THE ROLE OF SCIENCE AND CULTURE IN EAEU REINDUSTRIALIZATION

It was the technology begotten by science that brought about such a significant change in the development of mankind over the last couple of centuries. *Human life owes its change to the scientific and technological progress more than to politics, ideologies and various "isms"*. This statement is becoming even more relevant as we witness the world entering the era of a new industrial revolution. Its first phase appears to manifest itself in the explosive growth of digital IT penetration and communications, causing step changes in speed and nature of scientific, technological, cultural, economic, sociopolitical and other relationships. By improving human communications and facilitating information exchange, digitalization raises the question of knowledge and meaningfulness of transmitted information, which are developing in direct connection with scientific research and cultural and humanitarian foundations as the essential components of this process.

The question of the place of Eurasia in the global technological chain is of primary importance and can only be resolved through organization and development of proper research capacity, which, in addition, can potentially become the region's contribution to the future of mankind. The research capacity should primarily comprise such disciplines as geology, physics, chemistry, mathematics, and others. Speaking of the nucleus of the new economic growth center in Eurasia, one should realize that all strong global economies are fueled by development of natural sciences and, consequently, technologies, which constitute the lion's share of GDP (including post-industrial service market) and directly spring from the scientific discoveries.

Fundamental sciences, especially physics and chemistry, are the knowledge pool for applied scientific solutions and technologies driving the development of innovative economy. Ignorance of this fundamental premise in managing the industrial politics, aggravated by insufficient financing of culture, humanities, education and health services, which are the core of the innovative social policy ecosystem, threaten contemporary societies with decline and degradation. And vice versa, investments in this area leverage overall development of the system and economics, increasing international heft and influence of individual countries and regions. Social development drives the development of the social ecosystem, in which science and culture grow side by side, being the products of the humanity's higher intellectual function.

The following phases of the new industrial revolution will be predetermined by the pending discoveries and developments in such fields of knowledge as materials science, energy conservation and transportation (e.g. superconductivity), cryogenics, quantum matter, astrophysics, optical physics, high-energy physics, optical and micro-electronics (in particular, non-siliceous electronics), condensed matter theory, biology, chemistry, biotechnologies, medicine, Earth sciences and many others. The breakthrough in science and technology is already prepared and imminent; it will instill a new nature of political, economic, financial, international and other relations and determine the novel human environment, life style and way of development in the 21st century.

The overwhelming majority of these new discoveries are still to be made; however, they will constitute the foundation of events, relations and the very image of our future history, just like steam engine predetermined the history and geopolitics in

the 19th century, and discovery of electron, industrialization of internal combustion engine and electricity were their key driver in the 20th century. As of today, the consequences of this process are unimaginable. Nevertheless, there is no doubt that it will be driven by institutional development of human intelligence. Thus, the human factor, development of education and human capital, creation of development-friendly cultural and social ecosystem are becoming the key to successful development in the changing environment.

On the other hand, availability of or access to material and natural resources, which are the foundation for transformations and research, are a prerequisite of no small importance for this revolution. For EAEU, with its biggest territory in the world, the development of Earth sciences is probably the most important knowledge priority, which should be closely followed by multi- and inter-disciplinary research. Central Eurasia is a unique region of the Earth, as its reserves contain all elements from the Periodic Table; further research of their properties is important, beyond EAEU countries, for global technological development, and especially in the conditions of yet another industrial revolution that we are witnessing. One of its most noticeable features is the importance of new properties of new materials. These properties can be discovered from studying the properties of old materials, through experimenting with or research of the well-known basic materials available or produced in EAEU territory. Furthermore, many elements, in particular rare-earth metals, are an extremely important part of the present and future global technological chains. According to Dr. Siddharth Saxena, Professor in quantum physics at the Cavendish Laboratory, University of Cambridge, nearly every conductive device in every room of the world contains an

element from mineral resources of Russia or Kazakhstan. Mineral wealth, extended mining and metallurgical network, and human capital, including presence of diverse and ancient cultures, make Central Eurasia one of the most important regions in the development of the global civilization.

Research activities and discoveries are a primary and foundational factor in the new industrial economic reality and in the knowledge economy which should be a priority of any developed country. Technology transfer is a way out for many emerging countries. However, it requires a sufficient level of development of their own research capacity: for successful technology transfer, its recipient should be as technologically prepared as the source of import. This is impossible without development of endogenous fundamental science as a source of expertise, new knowledge and trained competent professionals. Besides, in case of technology transfer the probable pitfall is that the country can become dependent and dominated, which may be a strategic threat to its sovereignty. However, the geographic position, climate, historical and social conditions in the Central Eurasia make most technological transfers inefficient or noncompetitive globally, while endogenous scientific research could become the basis for development of unique technologies and innovations. Any domestic high-tech production has a considerable margin and minor transportation cost, in comparison with the end price. Development of research in natural sciences can boost the economy - its fundamental nucleus of the new advanced industrial and agricultural industries - and enrich, deepen and expand national moral, social, cultural and political paradigm in post-soviet societies. At the same time, the institute of academic thought and research is

the integral processor of the entire system, delivering valuable and actually competent personnel to manage the governmental and private economy and the society.

To an unknowing user, the innovation process is a gate for life-changing technology; in fact, technological achievement is the root of innovation. Technology itself is a result of efforts in applied science, namely engineering. It its turn, the latter is essentially the result of development of fundamental science, which is impossible without a certain level of culture and is driven by curiosity and purely spiritual craving for knowledge. Apart from their direct practical application, these two phenomena, science and culture, have presently crystallized into the most important source of global influence and "soft power". This logic is in favor of the necessity to focus efforts of post-soviet academic circles, society and state on enabling the research capability in the above-mentioned fields of knowledge, as historically it is the only available journey to successful national development. As a result, this process can lead to emergence of a high-tech and unique economy based on the "discovery industry", and provide sustainable development and international influence for the region in the period of inevitable tempestuous and unpredictable global changes.

According to the contemporary concept of the triple helix model of innovation[1], the society owes its progressive development to rotational interaction of three (conditionally round) centers with overlapping borders inside the helix: state, academia (institutionalized science and culture) and industry, creating the innovative core of development. It makes the centers rotate, propelling the progressive development of the

[1] Ranga, Maria, and Etzkowitz, Henry, 2013, *Triple Helix Systems: An Analytical Framework for Innovation Policy and Practice in the Knowledge Society*, Stanford University, retrieved from the Web, https://triplehelix.stanford.edu/images/Triple_Helix_Systems.pdf.

whole model, providing backup solutions and duplicating the other centers' functions. However, this is the ideal model. Autonomous functioning of these development centers in many developed countries, including the United States, brings about the task of their convergence through respective industrial policies. These centers were being formed over many centuries and represent a complex evolutionary social model of the "discovery industry". It's very difficult for the emerging countries to simply copy this effective model because of their underdeveloped centers and lack of time. In EAEU the state can assume the role of a development locomotive for the other two centers (industry and research) in order to put the whole system in motion, even if it implies potential and mostly inevitable risks of deteriorating interaction between the other elements due to the dominant role of the state.

For instance, EAEU countries can apply their national efforts to research in the field of generation, transfer, storage and use of energy through superconductivity. Another breakthrough field can emerge from development of new structures capable of revolutionizing the output of solar cells, batteries, fuel cells, light construction materials, refrigerating equipment, water treatment etc., to avoid failure in today's industrial race for small transistors. Such "magic" technologies are not pursued globally because of the lack of the necessary chemical elements which are abundant in our reserves. Meanwhile, the global industry continues to excessively invest in classical technologies. This situation opens limitless global opportunities to EAEU.

The task of launching scientific research simultaneously with a step change in historical development implies engagement of leading global natural scientists and engineers, in combination with development of domestic culture in all its diversity, as

well as development of social and economic sciences to reinforce the domestic philosophical basis, academic culture and knowledge. However, in order to achieve true success, EAEU countries will need a reform and evolution of approaches to management of such a sensitive sector and to search for valuable professionals who will manage the interaction between science and industry. Development and implementation of a successful Eurasian and, consequently, global industrial policy is an innovative task in itself, as it is evident from the learnings of the latest industrial history. But, strictly speaking, it is the existence of institutionally established science and culture that directly certifies the extent of the society's development, level of civilization, and its readiness for a developmental breakthrough.

Development of science and research is a necessary condition for global development. Extent of allocations in fundamental science and R&D is a reliable indicator of a country's extent of development. According to the current average data for OECD countries, R&D expenses in a developed country can vary around 2.4 percent of GDP per year (about one third of this amount is direct financing of fundamental science by the state). 1.1 percent of GDP in Russia, 0.67 percent in Belarus and 0.17 percent in Kazakhstan are clearly not enough for the three EAEU founding countries. Compare this to now virtually unrealistic 5 percent of GNP reached by the USSR in 1980. Investments in development of science and culture are the best option for any nation. Joining the Central Eurasian research capacity to the global research, simultaneously with development of the endogenous scientific research paradigm based on the USSR scientific potential, can become a considerable contribution to the global development and strengthen the position of the new Union on the international scene.

For EAEU, the development of research is a strategic priority which can be fairly easily accomplished. First of all, we should revive and establish the proper research and experimental infrastructure, and engage the right personnel. Annual allocations amounting up to two percent of GDP would be a strategic investment in the future of a country and could enable the Eurasian Economic Union to take a new place in the future global organization. At the same time, it should be kept in mind that no efforts or allocations will bring a significant result without enforcement of social policy and development of culture, education and healthcare as the critical aspects shaping a social environment.