THE ENVIRONMENT AND DIGITALIZATION OF THE NUCLEAR INDUSTRY

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Abstract - Environmental science has recently enriched digital accessibility, all aspects of our life, and the very foundations of the foundations of development-the economy, the environment, and the social sphere. The concept of the environmental system turned out the most appropriate for describing stable financial institutions. Digitization of the ecology itself is equally important is as an activity for protecting the environment and ensuring environmental safety. On the basis of a systematic approach, the paper describes the basics of ecology digitization. The environmental policy implementation system has many elements of digitalization such as corporate data storage, an automated radiation monitoring system, an environmental monitoring system, a waste register. The functioning of the environmental policy implementation system (SRES) has made it possible to have the necessary and ever-improving indicators of environmental efficiency.

Keywords - Digitalization, Ecology, Ecological Activity, Nuclear .

I. ECOLOGY OF DIGITALIZATION

Lately, digitalization has become a more and more sweeping phenomenon; it has reached all aspects of our lives-from digital television to digitalization of production, social sphere, etc. The idea of digitalization is intertwined with the environment. In such a seemingly distant from environment field as the financial industry, we can see how “ecosystems” are being created. This concept, created by nature itself, happened to be very convenient to describe stable and self-sufficient systems. The term digital ecology has been widely employed by many researchers from various fields. However, different scientists tend to assign different meanings to the term, which indicates that it is not well-established yet as well as reflects the attempts to find parallels between processes taking place in society and techno sphere and those characteristic of nature. And this is the domain of nature-like technologies. But why has the notion of ecosystem become so frequently used to describe such distant from nature human activities? The answer is that nature itself is the largest ecosystem on the Earth. Based on knowledge and experience gained through studying biological ecosystems, researchers try to employ approaches, unifying principles, and interaction models successfully used to describe and simulate relationships in biological systems to describe and simulate relationships between people, engineering arte facts, and information flows. The metaphor of a network has been effectively used in both STEM fields and art for a long time. We can find it in the evolutionary philosophy of Herni-Louis Bergson and in works of his contemporaries and followers such as Vladimir Vernad sky, Pierre Teilhard de Chardin, and Alexander Bogdanov[1-4]. While learning living and social systems, modern researchers-biologists, psychologists, and sociologists—do not focus on the static structure of the internal anatomy of such systems any more. In the second half of the XX century, scientists turned to the vast variety of adaptation of organisms to the constantly changing environment. A collection of ideas and techniques combine in the complex systems theory has lead researchers to understand that organisms and groups are self-organizing adaptive systems. This idea was most effectively developed by Norbert Wiener [5] and Ilya Prigogine [6, 7]. Digital ecology deals with information systems that were shaped by data flows broadcast through various media. Information is digitalized and becomes a resource that can be used to produce and transform as physical resources can be. The development of digital technologies has led to the emergence of an umbrella concept digital ecosystem denoting digital arte facts and the infrastructure for the transmission, storage and processing of data, which includes users of various systems and different factors influencing relationships such as social, economic, political, psychological, etc.

II. DIGITALIZATION OF ENVIRONMENTAL ACTIVITIES

Along with the above-mentioned way to employ ecology for describing digitalization, we can observe the reverse process when scientists employ digitalization to describe ecology as they do speaking of the digitalization of environmental activities. Therefore, there are two simultaneously developing concepts—the ecology of digitalization and digitalization of ecology (i.e. digitalization of environmental activities.) Digitalization of environmental activities of every enterprise, company, corporation, etc., is a part of the general digitalization of activities conducted by all modern organizations. Digitalization of economy is closely associated with sustainable development entailing joint development of economy, environment, and society. If the environment and society will not be undergoing the

process of digitalization, this will be hampering the development of the economy. Using a systematic analysis of the Russia nuclear industry as a basis, this paper proposes ways to enhance digitalization as a whole by increasing digitalization of environmental activities. The Russian nuclear industry is one of the most advanced industries of the Russian economy. In the nuclear industry, there is a digital strategy adopted by Rosatom [8]. The main tasks that the nuclear industry faces today are to implement a unified digital strategy and to promote further development of information technologies. The development of the digital economy is a priority for the Russian national policy. Rosatom strives to increase the effectiveness of its internal processes by broadening the applicable scope of digital technologies and is willing to offer products and solutions based on Rosatom's own best technologies such as cross-cutting technologies associated with the Internet, Internet of things (namely Industrial Internet of Things), big data, and additive technologies to other key sectors of national economy. Digitalization should provide considerable support to the implementation of strategic targets of Rosatom [9]. The targets include providing a safe nuclear shield as a basis of national security, supplying the world with clean, safe, and affordable nuclear energy and nuclear-based innovations, asserting global technological leadership, and preventing affecting the environment. Rosatom is the world's leader in the nuclear industry. At the Novovoronezh NPP, Rosatom commissioned the world's first water-water energetic reactor 1200 (WWER-1200) of the III+ generation complying with the post-Fukushima safety requirements set forth by the IAEA. At Beloyarsk NPP, Rostom commissioned the revolutionary BN-800 reactor, which caught much interest from foreign agencies. Rosatom implements projects that help reduce greenhouse gases emissions all over the world. For example, one reactor cuts 558 mn tonnes of carbon dioxide throughout its life, which equals to gases produces by 122 mn cars. As to its development outlooks, Rosatom is the number one nuclear agency in the world by contracts concluded worldwide, is the second by its uranium stock and, again, number one by the volume of uranium enriched. Every third electric bulb in the European part of Russia runs on "nuclear" electricity. A 4.5 g uranium dioxide pellet gives as much energy as 350 kg of petroleum, 640 kg of wood, 400 kg of coal, and 300 m3 of gas. If the industry switches to using mixed uranium-plutonium fuel the pellet would be 200 times smaller, and if it switches to using deuterium for nuclear fission the pellet would be a thousand times smaller. Over its life, a fuel bundle can generate 36 500 megawatt days of energy, which equals to a monthly demand of 600 000 households. The energy output of a 1 GW NPP can be compared with that of a 64 km2 solar power plant or a 273 km2 wind farm. At the same time, a 1 GW NPP occupies only 3 km2, which is 20 times less than a solar power plant does and a hundred times less than a wind farm takes up. The use of a "nuclear battery" powered by a nickel-63 isotope can supply medical implants (e.g. heat and brain pacemakers, ear and eye implants) with energy for 50 years. Digitalization does not make a new product beside it itself is a product and can be sold as an item of good. However, goods are created by means of all production factors, with the core factor being creativity. Back in the first half of the XX century, Vladimir Vernadsky wrote that value of a thing is not set according to the amount of money and work put in to make the thing, but also according to the same amount of the third component, creativity [10].

Therefore, it is the mix of digitalization and achievements of scientific and technical progress that makes digital economy successful. It should be noted that environmental activities are not included in the list of priorities of digitalization, but still, environmental safety is crucial. For example, here is what President Putin said about it in his message to the Federal Assembly of the Russian Federation [11]: People set higher and higher standards in the field of environmental safety… Finding solutions to environmental problems is one of the tasks that our industry and science face, it is everybody's responsibility. The term digital economy was introduced by Don Tapscott, the author of The Digital Economy: Promise and Peril In The Age of Networked Intelligence (first published in 1997). Some people even called him one of the top cyber-guru of the world. While the European part of the world community sticks to the term digital economy, the American part represented by Deloitte, IBM, and some other companies prefers using the more technologically correct name for the phenomenon, API economy. Digitalization means, first of all, a systematic approach, which is the main achievement of Rosatom's Environmental Agenda. The effective implementation of the Environmental Agenda by Rosatom's agencies allowed reducing the impact on the environment caused by nuclear activities.

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