creation of systems that promote the generation and introduction of new knowledge and technologies, while digital technologies create new opportunities for scientific and technological development [Lon18]. The ability to transform technological solutions into the life of cities, enterprises and society is the essence of the innovation system and its operating mechanism - the innovation infrastructure.

Innovative infrastructure is a set of certain types of elements (organizations) and links between them, which jointly provide access to various resources and services for participants of innovative activities to promote the production and sale of innovative products. Invariance of creation of innovative infrastructure in the Arctic cities and regions is actualized by the spread of the fourth industrial revolution. Transition to next-generation technologies should be taken into account in the development of support zone projects, development strategies, and become part of the industrial and innovation policy of the Arctic regions. In order to form a worthy future, cooperation between the authorities, science, society and business is needed to generate and transfer technologies, establish joint ventures, create training and employment programs [Det18]. In the framework of the digitalization of the economy, the basic subsystems of the innovation infrastructure (management, financial, information, marketing, personnel) must be created on the IT platform.

The above provisions allow us to formulate the concept of spatial development of the Arctic regions of Russia "Smart City - Smart Region", understanding it not as total digitalization, but as the intellectualization of the population, capable of meeting the challenges of the time and ensuring a worthy future. To do this, it is necessary to focus efforts on the formation of a local innovation infrastructure that generates both human resources and innovative projects. Thus, on the basis of "smart cities", "smart regions" and further "smart country" will be formed. In this context, the main idea of the concept of development of the Arctic is the formation of positive human capital. With this approach, it is proposed to consider a person as a sum of bio-info-cogno-socio technologies. The development and improvement of them is the task of the person himself, the corresponding sciences of man and social-humanitarian technologies [Det17/2]. The orientation of state policy towards the preservation, development and multiplication of human capital can play a key role in the harmonious development of the Arctic territories and the inexhaustible use of Arctic resources. It is also rightly noted that "the results and forms of socialization of models of sustainable development that are widely implemented today will ultimately depend on reliance on humanistic values in the practice of human activity and, above all, in the management of innovation activity" [Lev17].

The increase in the level of human capital begins through the development of educational technologies, which should guide the person to creativity, independent search and intellectual activity. Increasing the role of man in life and health of the planet forms the following direction of development of human capital - improving the quality of life of the person himself, in this connection the most important direction will be the creation of a favorable urban environment for human life in harmony with nature. Residents of these cities have the opportunity to apply their own talents and abilities to develop a multitude of technological directions to create an enabling environment. This will constitute the goal of forming a local innovation infrastructure in the cities of the Russian Arctic. To ensure an integrated approach to develop and improve the quality of life in the Arctic, there are at least 14 main areas that put a huge complex of tasks, involving the search for new technologies, their generation, approbation and implementation:

1. new modern (arctic) architecture;
2. light and energy-efficient materials for construction in the Arctic, making it possible to implement new images of cities and to provide a new level of beautification and landscaping;
3. qualitatively new roads and road surfaces that retain their properties in the changing climatic conditions of the Arctic;
4. new and improved modes of transport;
5. reliable energy systems that provide cheap energy, including alternative and intelligent energy, energy storage systems;
6. improving the environmental friendliness of transport and energy systems;
7. water purification technologies;
8. technologies of recycling and processing of domestic waste, up to the complete closure of landfills;

9. elimination of accumulated environmental damage;
10. development of technologies for northern (controlled) crop production and animal husbandry to ensure food security, including creation of effective commodity distribution systems and logistics;
11. development of information and geoinformation systems in cities;
12. technologies for creating a favorable educational, cultural and social environment, the entertainment industry, art, sport and tourism;
13. technologies in health care, use of local bioresources;
14. formation of a favorable legal, institutional and labor environment that ensures full employment of the population.

Complex transfer of these technologies for the creation of "smart cities" is possible only if local innovative ecosystems are created.

The formation of "smart cities" takes place around the world. According to iKS-Consulting, in general for Russia in 2016, the amount of financing for "smart city" programs exceeded 45 billion rubles (an increase of 6% compared to 2015), and 90 percent is an investment in a safe environment. However, at the present time there are no "smart cities" development programs in accordance with the concept of local innovative ecosystems that can provide an enabling environment for the coordinated development of a multitude of technological directions.

4 Conclusions

Rapid technological development is taking place in Russia and around the world, the scale and consequences of the digitalization of the economy and the public sphere are of a global nature. At the same time, the edge of technological development moves from academic institutions to high-tech start-ups. Today they are directing the entire civilized world along a new and unexplored path, offering smart, universal solutions both in traditional and habitual spheres of human activity, and in completely new directions. The ability to transform these decisions into the lives of cities, enterprises and societies is the goal of a local innovation system. Arctic regions need knowledge conductors - experts of a sufficiently high level. On the one hand, they should be actively interested in technological progress; on the other hand, they must understand the problems of their city, enterprise, industry, region; thirdly, they must build relationships between them, create teams, attract investments and form projects with stakeholders. This will make it possible to implement innovative development of cities in the absence of a localized block of knowledge generation. Local innovative infrastructure should ensure the generation of such specialists and projects.

References

- [Tuk17] I.L. Tukkel, N.E. Egorov, G.F. Detter, G.S. Kovrov. Assessment of Innovation Development in the Regions of the Arctic Zone of the Russian Federation. St. Petersburg Polytechnic University Journal of Engineering Science and Technology. *Economic Sciences*. 10(4):60–71, 2017.
- [Det17/1] Detter G.F. Great Challenges to the Development of Arctic Spaces in the Conditions of the Fourth Industrial Revolution. *Innovations*. 11(229):22–28, 2017.
- [Hal18] H. Hall. Exploring Innovation in Northern Canada with Insights from the Mining Innovation System in Greater Sudbury, Ontario. *Northern Review, [S.l.]*. 45:33–56, 2017. [URL]<http://journals.sfu.ca/nr/index.php/nr/article/view/660>.
- [Hal18] Inenpää, Häkan. The State of Innovation in Sweden and its Regions. *Northern Review, [S.l.]*. 45:57–75, 2017. [URL]<http://journals.sfu.ca/nr/index.php/nr/article/view/661>.
- [Lon18] H. Longi, S. Niemelä, P. Tervonen. Arctic Innovation Hubs: Opportunities for Regional Cooperation and Collaboration in Oulu, Lulea, and Tromso. *Northern Review, [S.l.]*. 45:77–92, 2017. [URL]<http://journals.sfu.ca/nr/index.php/nr/article/view/582>.
- [Det18] Detter G.F. Formation of a Functionally Complete Innovation Infrastructure in the Ecosystem of the Arctic Regions. *Issues of Innovative Economy*. 8, 2018.
- [Det17/2] Detter G.F. Substantiality of Nature-Friendly Technologies in the Sustainable Development of Arctic Regions of Russia. *Modern Scientific Thought*. 1:237–243, 2017.
- [Lev17] Detter G.F. Humanistic Approach to the Innovative Development of Society. *Values and Meanings*. 5, 2017.