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Global Megatrends and New Technologies: Challenges for and Threats to the Post-Industrial Economy*

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Abstract. The paper considers the influence of megatrends, currently acting as drivers of changes taking place in society, on the structure of the emerging economy of post-industrial society. Under their influence, a new economy is formed, focused on the use of such a resource as time, the amount of which, available to people, is increasing as robotomics develops. The research is based on the study of five global trends in the development of modern society: demographic transformations; natural resources depletion and climate change; changing geo-economic and geopolitical landscapes; digitalization and development of new technologies; comprehensive human welfare: wealth, health and knowledge. The article proves that these trends seriously challenge the future of humanity and fundamentally change the structure of the economy and employment. The response to the megatrends challenges is the formation of new directions in the economic structure that help to respond to them and deal with their negative implications. We establish that megatrends have contributed to the development of such areas as silver economy, circular economy, robotomics, peer-to-peer economy, and laid the foundation of a spiritual and moral economy and leisure economy. The work concludes that there are prerequisites in society for the transition to the economy, in which social effects will prevail over economic ones. High level of technology development and digitalization help to make such a transition to an "economics with a human face". The formulated

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principles of adaptation to the emerging economy enable countries to develop a transition strategy with minimal social and economic costs. The novelty of the research consists in comparing megatrends with changes occurring in the structure of the economy and the labor market, as well as in substantiating social orientation of the post-industrial economy, which is formed under the influence of global trends in social development.

Key words: megatrends, silver economy, circular economy, peer-to-peer economy, robotomics, leisure economy.

Introduction

The Fourth Industrial Revolution, which has turned the life of modern society upside down, is rapidly changing the established lifestyle generating new challenges and threats. Revealing unprecedented prospects to the world, technological progress also raises a lot of questions. What will the world be like? How will new technologies affect humanity? What place in this new world will be assigned to a person with their knowledge and skills? What professions do you need to master in order to stay a part of the post-industrial society?

Such questions are important because the experience of the previous industrial revolutions has shown their enormous impact on the labor market. During the First Industrial Revolution, which marked the beginning of the transition from manual labor to machine labor, there was a primary displacement of physical labor, which was massively developed during the Second Industrial Revolution. The Third Industrial Revolution, marked by electronics development and the advent of computers, served as an impetus for displacing the intellectual labor from the labor market which is now beginning to acquire a mass character [1].

In addition, the transformation of modern society and the economy is significantly influenced by global processes, related to climate change, political structure, demographic situation, etc.

The purpose of the study is to review global trends in social development and assess their impact on the emerging image of the post-industrial economy, the main characteristic of which is a high-impact industry with a greater degree of automation and low employment. In this regard, the paper attempts to find answers to two related questions. The first question is: how is the economic structure and the labor market changing under the influence of modern global trends? The second one is: how do these changes affect the appearance of the post-industrial economy? Despite the fact that an analysis of the impact of megatrends on certain aspects of economic and social development is occasionally found in the literature (see, for example: [2; 3]), a full-scale assessment is carried out for the first time. In addition, the novelty of our work is formed by the combination of economic and social aspects in studying the future economic structure.

Global megatrends: what is changing the world

The formation of the post-industrial society is inextricably linked with megatrends – large-scale social, technological, economic, political and environmental changes taking place in society and having a global impact on most types of human activity and the world as a whole.

J. Naisbitt began studying megatrends in 1982; he identified 10 global processes that determined the shape and essence of the emerging information society in the United States for the next two decades [4]. Despite the fact that the futurological approach to the analysis of megatrends has not found wide application, expert and analytical interest in this issue has rapidly spread around the world. Modern researchers consider megatrends as integral properties of the international political system, defined by its basic characteristics [5].

The literature rarely touches upon the question of the origins of the prevailing trends. Generally, megatrends are identified as a reflection of a certain sequence of the previous events [6]. For instance, according to the authors of [7], the collapse of the bipolar system and the subsequent change in the world order gave rise to modern global trends. The article [8] clarifies that the formation of megatrends was facilitated by the transformation of the world's political organization at least at three levels: the Westphalian system, interstate relations, and political systems of particular states, the simultaneous change of which led to the effect of a "perfect storm" [9], which influenced the trends' development. However, the main scientific discourse focuses on the degree of human influence on developing global trends.

Several points of view have been formed regarding this issue. Some researchers associate the formation of megatrends mainly with the anthropogenic factor considering them a reflection of the Anthropocene epoch [10]. Others tend to believe that the formation of megatrends is more determined by the cyclical nature of the political process, which is explained by the action of Kondratiev waves of economic upswing and downturn [11] and consists of a phase of evolution (ordering of structures) and a phase of chaoticization [12]. Still others correlate the emergence of global trends with natural processes. The discussion is most clearly manifested in relation to trends in climate and ecology. According to estimates, 97% of climate scientists associate the ongoing climate changes with human activity [13; 14] and indicate the need for society to respond to these changes [1]. Against such estimates, there are diametrically opposite points of view, according to which global warming, as well as global cooling, is caused by natural factors and is cyclical [15; 16], and is determined by the lack of consensus on the human role [17] and is even a "global deception" of political nature [18].

The study of global megatrends is a research topic mainly of foreign and Russian organizations, and is quite rare in scientific reviews. For example, in 2010, the European Parliament initiated the creation of the European Strategy and Policy Analysis System (ESPAS) project, whose tasks include constant monitoring, analysis of global trends affecting the EU development, and identification of problems, caused by them. The reports, published by the organization, note the pessimistic nature of almost all foresight studies, although this pessimism is not always objective, but rather caused by the fact that humans are, genetically speaking, biased towards the negative[1].

Among the organizations monitoring global trends that can dramatically affect the economy and society are the American research organizations: Gartner, Accenture, International Data Corporation (IDC) and Future Today Institute, British audit and consulting company Ernst & Young, which has offices in more than 150 countries, Danish analytical center Copenhagen Institute for Future Studies (CIFS), German Institute for the Future ZukunftsInstitut and the research company TrendOne, Canadian analytical Internet portal TrendHunter, Russian National Research University Higher School of Economics and a number of other institutions.

The number of megatrends, allocated by them, is quite diverse and varies from several units to dozens depending on the detail of degree. For example, CIFS defines 7 megatrends, ZukunftsInstitut – 12, TrendOne – 16, and TrendHunter – 18[2]. The authors of the Global Education Future report on the future of education believe that four megatrends will influence global social and economic transformations in the coming

[1] ESPAS Report 2019: Global Trends to 2030. Available at: https://espas.secure.europarl.europa.eu/orbis/node/1362

[2] How many megatrends are there in fact. Available at: https://ekhramkova.medium.com/сколько-на-самом-деле-мегатрендов-ec520e3ccc44

decades: digitalization, automation, transformation of social institutions and demographic changes[3].

Despite the fact that experts from various organizations identify a different number of global trends affecting the modern world order, all of them can be combined into five enlarged groups, which are most often discussed in ongoing research. For example, in the report of the Organization for Economic Cooperation and Development (OECD), commissioned by the Danish Ministry of Science, Technology and Innovation in 2016, the main megatrends include population growth, migration and aging; balance of water and energy resources, climate and food security; changing geopolitical and geo-economic landscapes; economic digitalization; wealth, health and education of nations[4]. Such megatrends will shape the socio-economic development strategies of nations in the coming decades.

The Higher School of Economics highlights similar trends in the study; the authors note that the prospects for Russia's development are largely determined not only by scientific and technological potential, but also by the action of global trends, related to changes in the natural environment, demographic and social transformations, transition to new models of economic growth, changes in the geopolitical situation and global management systems, formation of a new paradigm of scientific and technological development [19].

Our work analyzes the impact on the economy of five enlarged groups of megatrends which are an important part of existing studies. These include demographic transformations; depletion of natural resources and climate change; changes in geo-economic and geopolitical landscapes; digitalization and development of new technologies; complex well-being of mankind: wealth, health and knowledge. This choice is due to the fact that the areas under consideration generally accumulate reference points of human development: demography, ecology, technology, politics, and economics.

It is worth noting that the influence of these trends should be considered only in combination, as they are closely intertwined with each other and are capable of both strengthening and leveling the effect of each other. For example, the development of biotechnologies directly correlates with demographic changes; energy technologies help in solving environmental problems, most of which at one time were generated by technological progress. In turn, depletion of natural resources contributes to the development of alternative energy, and transformation of geopolitical landscapes radically changes the complex well-being of mankind.

Therefore, only a comprehensive study of megatrends will help to understand the prospects of the emerging world and prepare for the coming changes in time. Let us see more details of each of the megatrends and assess the potential threats and possible changes in the economy which are facilitated by the ongoing transformations.

Demographic transformations

Global trends in demography are primarily associated with the continued growth of the world's population, an increase in life expectancy, aging, an increase in urbanization processes and the smoothing of migration overflows against the background of the increase in the absolute value of the number of migrants.

According to the UN forecasts, the world's population will increase by almost a quarter by 2050 and will amount to 9.7 billion people, and by 2100 it will increase to 11.2 billion people[5]. The growth

[3] Education for complex society. Available at: https://drive.google.com/file/d/0B9ZvF6mQ5FMbSTFKVmhodU5rNTNiTXpUZ2QwZktiR0pzSmJR/view?resourcekey=0-d3FGUmpdKpcCi8CgLVHqXQ

[4] An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy. Available at: https://ufm.dk/en/publications/2016/files/an-oecd-horizon-scan-of-megatrends-and-technology-trends-in-the-context-of-future-research-policy.pdf

[5] The World Population Prospects: 2015 Revision. Available at: https://www.un.org/en/development/desa/publications/world-population-prospects-2015-revision.html

will occur mainly at the expense of African countries, while in developed countries the stagnation processes will continue, as a result of which the share of their population may decrease to 13.6% from 17.5% in 2013 and 32.2% in 1950[6]. Thus, over a century, the share of the population of developed countries in the world may decrease almost 2.5 fold.

This is not the only threat from demographic changes to the developed countries. In the coming decades, absolutely multidirectional processes will occur: a sharp surge in the number of young people on the African continent against the background of aging Europe, Asia and Latin America. It is predicted that by 2050, the number of people over 60 years old will increase to 2.1 billion people against the current 900 million and global parity will be achieved between this population group and children under the age of 15. In addition, the proportion of the population aged over 80 may reach unprecedented value: according to forecasts, by 2050 it may approach 10%, and in countries such as Germany, Italy, Japan and South Korea, it may even overcome the 15%[7] barrier. Thus, by the end of the century, the median age may grow from current 27 years to 41 years[8].

Another predicted trend is the accelerated urbanization. For example, if in 1950 the share of urban residents was 30% of the total population, then a century later a complete transformation of the ratio of urban and rural residents is expected: 32% will be the share of rural population. At the same time, in a number of countries, the share of urban population already exceeds 85% (for example, Singapore (100%), Argentina (91.9%), the Netherlands (91.5%), Brazil (86.6%), Australia (86.0%), etc.)[9].

Urbanization processes challenge existing urban management systems, the lack of improvements in which (including through the formation of "smart" cities, where various communication and transport networks will be linked into a single system that supports sustainable and efficient use of resources and their management) can contribute to increasing inequality in society, extensive slum formation and the growth of social conflicts[10].

Demographic processes in Russia generally correspond to the trends of developed countries: population decrease, declining birth rate, population aging, and reduction in migration flows. According to the UN, by 2030, the country's population is 95% likely to be in the range from 141.0 to 146.0 million people, and by 2100 – from 103.0 million to 160.0 million people[11]. Therefore, even under the most favorable scenario, it is unnecessary to expect a significant increase in the country's population. At the same time, in the next decade, the share of people over age 60 in the total population over age 15 is projected to increase by 2 p.p., as a result of which 533.8 people over age 60 will account for every thousand people of working age[12]. Against the background of these trends, the growth rate of migration flows will decrease to 0.6% per year against the current 1.3%[13].

[6] The world's population will grow, age, live longer and migrate less. Available at: https://iq.hse.ru/news/177669242.html

[7] The World Population Prospects: 2015 Revision. Available at: https://www.un.org/en/development/desa/publications/world-population-prospects-2015-revision.html

[8] The world's population will grow, age, live longer and migrate less. Available at: https://iq.hse.ru/news/177669242.html

[9] Forecast of urban and rural population of the world, 2018. Available at: http://www.demoscope.ru/weekly/2018/0775/barometer775.pdf

[10] An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy. Available at: https://ufm.dk/en/publications/2016/files/an-oecd-horizon-scan-of-megatrends-and-technology-trends-in-the-context-of-future-research-policy.pdf

[11] Population Division. World Population Prospects 2019. Available at: https://population.un.org/wpp/Graphs/Probabilistic/POP/TOT/643

[12] The elderly population of Russia: problems and prospects. Available at: https://ac.gov.ru/files/publication/a/8485.pdf

[13] Russia's population until the end of the century according to the UN forecast revision of 2019. Available at: http://www.demoscope.ru/weekly/2019/0829/barom03.php

It is worth noting that there are alternative estimates according to which the peak of the world population will be reached by 2064, after which the world population will decrease to 6.29–8.79 billion people, and the fertility rate will drop to 1.52–1.66. Against this background, as in the UN forecasts, serious shifts in the age structure and reduction in the working-age population are expected, especially in countries where a more than twofold decrease in the number of inhabitants is predicted (for example, Japan, Spain, Thailand, Ukraine, etc.). However, a number of states (USA, Canada, Australia, etc.) will be able to maintain the size of labor force due to migration flows [20]. Such significant discrepancies, according to the authors' opinion, are due to the difference in the approaches used in forecasting: the UN estimates are based on a deterministic model of fertility, mortality and migration, while alternative calculations consider progress in women's education and increased access to contraceptives as determining factors [20]. Despite the beneficial effect of reduction in the total world population on environmental and climate change, the expected demographic shifts are fraught with serious negative economic and financial consequences associated with a decrease in innovation activity, reduction in consumer goods markets, and a drop in GDP growth [20].

The published estimates caused quite active discussions in one of the leading medical journals *The Lancet*. Their essence can be reduced to the fact that it is necessary to expand the list of influencing factors [21; 22] and conduct a thorough critical analysis of the results obtained, as they can fundamentally change the strategies of further social development [23; 24].

Nevertheless, it is already obvious today that emerging trends are changing the economic structure and creating new requirements for the labor market including the need to increase the retirement age and development of the so-called *silver economy* which implies both the use of human capabilities during aging, and the expansion of traditional infrastructure for this generation (healthcare, social security) and those segments of it that were previously in little demand (leisure, tourism, educational) [25].

The silver economy generates changes not only in the labor market, but also in the structure of production of goods and services, stimulating the emergence of new market niches and sectors (for example, gerontomarketing) [26]. According to the European Commission estimates, in the coming decades it should become one of the drivers of developing the national economy and economic growth [25]. Already today, it makes a significant contribution to the economy of the developed countries. For example, in France 53% of economic demand is provided by elderly people, in the USA more than half of household spending is accounted for by people aged over 50, in Germany the consumer purchasing power of those aged over 64 is estimated at 316 trillion euros [25; 26]. According to the EU estimates, by 2060 the share of consumption provided by the silver economy will amount to 25% of GDP [25].

In Russia, the silver economy is still poorly developed, which is largely due to the low security of citizens of retirement age. However, the prospect of increasing life expectancy, which is one of the national development goals of Russia, exacerbates the need for its development and addressing the problem of ensuring healthy and active aging.

Depletion of natural resources and climate change

World population growth, combined with strengthening anthropogenic impact and increased economic well-being, contribute to the depletion of natural resources, ecosystem degradation and climate deterioration.

One of the most serious consequences of destructive human activity is an increase in global temperature, which is expected to grow by 1.5 degrees by 2030 relative to the middle of the last

century[14]. The greenhouse effect not only disrupts the planet's climate, which manifests itself in frequent weather anomalies, but also destroys existing ecosystems, contributes to the extinction of entire animal populations and the disappearance of a large number of plants. The seriousness of the situation lies in the fact that even with the complete cessation of all emissions into the atmosphere, the negative consequences of the accumulated effect to date will be felt for the next 40 years. Obviously, such a scenario is absolutely unworkable; at the same time, the absence of any constructive solutions may contribute to the fact that climate change will become uncontrollable and may lead to humanity death.

The most realistic scenario is the transition to renewable low-carbon energy sources. For instance, by 2040, the global demand for primary energy is projected to grow by 37% compared to 2012. The largest growth is expected in the chemical industry due to an increase in demand for plastics and other chemicals, as well as in the commercial transport and household sectors, where a widespread transition to cleaner fuels is expected. However, in order to significantly reduce global greenhouse gas emissions (by 40–70%) the share of low-carbon energy supply should increase by more than 80% which remains an unsolvable task. The use of renewable energy sources has the opposite effect. For example, a 55% increase in industrial demand for water expected by 2050 could lead to more than 40% of the world's population experiencing serious water shortages, especially in Africa and Asia[15].

At the same time, we should consider that developing countries will make the greatest contribution to environmental pollution in the coming decades due to the expected development of their economies. For example, the rapid development of China's economy in the previous 30 years has led to an increase in environmental pollution by 15 times [27]. Modern technologies could help to avoid such a scenario. However, another problem arises here: developing countries often do not have such technologies, and there may not be funds to purchase them. This creates a dilemma: on the one hand, the advanced technologies that developed countries have contribute to their leadership, on the other, the threat of an environmental catastrophe actually forces developed countries to either sell these technologies to laggards to the detriment of their economic superiority, or hinder the economic development of the latter, for example, by imposing various sanctions and restrictions.

The ongoing climate warming against the background of the world's population growth and increased competition for natural resources poses a threat to global food security associated with food underconsumption, a decrease in the quality of nutrition and a change in its structure[16]. Environmental pollution has a negative impact on living standards and population health, and depletion of hydrocarbon reserves contributes to a decrease in economic growth in resource-oriented economies.

For Russia, the most significant threats in this direction are the accumulation of environmental damage and its negative impact on people's lives and health, resource dependence, increasing frequency of environmental disasters (hurricanes, floods, forest fires, etc.), depletion of productive lands and threat to food security associated with the sanctions imposed on the country.

The development of the *circular economy,* based on resources renewal and the processing of

[14] Global Trends to 2030. Challenges and choices for Europe. Available at: https://espas.secure.europarl.europa.eu/orbis/sites/default/files/generated/document/en/ESPAS_Report2019_V14.pdf

[15] An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy. Available at: https://ufm.dk/en/publications/2016/files/an-oecd-horizon-scan-of-megatrends-and-technology-trends-in-the-context-of-future-research-policy.pdf

[16] The state of food security and nutrition in the world. Available at: http://www.fao.org/3/ca5162ru/ca5162ru.pdf

secondary raw materials, can be considered a response to the megatrend under consideration [28; 29]. The transition to a resource-efficient society is the inevitable future of all countries of the world, without which the planet loses its chance to survive and which opens up huge prospects not only for the environment, but also for the economic sphere. According to the World Bank estimates, by 2050, in the absence of a global modernization of the waste disposal system, their number will increase by 70% [30]. According to the OECD, the transition to waste-free production can not only reduce the extraction of natural resources and waste generation by up to 80% compared to the production of new products, but also reduce greenhouse gas emissions by up to 90%[17]. The economic effect of the reuse of materials in the future can reach more than a trillion dollars a year[18].

At the same time, the analysis of the circular economy influence on the economic growth has showed unfavorable relationship with a decrease in the negative result in the long term, as well as a lower adaptability of developed cities to the closed-loop economy, due to the high level of resource development preventing a rapid transition to a qualitatively different development path [27].

Programs for developing the circular economy have already formed the basis of the state policy in such countries as Japan, South Korea, the USA, Denmark, Germany, France, China, etc. Russia has relatively recently started moving toward the circular economy. Significant steps in this direction were the "garbage" reform that unfolded in the country in 2017 and the Industrial Development Strategy for Processing, Recycling and Neutralization of Production and Consumption Waste approved by the Government of the Russian Federation in 2018 for the period through to 2030, when the principles of environmentally safe waste management and disposal with an emphasis on recycling and involvement in economic turnover were laid down. At the same time, there are two key barriers that hinder the development of the circular economy in Russia: the inhibition of the country's innovation development associated with high corruption level, raw material structure of the economy, sanctions policy against Russia, etc., as well as cultural and economic barriers, such as mentality, underestimation of the seriousness of environmental threats, lack of a long planning horizon, etc. [31].

Changing geo-economic and geopolitical landscapes

This trend is formed by two large-scale processes that have captured modern society: the transition to a multipolar world and globalization. The first is a consequence of the defeat of the USSR in the Cold War which, as time has shown, marked the beginning of the loss of the world hegemony of the United States [32]; the second is the result of rapid development of electronic means of communication and technologies that allow easily moving around the world.

The main global threat that accompanies these processes is the geopolitical inversion with its characteristic struggle of states for world leadership and the accompanying growth of geopolitical instability and armed conflicts, creation of trade barriers, especially in the technology sector, as well as increased foreign policy pressure and aggravation of global security problems [33].

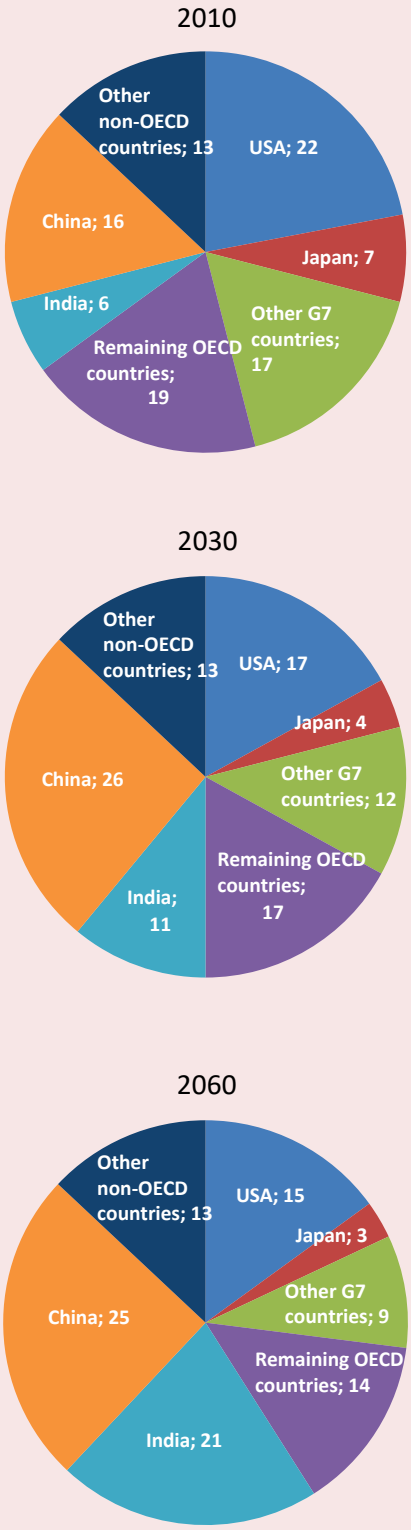
In the coming decades, the gravity center of the world economy is expected to shift towards Asia *(Fig. 1)*, as a result of which by 2050 only one European country – Germany[19] – may remain

[17] Business Models for the Circular Economy. Available at: https://www.oecd.org/environment/waste/policy-highlights-business-models-for-the-circular-economy.pdf

[18] An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy. Available at: https://ufm.dk/en/publications/2016/files/an-oecd-horizon-scan-of-megatrends-and-technology-trends-in-the-context-of-future-research-policy.pdf

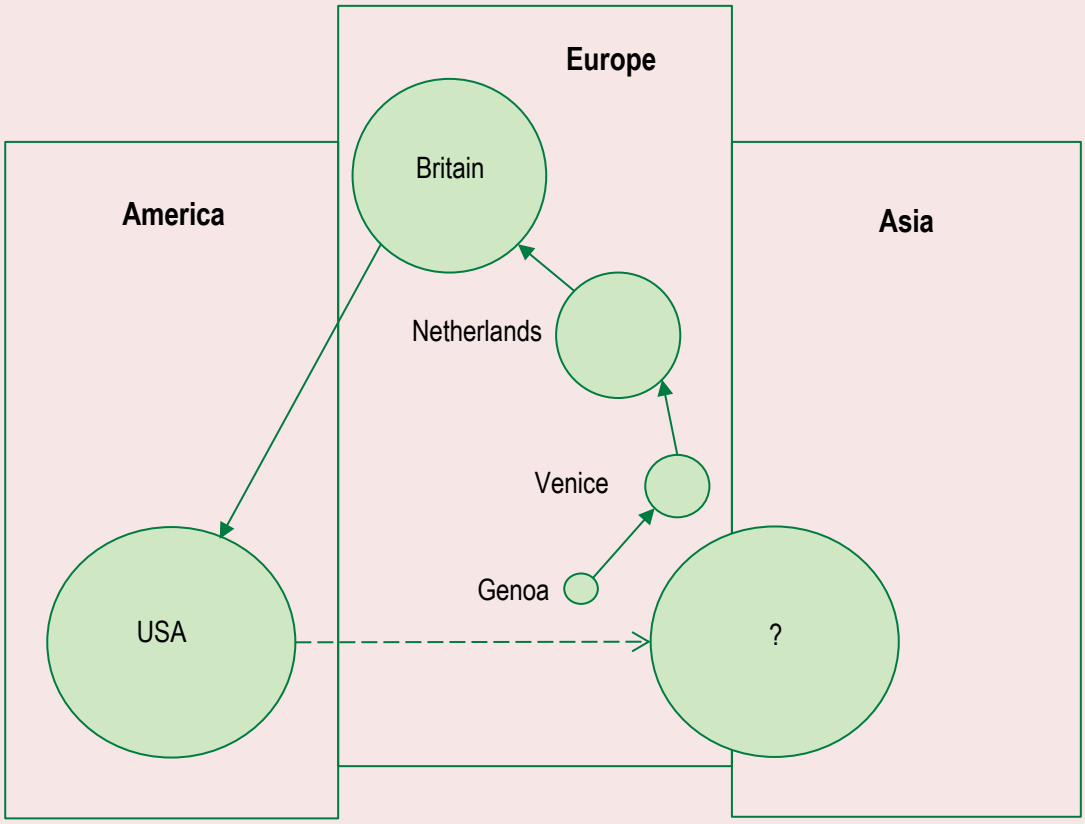
[19] Global Trends to 2030. Challenges and choices for Europe. Available at: https://espas.secure.europarl.europa.eu/orbis/sites/default/files/generated/document/en/ESPAS_Report2019_V14.pdf.

Figure 1. Share of countries in world GDP in 2010, 2030, 2060, %



Source: An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy, p. 24.

Figure 2. Stylized scheme of the history of the movement of world capital centers



Source: Balatsky E.V. Prerequisites for global geopolitical inversion. *Economic and Social Changes: Facts, Trends, Forecast,* 2014, no. 2 (32), pp. 36–52. DOI: 10.15838/esc/2014.2.32.4

among the eight largest economies in the world. At the same time, the question of which country will become the new world economic center remains open (*Fig. 2*).

Among the possible candidates for the world leader are India, Pakistan, Brazil, but the most frequent controversy is around China and Russia [34]. Studies show that a state with a resource reserve [35], as well as having territorial and demographic potential [33], can claim the hegemon role. Despite the formal compliance of both China and Russia with these characteristics, many researchers agree that these countries are not yet ready to take the leadership [33; 35; 36].

One of the key arguments in favor of the above is that China, by joining the "club" of the developed countries, accepts existing rules, and does not create new ones, i.e. does not form a new order. In addition, its path is unique and difficult to implement, which makes it unattractive for other countries wishing to repeat China's economic breakthrough [35; 36]. Russia is also not yet ready to become a world leader, as it is itself a semi-periphery country [37], which needs to create an effective model of resilient society and an attractive image of the future for the world [35].

However, many researchers think that it is not individual states that will claim the role of hegemons, but their unions (EU, EAEU, BRICS, etc.) [35; 36; 38]. In this context, new prospects are opening up for both Russia and China allowing them to claim the role of world leaders as part of

advanced alliances. At the same time, universities with their ability to respond to changes taking place in the world are considered the cornerstone of civil society in countries that will play a key role in the global world arena in the coming decades [39]. Already today, advanced university systems are forming programs that are ahead of time and integrate future technologies into the existing reality.

In particular, in 2008, the Singularity University, one of the most innovative educational institutions in the world, was established in one of the academic buildings of NASA in Silicon Valley. The University has united the advanced minds of mankind, who strive not only to explore advanced technologies of the future, but also to promote their use to address global issues. Training at the university is focused on senior management personnel and all creative strategists who want to transform their field of activity, takes place in the form of short-term immersive courses including the study of modern technologies, transformational practices and lectures by leading scientists of the world.

The Future of Humanity Institute functions as part of the University of Oxford of Faculty of Philosophy; the MIT Media Lab, which is the world's leading platform to study modern media technologies, is organized at the Massachusetts Institute of Technology; the Stanford University implement the Stanford BIO-X interdisciplinary program supporting advanced research in the field of bioengineering and biomedicine.

The uniqueness of these projects lies not only in the fact that they are embedded in educational processes and give students the opportunity to directly participate in the creation of future technologies, but also in the fact that they are focused on retraining the teaching staff, reformatting approaches to learning and, most importantly, creating a new way of thinking not only among students, but also among the teaching staff.

Geopolitical and geo-economic transformations, in addition to revising learning strategies, threaten to the economy's restructure. Today there is a lot of talk about the decline of the capitalist way of life and what can replace it. As one of the alternatives, the *peer-to-peer economy* is considered, the development of which is associated with the formation of a network information society and the creation of various economic coalitions [40]. This economy is based on the participants' equality and marks the transition from hierarchy to decentralization. Against the background of increasing openness and competitiveness of the economy, reorientation to the social significance of the final result and assistance in reducing inequality, monetary compensation of labor ceases to be an end in itself of peer-to-peer production, which, in fact, is equivalent to undermining the basic foundations of capitalism and the formation of fundamentally different development strategies.

Thus, transformation of the existing geopolitical and geo-economic situation in the world can serve as a factor hindering the economic development of society due to the obstacles posed to countries claiming primacy and threatening modern leaders, as well as an incentive to form fundamentally new coalitions and alliances that contribute to the reform of the global governance system and the restructuring of the global economic system.

Digitalization and development of new technologies

Rapidly developing technologies reveal to the world a wide range of opportunities, primarily related to the creation of new markets and increasing labor productivity. Despite the fact that so far their impact on productivity growth is not as strong as during earlier industrial revolutions [41; 42], a significant breakthrough in this direction is expected in the coming decades including through the development of digital technologies, such as artificial intelligence and machine learning tools [43].

Many organizations including those mentioned above, are constantly monitoring and researching

Table 1. Forty key technologies of the future according to the OECD

Digital technologies	Biotechnologies
Cloud computing Block chain Simulation modeling and games Artificial intelligence Photonics and light technologies Robotics Quantum computing Distributive computing Big analytics Internet of things	Bioinformatics Personalized medicine Health monitoring technologies Medicine and bioimaging Neurotechnologies Biochips and biosensors Stem cells Regenerative medicine and organ cultivation Biocatalysis Synthetic biology
Energy and environment	**New materials**
Smart grid Driverless cars Electric cars Drones Carbon capture and sequestration Wind turbine technologies Hydrogen energy Marine and tidal energy Photovoltaics Microgeneration Micro- and nanosatellite Biofuel Fuel element Advanced energy storage technologies Precision agriculture	Nanomaterials nanodevices Additive manufacturing Carbon nanotube and graphene Functional materials
Source: An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy, p. 8.	

promising technologies that can change the world. The most frequently identified, according to the OECD, are 40 technologies in four key areas: digital technologies, biotechnologies, energy and environment, new materials *(Tab. 1)*.

It is obvious that new technologies are new opportunities for society, new markets, new mechanisms for addressing demographic, environmental and social issues. As noted earlier, the development of each of these areas has a direct impact on the rest of megatrends. Moreover, this megatrend is the only one that contributes to the technological and economic progress of society. On the other hand, it significantly transforms labor market and creates high risks of technological unemployment. This is especially affected by the development of digital technologies. In particular, large-scale automation of the economy contributes to the formation of a fundamentally new paradigm of scientific, technical and economic development associated with the formation of *robotomics* – an economy, based on the widest introduction of robots to replace human labor[20].

According to various estimates, even if the current pace of technological development continues in the coming decades, 47% of jobs in the United States can be replaced by machines [44]. If the economy fails to respond properly to these changes and create new jobs, then one of the world's most significant achievements may turn into one of the largest social cataclysms associated with the formation of a class of "unnecessary" people and catastrophic stratification of society.

Tracking structural shifts in the labor market and forecasting future changes in the composition of professions are one of the key tasks for organizations dealing with employment and labor

[20] Balatsky E.V. The end of the illusion of economic growth. Available at: https://www.if24.ru/konets-illyuzii-ekonomicheskogo-rosta/

relations. In particular, projects under the general title "The Future of Work" are carried out by such major organizations as McKinsey & Company, the OECD, the International Labor Organization, and the European Commission; with the support of the Agency for Strategic Initiatives and the Skolkovo Innovation Center, the Atlas of New Professions is published. A similar initiative is being implemented by the HSE (the Atlas of Professions of the Future has been published, dedicated to identifying promising areas of employment).

Summarizing the conclusions, obtained in the studies of these organizations, we can note the projected increase in demand for leisure and the concomitant creation of new branches of the leisure and entertainment industry; the growing need for specialists capable of inventing and creating new technologies, goods and services, business models; the shift of workers of different qualifications to the construction and infrastructure sector. In addition, the demand for education and healthcare workers is expected to increase[21]. All this correlates with a study by the consulting company Boston Consulting Group (BCG), which estimates that by 2025, automation is projected for 81% of almost a fifth of all jobs in the world, as a result of which up to 50% of existing professions may disappear[22].

For Russia, this problem is not so acute yet, because, according to BCG estimates, robotization in it remains exotic and there is no reason to expect a sharp surge in widespread automation. Despite this, by 2025, about 10 million people may lose their jobs in areas where replacement of human labor is possible, against the background of the formation of an almost six million deficit in specialists in new areas[23].

Modern research as a solution to this problem suggests shifting the emphasis to the field of creative professions[24] and the knowledge economy [45]; expand self-employment opportunities in sectors with little prospects for robotization [46]; explore the possibility of moving to a broader division of labor and shortening the working week[25]; ensure the growth of online platforms connecting freelancers and companies in different parts of the world[26]. Moreover, a serious transformation of the higher education system under the emerging economic model is needed, aimed at strengthening the regional component of education and its orientation to the needs of the real economy.

Comprehensive well-being of humanity: wealth, health and knowledge

This megatrend is quite closely intertwined with the previous ones, as there is no doubt that the nation's wealth, health and education are directly influenced by the economic development of society, demographic factors, and ecology.

According to PricewaterhouseCoopers (PwC) estimates, global GDP will maintain a growth rate of 3% per year in the coming decades, which will lead to its more than twofold increase by 2050 relative to the beginning of the century[27]. This will contribute to the growth of per capita income and wealth accumulation, and in most developing countries, the growth of per capita income will be accompanied by an increase in population, while

[21] Jobs Lost, Jobs Gained: Workforce Transitions in a Time of Automation. Available at: https://www.mckinsey.com/~/media/mckinsey/industries/public%20and%20social%20sector/our%20insights/what%20the%20future%20of%20work%20will%20mean%20for%20jobs%20skills%20and%20wages/mgi-jobs-lost-jobs-gained-report-december-6-2017.pdf

[22] Russia 2025: from personnel to talents. Available at: https://image-src.bcg.com/Images/Russia-2025-report-RUS_tcm9-188275.pdf

[23] *Ibidem*.

[24] Which professions will disappear by 2030? Available at: https://futurehub.winningthehearts.com/kakie-professii-ischeznut-k-2030

[25] Skidelsky R. Rise of the robots: What will the future of work look like? *The Guardian*, 19 February 2013. Available at: https://www.theguardian.com/business/2013/feb/19/rise-of-robots-future-of-work

[26] Sundararajan A. The 'gig economy' is coming. What will it mean for work? *The Guardian*, 26 July 2015. Available at: https://www.theguardian.com/commentisfree/2015/jul/26/will-we-get-by-gig-economy.

[27] The World in 2050. Available at: https://www.pwc.com/gx/en/research-insights/economy/the-world-in-2050.html

in developed economies, the increase in per capita GDP will be caused not only by economic factors, but also by population decline.

Despite this trend, the stratification of society in the world will continue and may even increase within individual countries [47; 48]. According to the charity Oxfam, in 2020, the fortune of 2,153 billionaires on the planet accounted for 60% of the funds available to the rest of the world's population[28], and the coronavirus pandemic, provoked the strongest labor market crisis in the last 90 years, will contribute to an increase in inequality on a scale that has not been observed for a century[29]. The widening gap is largely due to the significant growth of "extremely poor" people, whose daily expenses do not exceed 1.9 US dollars. According to the World Bank estimates, in the coming years, their number as a result of the COVID-19 pandemic will increase by 150 million people and will amount to about 9.4% of the world's population[30].

Against the background of digitalization and the threat of technological unemployment, inequality can contribute to an even greater stratification of society, as it undermines the educational possibility for those who are below the poverty line, thereby depriving them of any chance to compete in the labor market. At the same time, it is digitalization that will create additional opportunities for access to education. The COVID-19 pandemic that has engulfed the world has accelerated the development of distance learning, which is actively developing today along with traditional forms and makes education more accessible and less costly. In addition, an increase in the number of people with the Internet access will also expand access to knowledge and provide new opportunities in the labor market.

It is worth noting that the issue of social inequality and its impact on economic growth is quite controversial. On the one hand, no one doubts the negative social aspects of inequality associated with injustice in income distribution, the enrichment of the minority at the expense of the majority, and the growth of social tension. However, when studying the inequality impact on economic growth, we have obtained the results indicating that society needs a normal inequality level for the effective functioning of the economy[31], as it is inequality that creates incentives for personal initiative and promotes innovation and investment, and consequently economic progress. The main task that the state faces with regard to inequality is to find a certain balance between economic efficiency and social justice [50].

Population growth, urbanization, migration, international tourism, climate change, population aging, increasing inequality – all these processes pose a serious challenge to the health sector, as they contribute to changing the landscape of diseases including in countries with developed economies. Despite all the achievements in medicine, the UN forecasts are disappointing: in the coming decades, the emergence of new infectious diseases is predicted against the background of the development of antibiotic resistance; the increasing risks of local epidemics and global pandemics; an increase in mortality from non-communicable diseases, such as cardiovascular diseases, cancer, diabetes; an increase in cases of neurological disorders including Alzheimer disease and depressive states.

[28] Oxfam: Billionaires are richer than 60 percent of the world's population. Available at: https://www.dw.com/ru/oxfam-миллардеры-богаче-60-процентов-населения-мира/a-52078410

[29] The Inequality Virus. Available at: https://oxfamilibrary.openrepository.com/bitstream/handle/10546/621149/bp-the-inequality-virus-summ-250121-en.pdf

[30] The World Bank has predicted the first jump in the number of "extremely poor" in 20 years due to COVID-19. Available at: https://www.forbes.ru/newsroom/finansy-i-investicii/410753-vsemirnyy-bank-sprognoziroval-pervyy-za-20-let-skachok-chisla

[31] Normal means such inequality, in which there is no absolute poverty, and the existing poverty level does not create obstacles to implementing vital social and economic functions [49].

Thus, the coming decades pose a global challenge to the complex well-being of mankind, on which the development of human capital will largely depend which determines not only the economic potential of society, but also its equally significant spiritual component. In order for the world not to be on the verge of a social catastrophe, it is necessary to build the *spiritual and moral economy* based on the principles of justice and focused on investments in universal public services (health, education, social security, etc.), guaranteed income and employment and redistribution of wealth. And this is, apparently, a transition to a fundamentally different type of economic relations and a new stage of social evolution[32].

Economic socialization: on the way to a new society

The analysis made it possible to assess the impact of megatrends on the economic structure and formulate a number of conclusions.

First, we have determined that each of the considered megatrends has a significant impact on the economy and labor market contributing to the emergence of new directions in the structure of the post-industrial economy *(Tab. 2)*. The emerging directions are aimed not only at mitigating the possible negative consequences of global trends, but also at adapting labor market to the conditions of the post-industrial society.

Second, a distinctive feature of the emerging economic structure is its social orientation. The action of global megatrends creates problems, the solution to which often contradicts the laws of economic growth. Except digitalization, which has the potential for technological transformation of the world and promotes economic growth, the established megatrends mark the beginning of the economy's socialization and transition to a society in which sanity *will have to* prevail over greed.

The situation is complicated by another threat, which may soon develop into a global trend. We are talking about the possible end to economic growth. Recall that the growth regime in which the world has been for the last 250–300 years, according to D. North, is "an exception, and stagnation and decline are the rule" [51]. Such famous scientists as R. Lucas [52] and T. Piketty [53] hold to the same view expressing frank doubts about maintaining the growth trend in the long term. A landmark in this direction is the work of R. Heinberg, who summarized the works of economists, politicians, scientists dealing with the problems of functioning and development of the world [54]. In this study, the author argues that society is on the threshold of a new economic reality associated with the achievement of the physical limit of economic growth, on the way of which there are three obstacles: resources, ecology and finance [54, p. 17].

Third, based on the results, it is possible to imagine what the appearance of the future post-industrial society will be. The new opportunities

Table 2. The impact of megatrends on the economic structure

Megatrend	Type of economy	Effect
Demographic transformations	Silver	Social
Ecology	Circular	Social
Digitalization	Robotomics	Economic
Geopolitical inversion	Peer-to-peer	Socio-ecoomic
Wealth, health, knowledge	Spiritual and moral	Social
Source: own compilation.		

[32] An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy. Available at: https://ufm.dk/en/publications/2016/files/an-oecd-horizon-scan-of-megatrends-and-technology-trends-in-the-context-of-future-research-policy.pdf

that technological progress opens up to the world allow society to move to a fundamentally new stage of evolution, connected, according to the theory of vital resources, with the development of such a vital resource as time [55]. The increase in life expectancy against the background of the release of time due to automation and robotization of production processes suggests that a new round of development will become the era of the socio-technological structure of the "economy of time", focused on the spiritual and moral development of an individual and the disclosure of their creative potential. Against this background, the post-industrial economy is primarily a struggle for a person's free time and their leisure, which makes it the *leisure economy* [56]. The above trends in the development of society confirm these provisions. With regard to Russia, the transition to a post-industrial society is complicated by what is happening in the absence of developed industrial sector requiring the government of the country to take preventive actions to reduce possible mass unemployment [57].

In order not to stay a part of new society, it is necessary to start preparing for the transition process today. To do this, in the development strategy of any state including Russia, it is necessary to provide for several principles related to the adaptation, first of all, of the labor market to future changes. These include the following provisions:

1. Technological industries are the basis of the economic development of society, requiring the improvement of the knowledge economy and training of highly qualified specialists including in the field of IT technologies and security. It is through the development of this economic sector that countries get the opportunity to remain technological leaders and actively participate in the formation of a global development strategy.

2. Sectors of education, healthcare, leisure, entertainment, and the social sector are the drivers of the emerging new economy from the employment position. It is these areas that will ensure not only mass employment, but also the full-fledged development of the leisure economy (including the silver economy), focused on mastering such a resource as time, and on its efficient use.

3. Higher education system is the cornerstone of the emerging society. It is here that the transformations associated with the revision of the structure of training, its quality and effectiveness should begin. The task of the higher education system today is to adapt to the constructed model of the economy and begin forming a new cohort of specialists with a shift in emphasis toward creative professions and the service sector.

Of course, these provisions are rather a kind of guideline and set the vector for further research and development, and help to understand the economic areas on which it is necessary to focus attention in order to survive the transition period with minimal social costs and in the future to extract the maximum possible benefit from the impending transformations.

Conclusion

The global trends of human development, considered in the article, have shown that the world is changing dramatically and the 21st century is inextricably linked with addressing the issues of environmental, political and economic injustice, ignoring which can lead to catastrophic consequences. A new paradigm is already taking shape today, acquiring real features in the form of the directions of the economy formulated in the work. The analysis made it possible to determine the appearance of a new society focused on the development and use of the spiritual and moral potential of mankind. We have revealed that the cornerstone of the emerging economy is its socialization and orientation to the development of such a vital resource as time. From this point of view, the new economy should become *leisure economy* – the next step after the knowledge economy, the development of which will give society

the opportunity to maximize the achievements of technological progress for the benefit of human capital development.

The main task facing countries in connection with the ongoing transformations is to prepare in advance for the upcoming changes. They already need to be taken into account when preparing strategic documents in all sectors and at all levels of government, especially in the field of education and science, which requires a serious revision of established traditions and reorientation to the needs of the economy. This will make it possible in the future to extract the maximum social and economic effect from the upcoming transformations with minimal costs associated with the transition process.

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