Neural network, ecological ecotone and tele-health in the development of rural areas during the crisis period caused by the pandemic Covid-19

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Abstract. The study presents materials that reveal some aspects of the development of the era of neural networks in the XXI century. It is shown that the study of the movement of matter and energy in the ecological ecotone between the human environment and landscapes contributes to the further development of humanity, including in rural areas during the COVID-19 pandemic. Extrapolating the logic of the development of ecotones to the management of smart technologies, we can justify the passionate areas of economic transformations that transform the environment. During the COVID-19 pandemic, many of the values that guided people were revised, ensuring life-saving safety and longevity, and receiving modern medical care came first. Homes began to acquire the status of biomedical startups that intensify the scientific research of international corporations in the development of home telemedicine.

1. Introduction

At the World Economic Forum in Davos (January, 2021), Russian President Vladimir Putin, in an online speech, drew attention to the fact that we are experiencing "a crisis of previous models and instruments of economic development", that "the coronavirus pandemic has only spurred and accelerated structural changes..."[1]. According to Johns Hopkins University (USA), the number of coronavirus cases in the world has exceeded 100 million, and more than 2 million people have died from the effects of COVID-19. Most patients with coronavirus infection in the United States (more than 25.4 million), India (more than 10.6 million), Brazil (more than 8.9 million), and Russia, the number of infected people is approaching 3 million. The question of the natural or artificial origin of the COVID-19 coronavirus has several dimensions.

Today's version of the naturally occurring COVID-19 coronavirus says it has passed on to humans from bats. This once again emphasizes that the boundaries between human civilization and the surrounding nature are quite transparent, which makes it necessary to strengthen scientific research in this transition zone. In the literature, the term "ecotone" ("oikos" – house, "tonus" – tension) is used, which was introduced in 1903 by the scientist B. Livingston (USA) [2]. He believed that in the transition zones between communities, the impact of abiotic factors is very high. Between cities, rural settlements and landscapes, a certain zone is formed – an ecological ecotone with a high intensity of metabolism and energy. Later, at the discussion platforms held at UNESCO under the program "Man and the Biosphere", the ecotone was defined as "a transitional area between adjacent ecological systems, which has a number of characteristics that are unambiguously fixed in space-time coordinates and determined by the intensity of interaction between neighboring ecosystems" [3].
The formation of sustainable ecotones has become very actual in the context of the crisis caused by the COVID-19 pandemic[4]. Extrapolating the logic of ecotones functioning to rural areas, it is necessary to understand what processes are driving here, what results to expect. 37.33 million (25.4%) people live in rural areas of the Russian Federation, which are a strategic resource. The majority of the rural population (87%) lives in settlements with a population of up to 10 thousand people. In most rural settlements, the communication, transport and engineering infrastructure does not have a high level of development and does not fully meet the needs of rural residents. The main factors hindering the development of rural areas are: departmental disunity, a narrowly sectoral approach to the development of the rural economy, and weak implementation of information technologies[5,6]. The report of the Russian Government notes that the development of agriculture until 2030 will be determined by a number of factors, including climate change and the development of global industry markets, the promotion of nature-saving and digital technologies on the platforms "Biotech-2030", "Bioenergy" and "Healthy food Products" [7,8]. A significant part of the citizens of the Russian Federation are pensioners, 11.7 million pensioners live in rural areas in table 1.

| Name                        | 2011    | 2013    | 2016    | 2017    | 2019    |
|-----------------------------|---------|---------|---------|---------|---------|
| Total pensioners, including women | 39706   | 40573   | 42729   | 43177   | 43504   |
| men                         | 26653   | 27238   | 28599   | 28909   | 29075   |
| of the total number of pensioners living: |         |         |         |         |         |
| in the countryside         | 13053   | 13335   | 14130   | 14268   | 14429   |
| in urban areas             | 27934   | 28765   | 30904   | 31363   | 31799   |

The state social standard for rural pensioners is a guarantee of receiving basic social benefits, which are divided into two groups: ensuring the standard of living of a rural citizen (a set of goods and services guaranteed by the state); ensuring the standard of living of a rural resident (a set of norms that determine the use of various types of resources). The development of digital technologies carries fundamentally new solutions in the field of health advocacy and the protection of public health and health of future generations.

Currently there are cloud platforms for monitoring human health, intellectual systems that record physiological data and human well-being [9]. During the study, methods of analysis and analogies were used to reveal the features of rural development in the context of the crisis caused by the COVID-19 pandemic. The areas of application of neural network technologies in medicine, in the development of the living environment (smart homes) were considered.

2. Results and Discussion

The emerging informative and technological neural network era leads to the formation of an integrative mega-network "Neuronet" with network neural interfaces with augmented reality. The Neural Network market is projected to reach $ 2 trillion by 2035. Under the programme "Digital Economy of the Russian Federation", in accordance with the President Decree of the Russian Federation of May 7, 2018 No. 204 "About the national goals and strategic objectives of the development of the Russian Federation for the period up to 2024", a project for the development of urban and rural settlements on a neural network platform is being developed. [10,11].

The functionality of the digital platform of rural settlements is able to integrate a variety of computer programs developed for different tasks of the economy, for example, budget management of a city or rural settlement. At the Volzhsky Polytechnic Institute (branch) Volgograd State Technical University (Russia) has developed programs for the functioning of green cities: "Neural network for determining the ecological and economic efficiency of the functioning of the Green City system No. 2017663126;" Artificial intellectual system for budget forecasting "Green City" No. 2017619844) in Figure 1[3].
The largest and fastest-growing segment of the neural network is neuromedicine, which consists of such elements as: genetic engineering, mathematical modeling of diseases, diagnosis and treatment of senile diseases, the use of artificial organs and biomaterials. It is estimated that the market for digital medical solutions will reach $6 billion by 2022. Electronic medical records, remote patient management capabilities, and the sale of medicines via the Internet will become more actively used. The state telemedicine service was launched in Russia, and it should be integrated with the portal of public services and the network of clinics "Mother and Child" in 2021. Telemedicine works in two directions: "doctor-doctor" communication, in which medical professionals contact and solve health issues; "patient-doctor" communication, which involves the remote exchange of information between a doctor and a patient. People living in rural areas can get advice through telemedicine. The doctor can remotely assign tests to a person for him to come to a full examination with a package of results. Telemedicine saves time and money, and reduces the risk of spreading infections. Among the main drawbacks, experts highlight the fact that the patient cannot be examined and listened to, and this is an important stage that helps to make an accurate diagnosis. Today, telemedicine services provide specialized services: Doc Plus, "Online Doctor", ONDOC, "Yandex Health", Qapsula. Sberbank, which acquired 79.6% of the DocDoc project, is showing interest in the telemedicine market. The owners of Sberbank's Premier service packages use expert advice. Sberbank's Artificial Intelligence Laboratory trains artificial intelligence in the diagnosis of cancer. Neural network training takes place on real depersonalized images of patients of a medical institution. The results of cancer screening are examined by doctors and their conclusion is uploaded to a single anonymous knowledge base of the neural network. At CES 2021, scientists from Japan presented a "smart" watch that can measure blood sugar levels without piercing the skin. Today's smartwatches can measure your heart rate and do an ECG.
Figure 2. Consultation of the doctor of the Nova Vita clinic (Volgograd, Russia) to the patient on the ONDOC platform.

The main indicator of the duration of a person's work activity is the state of health. In the UK, Germany, Spain, and Canada, the EuroQol EQ-5D Scale (EQ-5D) method is used to assess the health status of an elderly person. This is a kind of research tool based on the understanding of health as a quality of human life. The health status in the EQ-5D Method is measured by the following indicators: mobility, ability to take care of yourself, daily activity, discomfort, anxiety. The EuroQol EQ-5D method allows you to assess the overall health and mental state profile, the possibility of continuing work. Research conducted by scientists of the Volgograd Technical and Medical Universities shows that there are several types of individual values that guide people in rural areas: the first type is following the traditional rules that have developed over the centuries; the second – the desire to improve social and economic status; the third - the strengthening of spiritual orientation, the search for the meaning of life, the fourth - a practical (entrepreneurial) approach to solving issues of everyday life. In the isolation caused by the COVID-19 pandemic, another type was considered – a type that needs a quick resolving of issues related to ensuring the safety of one's life and that of one's family. In the context of the pandemic, aggressive and depressive moods began to manifest themselves more and more, services provided with the use of digital technologies accelerated its growth. The basic elements of the Neural Network include a "smart" home, which is able to make a person's life as comfortable as possible (table 2).[10].

Table 2. Assurance systems for life and health monitoring in a smart home.

| Periods | Content |
|---------|---------|
| Step 1  | Protection from emergency situations  |
| Step 2  | Climate control, chronotherapy, minimal electromagnetism |
| Step 3  | Monitoring of human physiological parameters |
| Step 4  | Support and assistance to the patient |
| Step 5  | Ecology |

The security system of the "smart home" is able to provide protection against break-ins, the activation of the fire alarm system. The smart home system is able to provide a microclimate: temperature, humidity, lighting, color design and control of the electromagnetic field in all rooms. Smart home system, smartphones and trackers are able to monitor body temperature, blood pressure, blood sugar level. The smart home system is able to control household appliances remotely, and timely notify about the time of taking medications. The building is built of environmentally friendly materials, certified by LED.

A smart home can be considered as a biomedical startup for corporations. The main task of a smart home in home healthcare is to track the medical parameters of a person, to inform a medical officer. Smartphones, that have a set of sensors, enable you to monitor your health more and more. About 1
billion people were connected to the COVID-19 carrier contact tracking program in China. Smart systems are still not without disadvantages: high cost of equipment, long payback period; vulnerability to cyber-attacks; inconsistency in the management of equipment from different manufacturers [10].

3. Conclusion
"Smart environment" "Smart way of life" (rational consumption of resources and ecological way of waste disposal and social interaction are the main vectors of rural development). During the COVID-19 pandemic the following issues became relevant: the definition and study of ecological ecotones, the formation of approaches to determining the objective assessment of human health at a distance. If the authorities see a person only as a patient, then health monitoring technologies give him hope for recovery and a long life; if they consider people as citizens, voters, then the same technologies establish constant control over their activities, which raises numerous ethical questions. The neural network era is increasingly becoming a reality for the majority of people on earth, and the use of smart technologies is a strategic vector for the development of human civilization.

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