Technosphere Safety: from Concept to Scientific Direction

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Abstract. The paper discusses the theoretical principles of the scientific field "Technospheric Security". The conducted research gives grounds to believe that this scientific field came as an attempt to integrate various aspects of life safety issues rather than a fundamentally new concept of safety. The paper reveals the key points of the current state of the theoretical foundations of the scientific field "Technospheric Security", among which is the gap between theoretical and practical/applied components of the area as well as the blurriness of the conceptual framework, the eclecticity of methodology and inconsistency of strategies for studying safety issues. The authors have come to the conclusion that it is necessary to work out an integrative concept of the technosphere which ought to become the basis for the development of the theoretical and methodological foundations of the new scientific field "Technospheric Security". The authors substantiate the definition of the technosphere that can be proposed to start the integration of the theoretical and methodological foundations of Technospheric Security and the development of the integrational concept of the technosphere.

1. Introduction

Researchers in Russia intended to propose a new integrated theory of safety and the methodology for its study to enter a new century. However, there was no concept that could integrate new methods and means of protection from threats and hazards with the advanced theoretical aspects and technological systems for providing safety. The knowledge of Technospheric Security turned into a full-fledged scientific field over the past decade in the search of new theoretical and methodological parameters.

2. The relevance and scientific importance of the study

Intensive technological development with the integration of technical and social structures at all levels of social life, from day-to-day problems to systems of international relations, sets new technogenic guidelines for the development of safety issues. In the modern technogenic world with the urgency of developing methods and means of protecting the technological infrastructure, the importance of technospheric security cannot be overestimated.

In the Russian historiography, the attempts to develop the theoretical and methodological foundations of Technospheric Security have been made several times in the recent decades. However, the integrated concept has not evolved yet. It should be noted that there are no definitions for the term "Technospheric Security" in any dictionaries, encyclopedia, or reference books[1], and its key components, i.e. "technosphere" and "security" remain multiple-meaning terms. This results, first of all, from the specifics of the renewal of the conceptual basis of both technical knowledge and the safety issues in post-Soviet Russia closely related to it considering that the scientific field under

consideration was formed in Russian research community. After all, Technospheric Security came as a result of the transformation of knowledge within the framework of the integrated scientific field "Safety of human life" rather than a fundamentally new concept of safety. Therefore, the technosphere parameters of the study of safety retained a significant part of the contradictions of the previous analytical model.

The intention of Russian scientists to renovate the theoretical aspects of safety was formed in the late 1980s when the weakening Soviet system had to encounter the new threats, and later on, during its reorganization in new Russia [2]. In 1989 the organization of the Scientific and Methodological Council of the USSR State Education under the title "Safety of Human Life"[3] was established followed by a new course "Fundamentals of Life Safety"[4]. The new course was meant not only as another component of the systematic knowledge about social and defense measures to protect the population and economy of the country from the aftermaths of accidents, natural disasters, enemy weapons, etc. This new field of knowledge was aimed to be the systematic link providing a unified approach to the creation and maintenance of healthy and safe living conditions both in everyday life and work and in emergency situations [5].

At first, theoretical changes touched upon anthropological reorientation, since they reflected the new state priorities in safety measures. While the old systems were based on the equipment and technology, taking into account possible dangerous and harmful factors, the new approach "Safety of Human Life" placed the human into the central place as a "measure of all things" combining all the factors affecting him/her [6]. In fact, the anthropocentric principles were reduced to some kind of theoretical "superstructure" (largely of a declarative nature) and to the general system of the principles of the security system that remained unchanged. This situation led to the increase in the number of contradictions rather than to their reduction, which was noted by many researchers. General dissatisfaction about this situation was expressed by one of the leading experts in the field of scientific knowledge, Professor O.N. Rusak, who wrote in 1994 that the "Safety of Human Life" does not contain a general theory of safety, there are no clear concepts and the philosophical and ideological bases are contradictory [7].

In the 1990s there was the period of initiatives and proposals for the reorganization of the system of knowledge about safety, among which a new concept of Technospheric Security emerged. At that time the term "technosphere" became increasingly popular with the Russian researchers in various fields of scientific knowledge. The transition from rather abstract projects to the planned development of a new scientific field occurred in 2004-2005, and universities began to train specialists in this field (2005). In 2006 the first issue of the research and methodological journal "Safety in the technosphere" was published. In 2009 "Technospheric Security" as a separate area of scientific knowledge and the program of specialist training was formally approved. At the same time, the technosphere issues were addressed to at the managerial level, where certain programs are designated to ensure human safety in the technosphere and the prospects for their integration in the overall system of providing "Technospheric Security" are considered [8].

The successful, at first sight, introduction of a new scientific direction, in fact, conceals many old contradictions in this scientific field with the dominance of utilitarian and applied paradigms, the uncertainties of the conceptual framework and quite vague general theory of safety.

3. Formulation of the problem

The current situation highlights the need, first and foremost, to identify the reasons for the lack of the developed concept of technosphere security and the key points of the theoretical foundations of scientific research in this field. The conducted study is aimed to work out the proposals for their resolution and to give the rationale for the development of the theoretical and methodological concept of Technospheric Security.

4. Theoretical part

The former paradigms declared in the Soviet times demonstrated their inconsistency in the study of safety but still remain at the level of declarations. Undoubtedly, the process of forming a new security paradigm is a long-term process, due to the complex transformation of the ideas and practices that were established long ago. Meanwhile, the insufficiency of conceptual foundation of the transformation became rather a serious obstacle for its development. As a matter of fact, the discrepancies and disagreements occurred even in the reference categories. This situation contributed to the amorphousness of the general theory of safety, which finally turned into a set of multidirectional research strategies, with fundamental differences in the interpretation of the terms "danger", "safety", "life activity", "threats", often interpreted from the opposite theoretical and methodological angles.

The widespread use of the term technosphere in both scientific and educational literature has led to its use in the most unexpected discources. The fact that this term just in a few decades has turned into a multiple-meaning notion far from an analytical substantiation and common conceptual bases is recognized by most researchers[9] [10]. The meaning of this term is "adjusted to" by each scientific field, if not by each researcher, expanding the collection of "their own" authorial technospheres. Therefore, the term "technosphere" is differently understood in the philosophy of technology and in technospheric security. Moreover, the general points in the arguments of most specialists who operate with the term "technosphere" are quite obvious, but it is rather difficult and sometimes absolutely impossible to find common ground for the consolidation of terms. Therefore, the heterogeneity of the conceptual aspects of "Technospheric Security", both borrowed and reformulated to suit the relevant problems, is striking.

Technospheric Security was originally conceived as one of the cornerstones in implementing the shift towards a new understanding of the environment and a methodological basis for analyzing the dangers and threats associated with it. At the same time, safety experts rarely touch upon issues related to the theoretical foundations of the notion "Technospheric Security" trying to avoid the intricacies of philosophical concepts and futurological insights [11]. They tend to consider technosphere as some kind of environment, or, more accurately, technogenic part of the living environment of the modern man. The study of "technospheric safety" tends to refer to the notion of the technosphere as "the habitat that arose through the direct or indirect influence of people and technical means on the natural environment (biosphere) in order to best adjust the environment to human needs"[12]. This definition clearly demonstrates the general gaps in the theory of safety and the inconsistency of its formulations. This definition is characterized by extremely vague and ambiguous positions in the absence of attributive qualities of the determined notion, not to mention one-sided utilitarian postulates (which presume a kind of means satisfying human needs). However, the most important thing in theory, i.e. technosphere, is, in fact, blurred and it is not possible to distinguish it from a number of other concepts. In the scientific literature there are many terms that denote an artificial world, its subsystems and the parameters of their interaction. Starting from the definition in question, it is not entirely clear what differs the technosphere from the technogenic environment or any other terms meant to denote the "second nature" that is formed in the course of the development of a person's technical praxis. Further specification of the term "technosphere" is reduced to "industrial, urban, household environment", hence the representations of the technosphere are reduced to social infrastructure, or to its elements: populated areas, industrial zones and enterprises, communication networks, technical facilities, etc[13]. However, such concretization does not help to clarify the general problems, but only reduces it to the level of an arbitrary set of particular issues.

Terminological voluntarism and general gaps in the theory of Technospheric Security have intensified the tangible discontinuity of theory and practice in the chaotic stratification of utilitarianism and abstract theorizing. In the Soviet past, a vast array of theoretical and applied knowledge on specific and general theoretical issues has been accumulated. However, their comprehension was clamped in the grip of standardized practices and rigid, ideologically adjusted regulation of individual disciplines and fields of analysis. As a consequence, the existing system was of a purely applied nature and, moreover, was susceptible to new aspects of the theory and practice.

Undoubtedly, the attempts to renovate the general theory of technogenic security in the 1990s were aimed at resolving the problems of the Soviet past. But, quite often, they only intensified contradictions between theory and practice in the conceptual innovations. After all, the "" turned out to be, in fact, "open" to any innovations, but it is extremely difficult to integrate them into one direction. Developing as an independent field of knowledge the "Safety of Life" was originally conceived of as a complex science of a fundamentally applied nature. Hypothetically, it covered almost all areas of human knowledge and relied on the theoretical and methodological foundations of many sciences. Such divergence together with the absence of the conceptual basis for understanding safety turned out to be the augmentation of its structural elements, which turned the "Life Safety" into an amorphous conglomerate of methodological and conceptual strategies and practices still weakly connected with each other.

Actually, the conceptual foundations of Technospheric Security were based on the eclectic ground of renovated notions of safety and the general reconsideration of the phenomenon of technology at the end of the last century. However, the basic components of "Technospheric Security" including the issues of industrial and fire safety, civil defense and environmental protection, safety engineering, etc, were formed in the Soviet past. The amorphous theoretical superstructure in the field of life safety was built up in the form of various rather vague arguments about the technosphere. As a result, the technosphere considered by many specialists in the field of security as a planetary man-made shell was arbitrarily associated with specific problems of health protection or safety precautions in transport.

The uncertainty of the conceptual framework of technospheric security contributed to the increasing eclecticism and general blurring of the methodological research in this field. Besides, as the safety problems were getting more and more relevant they were approached by the specialists from different fields of science with their research priorities, methods and conceptual guidelines[14]. The theoretical, methodological and thematic "dispersion" of the problem field of safety in the conditions of the disintegration of the former unity of the intellectual space and the lack of reconciled prospects for the reorganization of the safety system only contributed to the growing inconsistency of their study and the eclecticism of the methodology.

Not once the attempts to combine disparate strategies and methods for studying the issues of Technospheric Security, to ensure the connection of its theoretical and practical/applied components were, as a rule, unsuccessful because the theoretical fundamentals and the very understanding of the technosphere were not thoroughly considered. However, the renovation of the conceptual basis should be started from its basic categories, without trying to find the approval of another definition of the term in sociotechnical realities or to impose a particular understanding of the technosphere to the technological world. On the contrary, keeping the semantic core of understanding the technosphere, it is necessary to adjust its definition in accordance with effective practices in the field of safety.

In any case, the technosphere appears, first of all, as a historically conditioned form of conceptualization of the technical reality that defines a functionally designed view of its representation. In spite of its contradictory nature, this concept implies, first of all, the nominal area where the definitions are agreed upon in the context of newly introduced terms. The contextuality of the concept of "technosphere" is obvious, as well as the specifics of its use in safety issues, where it appeals to the phenomenon observed and is subject to experimental knowledge.

If we try to briefly summarize the distinctive features of the "technosphere", singled out in various discourses, and pretending not to exhaust the entire semantic variety of the concept use, but to find the key approaches in its interpretation, we get the following. The technosphere is a term that considers technical reality as the integral technological system that determines the life of modern society, formed as a part of the environment as a result of the transformation of the biosphere with active direct or indirect human influence. The existing system is considered as a global technogenic environment, the globalization of which is adopted in one or several of the key aspects:

1) the whole planetary scale, a kind of terrestrial shell (in which unity and integrity cannot be reduced to technical and technological unification or some political, economic, managerial agreement between different technical and technological systems and regions, but it also assumes similarity and

conformity of the basic principles of their functioning and management , different levels of their interrelation and proximity of the foundations of technical rationality);

2) common principles and mechanisms of technical development (patterns of origin of technological transformations of the technogenic environment, allowing us to make conclusions about different levels of integrity of the technical and technological systems);

3) the system that has a comprehensive, all-pervasive character in relation to modern society, which isolates the man in technogenic parameters and closes the functions of life support for the society (the determining role of technical components in the functioning of the social infrastructure);

4) the key determinant of modern socio-cultural development (technical and technological orientation of the development of modern society).

In such understanding, the technosphere is not an invariant description, but an analysis of the world of technology, which sets its general format, emphasizing the interrelationship of its individual elements and integral state. It is also important that this interpretation of the technosphere without labor correlates with a fairly wide range of research directions in the study of technical reality.

5. Practical significance, proposals and results of implementation
The contradictory nature of theory and practice in technospheric security is hardly solvable by the declarative recognition of the technosphere in a number of signs of the sociotechnical reality and by "pulling together" theoretical constructions and practical measures at the expense of popular notions. The solution of disputable moments in the correlation of ideas about the technosphere and socio-technical realities is possible taking into account the principles of theoretical and methodological modeling with a variation of the permissible conditions for constructing generalizing models of technical reality. The indicated variative understanding of the technosphere is seen as perspective in the context of conceptual modeling of the problem field and therefore can serve as a necessary conceptual basis for the general technospheric problems and related safety issues.

The global parameters of the technogenic environment are recalled every time in the discussions on general theoretical issues, however, mainly at the level of the small talk. At the same time, the general theory of the "Technospheric Security" does not at all contradict the global parameters of the technogenic environment. Global technical and technological contradictions and technological hazards, socio-technical dominants in safety issues, in relation to technical reality as a comprehensive, all-pervasive system that determines the life of modern society, initially are among the key postulates of Technospheric Security. The theoretical and methodological foundation of research practices in the context of the general laws of the evolution of the technogenic environment lies in the field that is popular with the specialists in the field of general theory of systems and system analysis, system engineering and synergetics.

Even in the case of certain aspects of the production, urban, household environment, with all the conceivable set of its elements: populated areas, industrial zones and enterprises, communication networks, technical facilities, etc., the technospheric parameters retain their validity under the condition of analysis of local areas of man-made infrastructure in the light of the general laws of its existence and functioning. Studies with system settings that consider individual elements of technogenic structures as components of more general systems occupying a certain place in the hierarchy of other systems have become quite common. However, the technospheric horizons imply a new level in which the socio-technical hierarchy is the dominant systematic factor.

The technospheric bases for studying the current socio-technical realities are emerging under total systemic perception with the theoretical subordination of the whole set of individual objects in the production environment, or technical processes to the general structure of socio-technical reality, which, in its turn, fits into the socioprogenic order. Such schemes that divide the structure of the universe into a number of interacting systems (man, technosphere, biosphere, space) are widespread among the researchers in the field of technospheric security[15]. However, these schemes are based on the dubious principles of strict demarcation and opposition of technogenic systems to other systems and, moreover, they overlook the main thing, that is the content characteristics of the technosphere, so

that the questions of tackling epistemological reorientation (the principles of opposition, utilitarian settings) in interpreting the term remain open.

6. Conclusions

Technospheric Security came as a result of the transformation of the integrated scientific field "Safety of human life" rather than not a fundamentally new concept of safety. As a result, the technospheric parameters of the study of safety retain a significant number of the contradictions of the previous analytical model.

Among the main theoretical contradictions of this science field there is a complex of interrelated problems:

- blurriness and ambiguity of the conceptual framework;
- eclectic methodological base;
- the diversity of strategies for studying safety issues;
- the gap between theoretical and practical/applied components of the science field.

It should be noted that the identified problems are largely due to the lack of a unified theoretical and methodological platform in explaining what the technosphere is, the understanding of which is replaced in many ways by an arbitrary set of fragments, excerpts and borrowings from the most diverse fields of technical knowledge.

The authors have come to the conclusion that it is necessary to formulate and assume a common integrative concept of the technosphere, which should become the single basis for the development of the theoretical and methodological foundations of the new scientific field "Technospheric Security". The development of integrated theoretical bases of Technospheric Security with the principles of integrity and systematic approach should be based on the general reorientation from ontological to conceptually abstract understanding of the technosphere. The authors' definition of the technosphere based on the conceptual parameters of its understanding can be proposed as the starting point of the integration of the theoretical and methodological foundations of Technospheric Security and the development of a unified concept of the technosphere.

7. References

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