

# Current issues of using digital technologies for environmental protection: legal aspect

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**Abstract.** The global changes of recent years in the world around us indicate that the line between the physical and digital worlds becomes blurred. More and more sectors of social life move online, and digital technologies have an increasingly strong influence on the industrial, agricultural, scientific, medical, educational, and other processes. Digitalization technologies have a particular influence on the evolution of traditional ideas about the methods of environmental protection. Though most international legal acts do not place a direct emphasis on this, many environmental problems caused by the globalization era can hardly be resolved without using digital technologies (for example, in terms of overcoming the consequences of global climate change). Further development of digital technologies will reduce the consumption of hydrocarbons and greenhouse gas emissions, help to mitigate the consequences of the emergence of e-waste. The use of environmental digital technologies within the framework of global and national environmental monitoring, improvement of the safety of the operation of industrial enterprises, in agriculture, as well within the framework of enhancement of the comfort of living in the urban environment, is quite promising. However, in Russian environmental legislation, there is now no direct mention of the possibilities of using digital technologies in the field of environmental protection, which should be corrected by supplementing the law with a special chapter.

## 1 Introduction

The global changes of recent years in the world around us indicate that the line between the physical and digital worlds becomes blurred. More and more sectors of social life move online, and digital technologies have an increasingly strong influence on the industrial, agricultural, scientific, medical, educational, and other processes.

Digitalization technologies have a particular influence on the evolution of traditional ideas about the methods of environmental protection. Though most international legal acts do not place a direct emphasis on this, many environmental problems caused by the globalization era can hardly be resolved without using digital technologies (for example, in terms of overcoming the consequences of global climate change).

The close interrelation between digitalization and the Sustainable Development Goals (SDGs) formulated in the UN Summit Outcome Document "Transforming our World: the 2030 Agenda for Sustainable Development" in 2015 appears not less important since it is not possible to ensure the balance of economic, environmental and social interests in the globalization era without using digital technologies.

The coronavirus pandemic has had a particular influence on the discussion of the role of digitalization for environmental protection. First, it paralyzed the

operation of many industrial enterprises. As a result, a number of countries registered reduction of emissions of harmful substances, including CO<sub>2</sub>, NO<sub>2</sub>, and the blue sky returned to some megalopolises as a consequence of this [1]. Second, the problem of mass infectious medical waste has emerged, for which many countries had not been ready. Third, there has been an increased demand for digital technologies, in particular, for those which make it possible to remotely monitor technological processes, including emissions into the environment. Digitalization has become especially important for monitoring of the state of the environment in general (and not only emissions of a given enterprise), which ensures remote assessment of environmental threats to the areas of particular municipalities and regions and adoption of prompt measures to eliminate them.

## 2 Problem Statement

In this situation, we observe a greater role of the studies of the possibilities of law to regulate social relations associated with digitalization of certain areas of social life to reduce the negative impact of society on ecological systems, both natural and changed by humans.

## 3 Research Questions

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Elimination of the consequences of the coronavirus pandemic will be of a long-term nature, and it will definitely have an effect on the dynamics of achievement of 17 Sustainable Development Goals (SDGs) that was before 2020. The importance of achievement of the goal of ensuring public health will inevitably divert the attention of both governments and the public away from other goals, which seemed so important to everyone not long time ago (fighting against climate change, ensuring sustainability of seas and oceans, etc.). However, neglect of some goals in the interests of other ones can hardly be maintained even in a middle-term perspective since they are closely interrelated. In our view, in order to identify the dynamics of their interaction and work out a new strategy for the achievement of all SDGs in the period of the pandemic and after it ends, we need new technologies, which are provided by digitalization. However, before we start analyzing the environmental and legal aspects of digitalization, it is necessary to answer a more general question of what should be understood by the term "digitalization".

For example, some authors note that digitalization is "not only the use of digital technologies and the creation of new possibilities, including the exercise of interests in gaining profit, it is a process of transition to digital business, which requires detailed regulation by law" [2]. Others think that "digitalization can be considered as a process of application of digital technologies in various fields, while digital transformation implies specific results arising from their use" [3].

Therefore, the emphasis is placed on technical and/or economic aspects. For our part, we think that it is a much wider phenomenon. Digitalization is a complex of economic, management and social processes associated with the application and widespread expansion of digital, computer, information, electronic, network (telecommunication) technologies, and AI systems in modern life [4]. Further we will consider digitalization exactly in this sense.

At the moment, there is no generally accepted classification of the main areas of digitalization of legal protection of the environment either in international legal acts or doctrinal studies, though its certain elements have already been examined in detail.

We think that digitalization of environmental protection can be mentioned in two aspects: digitalization of "classic" areas of legal protection of the environment and those which emerged not long time ago and were caused by the shift of countries to the sixth technological paradigm.

Within the first aspect, we suggest distinguishing digitalization of state environmental management (especially in terms of environmental supervision and licensing), digitalization of calculation of the payment for the negative impact on the environment or estimation of the volume of emissions, discharges, etc. A particular place in this group is occupied by digital solutions in the field of protection of environmental human rights related to the use of digital technologies to file complaints, applications and suggestions on the portals of state authorities and local government bodies that perform environmental protection functions, as well as

consideration of citizens' opinions while discussing projects of various solutions of authorities [5].

Within the second group, we propose to distinguish the following elements:

1) Digitalization of production processes in agriculture that improves its sustainability. This area can both include several sectors related to digitalization of the very production processes (use of drones for spraying of fields, robotic automation of agricultural machinery, etc.) and be of a purely informational nature (use of mobile phones to deliver agricultural products, access to information about the soil condition and air humidity that is necessary for farmers, advice on fertilizer application, etc.) [6]. Artificial intelligence technologies can be used in the future [7]. Digitalization becomes especially important with respect to the development of the market of organic goods [8]. Its significance could consist in the development of a "digital passport" for certain kinds of agricultural products that would enable consumers to track the place and time of production of the goods, their chemical composition, use of fertilizers, etc. Particular steps in this direction have already been made. For example, Russia has created the Unified State Register of Organic Producers, which is maintained in electronic form. It seems equally promising to develop an open electronic database of unscrupulous producers of food that have been held liable for production and circulation of foodstuffs which do not comply with the established quality and safety requirements [9]. Hence it follows that the main areas of digitalization of agriculture and legal incentives for their introduction should be reflected in the national legislation on agriculture.

2) Digitalization and the "smart urban environment". Without having the possibility to consider all aspects of the "smart urban environment", let us focus on only one of them – the digital logistics of transport flows. Within this area, we distinguish two environmentally important sectors. First, the management of urban transport flows can be improved due to digital technologies, which will reduce the time spent in traffic jams, the fuel consumed in vain (which will decrease the volumes of oil production and processing), and the emissions from cars into the air (which will reduce urban pollution). Second, the development of digital technologies will eventually enhance the logistics of cargo transportation, which will improve their efficiency, reduce empty runs and result in the same positive effect as in the case stipulated above.

The improvement of the "green logistics" will lower pollutant emissions by as much as 3.6 billion tons by 2025. This can be facilitated by introducing new digital platforms (Uber Freight, Convoy or Transfix) that help to increase the overall efficiency of a supply chain by cutting out unnecessary intermediaries, sharing transport capacity, and sharing warehouse space. Moreover, the internet of things makes it possible to identify optimized patterns and potential breakdowns in the supply chain, which also contributes to logistics players' corporate social responsibility initiatives. In the maritime logistics industry, using big data to optimize vessel speeds and paths reduces waiting times in ports and, therefore, CO2 emissions. Another way to resolve logistical issues

would be development of government incentives and subsidies [10].

3) The energy sector is the most promising area for environmental digitalization; it can increase the efficiency and cost-effectiveness of the processes of production, transmission, and distribution of energy.

Reduction of electricity consumption, further integration of electricity produced by means of renewable energy sources into the system of national and international electricity markets will lead to decrease in the use of hydrocarbons in the energy sector as well as emissions of harmful substances related thereto. In addition, there is a close relationship between electricity generation as well as industry and the transport sector (manufacture and use of electric vehicles). There are opportunities for digitalization also in industry, where the use of these technologies strengthens control over wastewater discharge, improves its physical and chemical treatment, which is already happening gradually.

4) It is possible to improve the rationality of the use of certain types of natural resources with the help of digital technologies. For example, due to them, it is possible to use forest resources more rationally, reduce water losses by creating online networks and using sensors that transmit information about leakages and consumption of water.

5) Digitalization and climate. Climate change and digital technologies are undoubtedly two of the most defining features of our civilization. Digitalization of production can have several areas. For example, digitalization of the manufacture of electric cars (and electric planes and ships over time) will make it possible to reduce dramatically emissions and discharges and to improve the climate. Introduction of hydrogen engines in production will play here a particular role, which will lead to the end of the oil era and reduction of greenhouse gas emissions. Meanwhile, the economic growth has not yet been separated from the growth of emissions and the use of natural resources. The historical trend is that for every 1 percent increase in global GDP, CO<sub>2</sub>-equivalent emissions increase by about 0.5% and resource intensity by 0.4%. The current business practices contribute to the increase in the global gap between natural resources supply and demand up to 8 billion tons by 2030, which will result in a loss of 4.5 trillion dollars in the economic growth by 2030. To settle this issue, a legally binding climate agreement was concluded at the UN Conference in December 2015. The agreement is aimed at preventing the average temperature on the planet from rising above 2°C relative to the pre-industrial era, and if possible, to reduce it to 1.5°C. It appears that, to make this activity effective, a coordinating body should be established under the UN to assist all interested countries in introducing digital innovations in the field of climate. Within this area, we should emphasize that digitalization of certain sectors of the economy (transport, industry, agriculture, etc.) can create synergies by strengthening the results in each sector, which is, in our view, the aim of the 2015 Paris Climate Agreement.

6) Digitalization and environmental monitoring. Big data and artificial intelligence algorithms can be used for

environmental monitoring, including that one which ensures conservation of endangered land species, as well as for early warning of natural disasters such as earthquakes, forest fires, floods, and droughts. It is especially important to receive these data about the condition of specially protected natural areas (reserves, natural monuments, etc.) [11]. Tools for data collection and satellite survey can help to ensure ocean sustainability by preventing overfishing and monitoring of the level of health and pollution of marine ecosystems and ocean habitats. Intelligent networks can help track trends in energy consumption and ultimately reduce greenhouse gas emissions.

Space environmental monitoring and improvement of informational interaction between different countries are of particular importance in this case [12]. For example, in Russia, the state space monitoring system includes several centers located in the European, Siberian and Far-Eastern parts of the country. The Earth remote-sensing data received from domestic and foreign satellites are matched with a network of ground-based observation sites that provide high reliability and calibration of the remote sensing data [13].

7) Blockchain digital technology can revolutionize the environmental protection efforts since such technologies can ensure decentralized and sustainable management of resources, including water and energy consumption. Moreover, blockchain technology could help to save marine biodiversity preventing such practices as overfishing by means of traceable and transparent supply chains. Finally, no discussion of new technologies would be full without the internet of things. Though the term "the internet of the environment" can be more suitable in this case, the sensors connected to the internet can help to control and prevent deforestation, which is associated with 15 percent of global greenhouse gas emissions. They can be used also to fight against poaching by keeping track of endangered animals, monitoring their location, and introducing intelligent security systems.

8) Digitalization and scientific studies. Due to digital technologies (including mobile applications) even unskilled citizens can make an important contribution to processing of empirical data, for example, those related to observation of species. Digital technologies can unlock the potential of already collected data, for example, citizens can help with the digitization of natural history collections. Search engine data can now be used not only to trace such common processes as pollen release and mosquito outbreaks but also to forecast more important biological events [14].

9) Environmental digitalization already has numerous consequences, which are not always clearly perceived by us. For example, during the period of the coronavirus, the transfer of school and university education to digital form caused a decrease in the demand for paper, which will lead to a decrease in felling of trees. In a similar manner, the transfer of postal communication to digital form (electronic mail) led, in addition to the decrease in the demand for paper, to a decrease in the postal transportation, in the demand for fuel, and reduction of emissions into the air. Moreover, the transfer of business

negotiations (or scientific conferences) to digital form caused reduction of trips and fuel consumption, which will inevitably have an environmental effect.

Along with the abovesaid objective prerequisites for the introduction of digital technologies in environmental protection activities, we should also note a subjective factor existing in this process. The matter is that the prospective consumers of digital environmental services should, at least, know about their availability, and, in addition, rely on them. Even if we speak of not interaction with authorities by means of digital platforms but only of digital technologies that enable citizens to control water and electricity consumption via mobile applications, even in this case consumers should believe that their devices and data are protected, and their personal information will not be stolen.

It should be noted that along with undoubted advantages (even with allowance for the subjective factor of their perception by society), digital technologies pose a number of inevitable threats to the state of the environment. First, we can say that the Internet causes hidden (invisible) pollution. This manifests itself in the huge electricity consumption, in terms of which there is an impact on the environment.

Second, the use of digital devices themselves (computers, telephones, etc.) leads to the emergence of such a phenomenon as "digital e-waste", which is a serious environmental problem. According to the available data, about 50 million tons of e-waste is produced every year, and only 20 percent of it is recycled. The other 80% of e-waste is usually buried underground. Though the vast majority of e-waste is produced by developed countries, its most part is handled (i.e., dismantled and recycled in so-called e-waste dumps) in developing countries.

Though utilization of e-waste may seem a more reasonable option, it has its own disadvantages as well. Contact with harmful toxic materials such as lead, chromium, and cadmium can cause serious health problems, including respiratory diseases and lung cancer, to which working children are especially vulnerable. Despite the piles of e-waste, the demand for new high-tech gadgets continues to grow and aggravate the environmental consequences. Almost all digital technologies imply the presence of metals and minerals, known as rare earth elements, which are necessary for their functioning and are only sometimes recycled from e-waste. A smartphone contains 16 various rare earth metals. Even when metals are not rare, the process of their extraction causes serious environmental problems since it causes significant damage to the soil, pollutes water with chemicals used in the extraction process, and requires expensive cleaning operations.

Third, rising sea levels could cause damage to submarine cables (particularly in coastal areas in the US) and ultimately disrupt the functioning of the Internet in the coming 15 years. Similarly, the depletion of the ozone layer that in turn contributes to the increase in the intensity of ultraviolet rays from the sun will most likely hamper the electromagnetic frequency along which Wi-Fi travels [15].

## 4 Purpose of the Study

The purpose of the study is to consider the main areas of environmental protection digitalization for further change of environmental legislation.

## 5 Research Methods

Such research methods as comparative legal analysis, synthesis, formal logical and other methods of scientific knowledge were used within the framework of the conducted study.

## 6 Conclusion

Therefore, there are advantages and disadvantages of environmental digitalization, and there are no reasons to idealize this factor of modern life. Further development of digital technologies will reduce the consumption of hydrocarbons and greenhouse gas emissions, help to mitigate the consequences of the emergence of e-waste. The use of environmental digital technologies within the framework of global and national environmental monitoring, improvement of the safety of the operation of industrial enterprises, in agriculture, as well within the framework of enhancement of the comfort of living in the urban environment, is quite promising. However, in Russian environmental legislation, there is now no direct mention of the possibilities of using digital technologies in the field of environmental protection, which should be corrected by supplementing the law with a special chapter.

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