

**ON THE REGIME OF COVID-19 EPIDEMIC IN RUSSIA
AND ITS IMPACT UPON THE FUEL AND ENERGY
COMPLEX, INCLUDING IN EDUCATIONAL AND
SCIENTIFIC SPHERES**

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ABSTRACT

The mode of development of the COVID-19 pandemic in Russia and the impact of the epidemic on the areas of scientific research, education and functioning of the fuel and energy complex are discussed. The official statistics revealed evidence both of effectivity of the taken anti-epidemic measures in Moscow and of possible cases of incorrectness of statistical data. The social situation and the mode of development of the epidemic in Moscow and in the regions of Russia are essentially different, that reduces the effectiveness of anti-epidemic measures introduced uniformly throughout the whole country. The conditions of the pandemic and quarantine are difficult for everyone, but organizations and persons with a more modern informational character of production adapt to them more easily. In general, it can be suggested that the epidemic besides the very essential losses gives an important impulse for social-economic and political modernization of the society.

***Keywords:** Regional differences in the epidemic regime in Russia, the quality of official statistics, the impact of the epidemic on scientific research, education and the fuel and energy complex*

INTRODUCTION

The economic and social impact of the COVID-19 pandemic depends on the epidemic and on the anti-epidemic measures taken. This article, following earlier publications of one of the authors [8], [9], [10], examines the regime of development of the COVID-19 epidemic in Russia, and some trends of the impact of the pandemic on education, science, and on the production process (mainly in relation to facilities related to the functioning of fuel and energy complex). Firstly, we will briefly summarize some general trends of development of epidemic in Russia and then the features of the impact of the epidemic on the society will be discussed.

Some trends in the development of the COVID-19 pandemic in Russia

In Russia, a strong difference in the development of the COVID-19 epidemic exists between megacities (primarily Moscow) and in the regions. Fig. 1 with a semi-log scale along the y-axis displays the official data on the growth of the

number of cases of infections and deaths in Moscow and in the regions of Russia. It can be seen that in Moscow, at the beginning of the epidemic, the number of cases (curve 1), and with a certain time lag, the number of deaths (curve 2), grow rapidly. Over time, the rate of growth of the epidemic decreases, and then the growth in the number of cases and deaths stabilizes at a certain (moderate) level. At the initial stage, the development of the epidemic in semi-logarithmic coordinates can be satisfactorily described by a straight line, which indicates an avalanche-like character of the first stage of development of the epidemic.

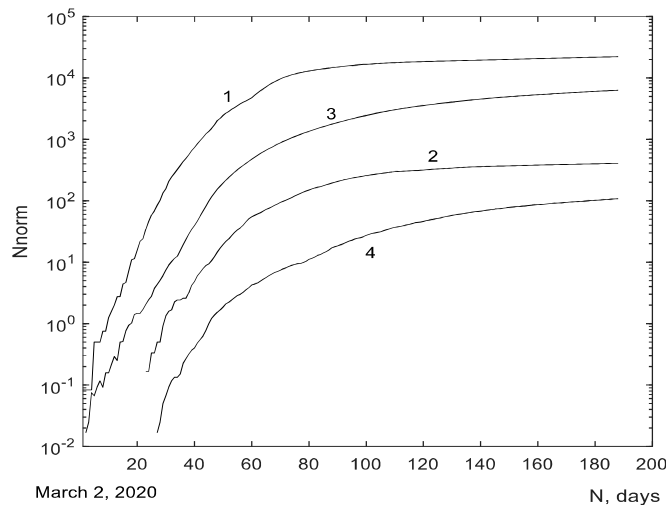


Fig. 1. Growth mode of the number of cases and deaths (N_{norm}) from COVID normalized per million population in Moscow (curves 1 and 2) and in the regions of Russia (curves 3 and 4).

A significantly different nature of the development of the epidemic is observed in the regions of Russia (outside megacities). The normalized (per million population) number of cases and deaths is much less in the regions; the growth curve of the number of cases and deaths is flatter. However, the rate of development of the epidemic in the regions decreases with time much slower. At this moment, the normalized number of victims of the epidemic in the regions is still 3-4 times less than in Moscow, but the growth rate of the number of victims in the regions is higher. It seems expectable that over time, the proportion of cases and deaths in Moscow and in the regions becomes close. Similar regional differences exist in other countries; in particular, the curves of the epidemic development in New York and in the agricultural states of the USA are qualitatively similar to the data in Fig. 1. Having this in mind, it can be suggested that cumulative losses from the COVID-19 in the countries and regions currently less affected by the epidemic can be even heavier than the ones that have taken place in big cities. See also similar discussion in https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/publication/pb_60.pdf where a similar situation is characterized as a “calm before the storm”.

Section ENVIRONMENTAL GEOLOGY

For Moscow, the measures taken to limit the development of the epidemic and prevent overloading the health care system were quite effective. As noted above, the slope of the exponent has greatly decreased over time. It is essential, that these changes were uneven. Three decreases in the slope of the growth curve of the number of infected cases were mostly significant. These changes occurred on March 22, April 2 and April 18 (Fig.2). 5-7 days before this, the Moscow Mayor's Office introduced important new anti-epidemic restrictions. Starting on March 16, schooling was stopped. Starting on March 28, the work of a large number of organizations was ordered stopped, and starting on April 13, a pass system was introduced. The delay in the decrease in the growth rate of the number of cases of infections relative to the dates of the introduction of the mentioned restrictive measures in all three cases is 5-7 days, which is consistent with the data on the typical duration of the time interval from the moment of infection with COVID-19 to the onset of the disease. Analysis of the data for other countries made it possible to also identify the typical duration of severest cases, from the onset of the disease to death, that duration turned out to be about 10 days [10].

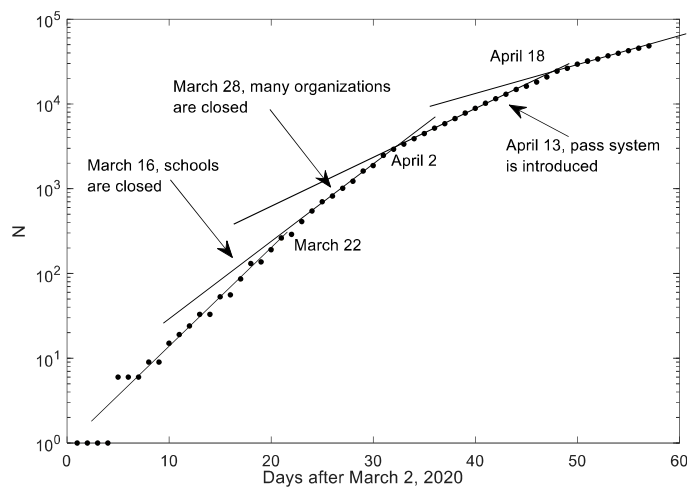


Fig. 2. The impact of the restrictive measures taken by the City Hall on the development of the epidemic in Moscow, N – number of COVID-19 cases in Moscow, from [2], [9].

However, not all measures taken by the Moscow City Hall were so successful. In the first day of the introduction of the passes, there were massive pass checks, causing long queues formed in the Moscow metro on the morning of April 13. Daily data on the number of infections and deaths from COVID-19 in Moscow are presented in Fig. 3. The graphs show that 6 days after the onset of the queues, there was a surge in the number of cases of the disease, and after another 10 days, a surge in the number of deaths. These maximums can be interpreted as direct consequences of queues in the metro with additional number of diseases of about 500 people and up to 30-40 deaths.

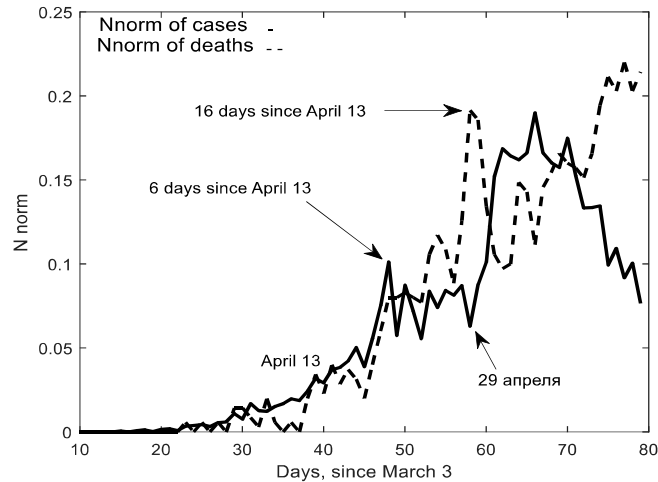


Fig. 3. Possible effect of an increase in the number of COVID-19 diseases and the deaths because of queues in the subway arising from the police checks during the first day of pass regime. Arbitrary scale is selected for the best comparison of curves.

The reasons of some features of the COVID-19 epidemic in Moscow remain unclear. Thus, for example, from April 29 up to early May, official statistics show an essential increase in the daily case numbers. However, the corresponding surge in the number of deaths was not observed. It can be assumed that this increase in the number of infections was caused by the sharp increase in the number of tests and detection of cases of latent incidence of COVID-19. However, attention is drawn also to the fact that on April 29, an order of the Ministry of Health of Russia came into force "On incentive payments to medical workers in connection with the spread of coronavirus infection" (<http://www.consultant.ru/law/hotdocs/62022.html>).

Thus, the emergence of corporate material interest of medical personnel in overestimating the number of cases of COVID-19 cannot be excluded. Note also, that some points in the official statistics appear to be dubious. For example, the mortality rate since the end of July in Moscow has remained at a quasi-constant level (Fig. 4), but with no case of the same repeating number of deaths in neighboring days, while it should take place in about a quarter of cases; this seems hardly likely from statistical reasons.

The overestimations and underestimations of the number of cases of morbidity and death from COVID-19 are closely connected also with the lack of a method for their unambiguous formalization. The difficulty in the case of the disease is associated with a possible unclearness of the clinical picture of the disease and inaccuracy of tests. In the event of a patient's death, ambiguity arises when the patient dies from other diseases, aggravated by infection with COVID-19.

Restrictive antivirus measures were often introduced in Russia uniformly throughout the whole country. The introduction of quarantine, synchronized with Moscow, often turned out to be ineffective in some regions, since quarantine was introduced at a low level of the epidemic, when the epidemic could not overload the healthcare system. The easing of quarantine, also synchronous with Moscow, was introduced frequently at the phase of a significantly greater development of the epidemic than it was at the time of the introduction of quarantine. However, the continuation of the quarantine in the regions turned out to be highly undesirable for economic reasons. Thus, the quarantine period was often inconsistent with the local mode of development of the epidemic. In this situation, quarantine restrictions are hardly effective and could be more difficult for the population than the epidemic itself.

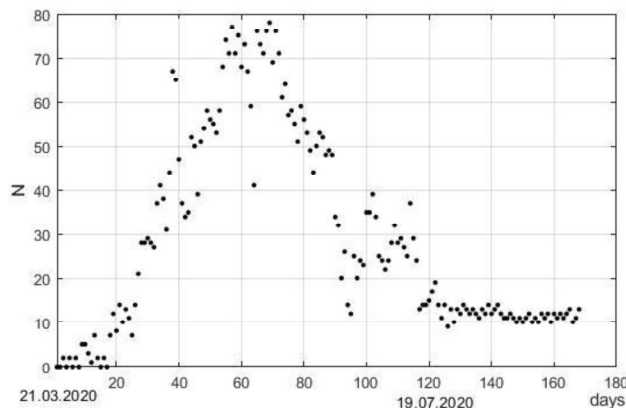


Fig. 4. Daily numbers of deaths from COVID-19 in Moscow.

The brief examination presented herein indicates that the official COVID-19 statistics in Russia reflects the rather subtle features of development of the epidemic and the implementations of anti-epidemic measures in Moscow, however, it bears features of probable falsification as well. Understanding the degree of accuracy of the official data, only sufficiently detailed, on the development of the COVID-19 epidemic is necessary for the correct understanding and use of this data.

The above is a general background in relation to further discussion of the impact of the COVID-19 epidemic and anti-epidemic measures on the social and economic situation in Russia. In this regard, we will discuss the introduction and practice of distance education at universities and research institutes, the situation with the provision of rotational work at remote oil and gas fields and questions concerning the current situation with scientific research in the field of geological sciences and environmental protection (difficulties in holding symposia and congresses, experimental and field research).

SOME ASPECTS OF THE IMPACT OF THE COVID-19 EPIDEMIC UPON SOCIETY

The impact of the COVID-19 epidemic on the oil and gas industry is two-fold. The first one concerns the fall in energy demand during the epidemic. The second one concerns the functioning of the oil and gas complex and corresponding fields of science and education, during the epidemic.

SITUATION IN THE OIL AND GAS MARKET

According to Vladimir Chuprov [1], the head of the energy program of the Russian branch of Greenpeace, the coronavirus hit hard the world oil market, which was already unstable. Reduced oil consumption in China due to that country's quarantine, reduced consumption of transport fuels which resulted in the downturn of global business activity along the chain have brought down world oil and gas prices [4]. The question arose about the financial stability of countries whose economies are overly dependent on oil production and exports. Russia is one of such countries.

Note, however, that despite the obvious vulnerability of the hydrocarbon market, the Russian leadership is still betting on a high level of oil and gas production, which requires both the discovery of new fields and further development of already exploited fields. As part of the implementation of this program, on March 5, 2020, the President of Russia signed a decree "On the Fundamentals of State Policy of the Russian Federation in the Arctic for the Period until 2035", according to which oil and gas production in the Arctic latitudes is planned to be systematically developed through government subsidies and private investment.

DISTANCE LEARNING - PROS AND CONS

In the list of anti-epidemic measures, an important role is played by the decision to introduce distance learning in schools, colleges and universities. The problems of distant learning is discussed in a number of papers (see [7], [11] as an example); main pro et contra of the distant learning are summarized in <https://www.educationtask.com/>.

Concerning the field of oil and gas education system (from Geology faculty of Moscow State University, University of Oil and Gas, Kazan University) all interviewed teachers note the difficulties with the implementation of such a learning regime. They say that distant manner of learning for students is more difficult and takes more time both for students and teachers. The following observations were obtained also: better attendance of distant lessons and increased difficulty in controlling the assimilation of study material by students. An increase in the differentiation of the quality of assimilation of the study material is also outlined. More successful and reasonably motivated students take advantage of the new opportunities of more rational use of time and choice of sources of learning. At the same time, poorly performing and poorly motivated students show worse results with a significant complication of control of their assimilation of the study material. With distance learning, hands-on and laboratory classes are especially affected, and the corresponding practical skills are not developed.

ROTATIONAL WORK AT REMOTE OIL AND GAS FIELDS

With regard to the oil and gas complex, an essential complexity is generated by the existing system of rotational servicing of many remote oil and gas fields. At the peak of the quarantine, the rotational personnel had made up the bulk of air passengers on flights to Western Siberia, Sakhalin and a number of other remote oil-producing regions. A strong decrease in the number of domestic and international passengers is the common feature typical to many countries

https://www.icao.int/sustainability/Documents/ICAO_Coronavirus_Econ_Impact.pdf

Due to the combined impact of the vacation period, cases of COVID-19 diseases, and the quarantine, significant difficulties arose in the formation of shift teams. In this situation, unpopular and tough decisions were often made. For example, due to the threat of the spread of the coronavirus infection, Gazprom Dobycha Nadym stopped the shift of personnel who worked on a rotational basis at the Yamal fields, including at the largest Bovanenkovskoye field in Western Siberia [3].

OIL AND GAS SCIENCE DURING PANDEMIC AND QUARANTINE

In the field of scientific research, the most painful difficulties center on carrying out the experimental research, fieldwork and conferences. Most of the conferences that had been planned for March 2020 and onwards were either canceled or postponed. In the cases of holding conferences online (fully or partially), the lack of familiarity with the online format by many participants, negatively affected such conferences. It is hoped, however, that such remote conferencing capabilities and skills will soon be attained.

Currently, due to the decrease in the activity of the epidemic in large cities in Russia, a few conferences have taken place recently or are planned to occur mostly offline in the near future. The following events can be mentioned:

- VIII All-Russian Meeting with International Participation "Jurassic System of Russia, Problems of Stratigraphy and Paleogeography. Syktyvkar: IG Komi Science Center UB RAS Online, September 7-10 [6];
- International Scientific and Practical Conference "On a New Paradigm for the Development of Oil and Gas Geology" dedicated to the 100th anniversary of the establishment of the Republic of Tatarstan. Kazan, September 2-4 [5];
- XI International Conference "Chemistry of Oil and Gas" dedicated to the 50th anniversary of the Institute of Petroleum Chemistry of the Siberian Branch of the Russian Academy of Sciences. Tomsk, September 28-October 2. <http://petroleum-chemistry.ru/>

The authors of this article took part in these events with reports.



The other example that can be mentioned is the Geolinks Conference, dedicated to the environmental sciences, planned to occur October 5-7, 2020 in Plovdiv, Bulgaria. www.geolinks.info. We hope, it will be held in compliance with all necessary protective measures, and with a large scientific load, and will have a great resonance. In-person communication between scientists will bring joy to the participants and colleagues after a long quarantine and forced retirement and will help to solve urgent environmental problems.

In terms of the role of science during the pandemic, it can be mentioned that dozens of Russian projects related to the study of coronavirus have received support from the Russian Foundation for Basic Research (RFBR). Already in mid-April, in the midst of the pandemic, the competition "Fundamental problems of the emergence and spread of coronavirus epidemics" was promptly organized. RFBR promptly responded to the possibility of supporting science by organizing a program of fundamental research on the pandemic problems. More than 500 applications were submitted for the RFBR competition. For the competitive selection, an expert council was formed, which included representatives from both natural science fields and humanitarian disciplines.

CONCLUSIONS

The examination of the official statistics of the COVID-19 epidemic in Russia allows both to highlight rather subtle features of the development of the epidemic (in particular, reflecting the effectiveness of the anti-epidemic measures taken), and also indicates possible cases of incorrectness of statistic data. In general, the experience of the COVID-19 pandemic in Russia provides an example of the limited effectiveness of adopting a set of measures uniformly throughout the large country. In Russia, such measures were taken under the strong influence of the situation in the capital region. However, the situation in the Moscow region is not typical of the most other regions of Russia. Thus, these measures frequently were ineffective in the regions. Moreover, they could increase social tensions.

The consequences of the pandemic are very grave for both the economy and the people. They appear to be heavier for people who are accustomed to functioning in conditions of external management and control. Internally motivated people (for example, students) who independently set tasks for themselves adapt to pandemic easier, and even find new opportunities for growth. Such people benefit from the obvious savings when the movement of people is replaced by the movement of files.

The analysis of the experience of the pandemic will undoubtedly prove to be important and required in the event of similar cataclysms in the future. Let us emphasize that a full-fledged analysis is possible only with a multidisciplinary approach, using the methodology of various fields of knowledge, both natural science and humanitarian.

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REFERENCES

[1] Chuprov V. Expert opinion 11.03.2020. <https://greenpeace.ru/expert-opinions/2020/03/11/koronavirus-vyjavil-strategicheskiju-oshibku-v-klimaticheskij-politike-rossii/>

[2] Enikeev B.N. Feedback on publications: Rodkin M.V., Shikhova N.M. Mathematical modeling of the development of the COVID-19 epidemic, an attempt at forecasting. Ural Geological Journal. No. 3(135), p. 23-27. 2020. In Russian. <https://www.ural-geol-j.net/archive>.

[3] Gazprom isolated the largest field in Yamal due to coronavirus/ Read more on RBC:<https://www.rbc.ru/business/27/03/2020/5e7db4379a7947b24a8629ff>

[4] Ivanov K.S. On the coronavirus and the price of oil (review of the article "On the statistics of the spread of the COVID-19 virus". Ural Geological Journal. 2020, No. 2(134), p. 22-25. In Russian. <https://www.ural-geol-j.net/archive>.

[5] Materials Int. scientific and practical conf. "About a new development paradigm Oil and Gas Geology". Kazan, Ikhlas, Russia, 584 p., 2020.

[6] Materials VIII All-Russian meeting with international participation. "Jurassic system of Russia: problems of stratigraphy and paleogeography". Online conference. Syktyvkar: IG Komi Science Center UB RAS, 297 p., 2020.

[7] Onyema E.M., Eucheria N.C., Obafemi F.A. et all. Impact of Coronavirus Pandemic on Education. J. Education and Practice, 11, 13, 2020, ISSN 2222-1735 (Paper) ISSN 2222-288X (Online).

[8] Rodkin M.V., Belov S.V. On the oddities of the statistics on the coronavirus COVID-19. Use and protection of natural resources of Russia. No. 2 (162), p. 117-120, 2020. In Russian.

[9] Rodkin M.V., Shikhova N.M. Mathematical modeling of the development of the COVID-19 epidemic, an attempt at forecasting. Ural Geological Journal. 2020, No. 3(135), p. 3-13. In Russian. <https://www.ural-geol-j.net/archive>.

[10] Rodkin M.V., Shikhova N.M., Rukavishnikov T.A. Preliminary analysis of the dynamics and possible factors of influence of the COVID-19 pandemic. Ural Geological Journal. No. 3 (135), p. 14-22. 2020. In Russian. <https://www.ural-geol-j.net/archive>.

[11] Tishchenko A.S. The impact of the pandemic on the education economy. Economic development of Russia. Vol. 27. No. 5. 2020. <https://cyberleninka.ru/article/n/vliyanie-pandemii-na-ekonomiku-obrazovaniya/viewer>