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ANALYSIS OF INTERNATIONAL EXPERIENCE OF CREATION AND PROTECTION OF CRITICAL INFRASTRUCTURE FOR IMPLEMENTATION IN UKRAINE

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ABSTRACT

The analysis of international experience of creation and protection of critical infrastructure is given. The definition of the term “critical infrastructure” is given too. The areas of critical infrastructure protection mechanisms in Ukraine are shown.

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INTRODUCTION

The development of the modern world depends on such critical sectors of society functioning as energy, transport, telecommunications, bank-

ing, defense networks, etc. Failure of any sector of society fraught with serious disasters. In most countries the term “critical infrastructure” has been introduced for systematization the objects that are essential for the functioning of society in the country. Typically, the critical infrastructure included transport and energy networks, oil and gas pipelines, ports, information systems and telecommunications system (water and heat) and facilities necessary for the functioning of the government (the government channels, high-speed communications’ communication), service emergency response and emergency care, enterprises army-industrial complex etc.

I. ANALYSIS OF ORIGIN OF THE “CRITICAL INFRASTRUCTURE” TERM

The “critical infrastructure” term appeared in the US to include in it systems, networks and individual objects, malfunctioning or damage of which can lead to huge or even irreversible negative consequences for the economy, welfare and health [1]. The list of such objects include system of the government, defense, health care, credit and financial, banking and research sectors, industry, energy, including nuclear, oil and gas, food, transportation, public utilities, including water supply, communication and civil protection [2]. This terminology contained in the EC Directive number 786 of 2006 [2], according to which “the European critical infrastructure facilities are those national critical infrastructure of the Member States, whose influence in the event of failure, the incident or malicious attacks will spread as a country where an object is located, and the at least one other EU member states. The critical infrastructure sectors includes: agriculture, food, water, healthy lifestyle, spare (rescue) service, base defense industry, telecommunications, energy, transport, banking and finance, chemicals and dangerous substances postal [2, 3]. The concept of critical infrastructure protection is implemented also in developed countries such as Canada, Australia, UK. The term “critical infrastructure” was introduced in the regulatory legislation of many countries, its terminology is different, but these differences are not significant.

The sources [2–8] contain the following definition of critical infrastructure:

1. US law – systems and facilities, physical or virtual, so vital to the state, incapacity or destruction of such systems or facilities jeopardize national security, the economy, public health or safety, or has resulted in any combinations of the above.

2. Legislation of Croatia – activities, networks, services, material goods and information technology, failure or destruction of which would significantly impact the health and safety of citizens, or activities of the government.
3. Legislation of the Russian Federation – objects breach (or termination) function which leads to loss of control, destruction of infrastructure, irreversible negative changes (or destruction) of the economy, entity or local government area, or significant deterioration of human safety living in these areas for a long period of time.
4. Legislation of Israel – infrastructure is defined as critical, if the violation of its operation can lead to significant social and economic upheavals that are able to undermine stability in society and thereby cause of threats to national security.
5. Legislation of Netherlands (part of the plan of fight against terrorism, 2001) – Project of protecting critical infrastructure such as after testing identified 11 critical infrastructure sectors, namely energy economies, telecommunications, drinking water, food, health, finance, surface water drainage, general order and safety, legality, public authorities and transport.
6. The legislation of the Czech Republic – system destruction or reduction of functionality of which has a serious impact on the economic and social stability, defense, security and functioning state.
7. The law of Poland – functionally linked production facilities, institutions, services that are critical to the security of the country and its citizens, to ensure the proper functioning of both the government and self-government agencies, and commercial (private) sector [8].
8. Legislation of Slovakia – based on “Concept of critical infrastructure in the Slovak Republic, its protection and defense” [9] (2008) developed the National Program of protection and defense of critical infrastructure [10], which are conceptual in nature and do not provide detailed describe measures for its implementation.
9. Legislation of Hungary – commissioned Programme of protection of national critical infrastructure [11] (2008) according to which 11 sectors of critical infrastructure in the country are defined.
10. Legislation of Bulgaria – the term “critical infrastructure” was introduced in the Law “On Management in Crisis” [12] subsequently updated in the Resolution of the Council of Ministers “On the procedure,

the method and the competent authorities to determine the critical infrastructure and facilities and assessment risks” [13].

11. Romanian legislation – there are about 15 lists of the objects relating to the term “critical infrastructure” that are found in various statutes [14]. In Ukraine, the protection of critical infrastructure is regulated by a majority of legal acts for interdepartmental use. To date in the current legislation identified a number of categories of objects that are regulated by specific conditions to protect [3, 4, 15–28]. The absence of the term “critical infrastructure” in Ukrainian legislation, no list of objects that should be attributed to it, prevent the effective exercise clause 6 of the decision of the National Security and Defense Council of Ukraine from March 1, 2014 “On urgent measures to ensure national security, sovereignty and territorial integrity of Ukraine” (introduced by decree of the President of Ukraine №189 / 2014, 02.03.2014), pursuant to which the Ministry of Internal Affairs of Ukraine is ordered to provide “enhanced protection of energy facilities and critical infrastructure”.

D. S. Biryukov [4] proposes to formulate the term “critical infrastructure” as follows: “systems and facilities, physical or virtual, so important to state that their incapacity or destruction threaten national security, the economy, health or safety of the population”. This formulation closest to the wording adopted in the United States.

In the new National Security Strategy of Ukraine [29] in the fourth section “Strategic goals and objectives of the national security” shows one way to improve energy security (par. 4.3.4.). It is called “the effective protection of critical infrastructure of the fuel and energy complex of environmental and man-made impacts and malicious acts”, and one way to ensure “information security (par. 4.3.8.)” for security of information and telecommunication systems that operate in the interest of governance, provide defense and security, credit and banking and other sectors management systems of critical infrastructure. However, the term “critical infrastructure” definition has not been defined [3,4].

Based on a detailed analysis of the term of infrastructure and critical infrastructure we offer the following formulation of the “critical infrastructure” term – physical and virtual systems, facilities and resources, of which the destruction, loss or reduction in capacity will lead to significant threats to the country and its national security, safety and health of the population.

II. SECTORS AND CRITERIA OF ESTIMATION OF OBJECTS OF CRITICAL INFRASTRUCTURE

According to international experiences, critical infrastructure contains a number of objects, which are grouped by sectors. The number of sectors and the principle of grouping vary by country [4]. For example in the United States 18 sectors were identified: banking network, water supply, dams, energy, hazardous materials, the military-industrial complex, executive and judicial bodies, health, fuel and energy complex, postal services, agriculture, emergency assistance and emergency response, telecommunications and transport.

Canada has identified ten critical infrastructure sectors: food, finance, industry, security, energy, government, health care, information technology and telecommunications, transportation, water supply.

In the UK, the critical infrastructure include 14 sectors: banking network, water, energy, hazardous materials, executive and judicial bodies, health, fuel and energy complex, postal services, agriculture, services, public order, emergency assistance and emergency response, telecommunications, transport and waste management.

Sweden has identified 5 critical infrastructure sectors: banking network, power, executive power, system of air traffic control and telecommunications.

In France there are 8 critical infrastructure sectors: banking network, water, energy, defense industry, public health and public order services, telecommunications and transport.

The list of critical infrastructure in accordance with the EU Green Paper [30] includes 11 sectors: food, finance, chemicals, energy, healthcare, information technology and communications, nuclear industry, transportation, water, space study, research institutions. However, in the short term, the EU Directive [31] says only about two sectors – energy and transportation – that were considered a priority. To the energy sector was included in the following systems and facilities: means and objects of generation and transmission of electricity; the oil and petrochemical industry, pipelines and storage facilities; gas production industry, gas pipelines, liquefied natural gas terminals. To transport sector includes the following species and its objects: road, rail and air transport; river fleet, oceanic and marine; ports.

In general, there are not significant differences between the list of sectors and sites identified as critical infrastructure in the US, Canada, Australia and the EU. However, in the United States to the critical infra-

structure category national monuments and symbols were included, and commercial facilities, and the EU – research institutions.

In determining elements and objects related to critical infrastructure, they define evaluation criteria that form the following groups [32]:

1. economic security,
2. safety and health,
3. national security and defense,
4. National self-esteem and image of the state.

When identifying potential critical infrastructure such elements, factors and characteristics are taken into account [33]:

- a) scope (geographic coverage of area for which the loss of critical infrastructure element is a significant damage) – international, national, regional or territorial;
- b) severity of the possible effects for the following parameters:
 - Impact on the population (the number of casualties, seriously injured, and the number of evacuees);
 - Economic damage (impact on GDP, the size of the economic costs – direct and indirect);
 - Environmental damage (impact on people and the environment);
 - Relationship with other elements of critical infrastructure;
 - Political effect (loss of confidence in the capacity of power);
 - Duration of the exposure (how and when manifest the damage or loss associated with the loss or refusal of objects of critical infrastructure).

Another example is the construction of categorization of criteria for determining critically important facilities of the Fuel and Energy Complex of Russia. This takes into account the following parameters [34]:

- critical importance of facility of infrastructure and life support energy sector;
- the extent of possible socio-economic consequences that arise as a result of an accident at the facility;
- availability of critical components, potentially dangerous areas and vulnerable points on the object.

This categorization of critical infrastructure will ensure the safety of these objects in view of the degree of potential danger of terrorist act and its implications. Given the difficult situation in the Middle East, are of great interest principles of identifying of critical infrastructure in Israel for the following features [35]:

- symbolic significance of the objects – primary protection of cultural heritage (museums, archives, religious buildings and other monuments, government sites, national media, etc.);
- dependence of the basic processes of life support of the society from an infrastructure (power lines, water supply, sewers, general telecommunications networks);
- presence of complex interactions and dependencies between infrastructures (cascading effects in failures of infrastructure elements).

Today protection of critical infrastructure is an important area of policy on security of many countries, the main factors are:

- Strengthen the fight against international terrorism;
- Improving the system of protection of critical infrastructure in energy and transport of heat transfer agent;
- Ensuring international coordination and information exchange in preventing threats to critical infrastructure.

III. THE LIST OF SECTORS WHICH ARE OFFERED TO BE ATTRIBUTED TO CRITICAL INFRASTRUCTURE OF UKRAINE

Today the Green Paper on Critical Infrastructure Protection in Ukraine [32] includes 22 sectors which are offered to be included to critical infrastructure of Ukraine, namely:

I Energy Sector

- a) electricity
- b) fuel industry
- c) coal industry

II Transport

- a) rail and road
- b) air
- c) marine and river
- d) pipelines

III The financial and banking sector

- a) payment systems
- b) stock exchange
- c) production of government securities

IV Telecommunications

- a) government communications and e-government
- b) mobile, fixed-line telephony and broadband

- c) broadcasting
- d) postal services
- V Chemical Industry
- VI Food industry and agriculture
- VII Net life support
 - a) public utilities and functioning of large cities
 - b) metro
- VIII Authorities, the judiciary and the rule of law
 - a) executive agencies
 - b) executive of justice
 - c) the penitentiary system
 - g) diplomatic missions of Ukraine abroad, diplomatic and consular missions of other countries in Ukraine
- IX Emergency Services and Emergency Response
 - a) civil protection force
 - b) the internal affairs
 - c) notification systems
- X Public health and the environment
 - a) waste management and hazardous materials
- XI Cultural heritage and places of mass cultural and sporting events
 - a) immovable monuments of cultural heritage
 - b) stadiums, concert halls and sports, etc.
- XII The Military
 - a) military-industrial complex
 - b) logistical providing of military units and law enforcement agencies of Ukraine
 - c) the objects of an increased risk.

IV. THE DIRECTIONS OF DEVELOPMENT OF MECHANISMS OF PROTECTION OF CRITICAL INFRASTRUCTURE IN UKRAINE

On the basis of international experience in protecting critical infrastructure the following areas for the protection of critical infrastructure have been proposed [32]:

- Improve the legal and institutional mechanisms for the protection of critical infrastructure;
- Identify priority sectors of critical infrastructure and public authorities responsible for the formation and implementation of public policies to protect the relevant critical infrastructure;

- Develop and approve of criteria and methodology for classifying the objects (regardless of ownership) to the list of critical infrastructure;
- Improve the monitoring system for critical infrastructure, threats analysis and forecasting of critical infrastructure, identify ways and means to reduce the risks associated with the operation of critical infrastructure;
- To improve the mechanisms of public-private partnerships;
- Introduce innovations and improve existing security arrangements and protection of critical infrastructure;
- Develop and implement standards, regulations, specifications of security critical infrastructure;
- To improve systems and modes of critical infrastructure;
- Involve community experts to disseminate the information and best achievements, training, conduct training and exercises;
- Eliminate the sources of threats, reduce threats through the use of complex security measures;
- To foster international cooperation on critical infrastructure protection.

It should be noted that it is now when the Government of Ukraine decided of the imposition of the state of emergency in the Donetsk and Luhansk regions, high alert mode throughout Ukraine and the creation of the State Commission of Emergencies, intensify efforts to address the issue of creating a single state detection and prevent threats to the socio-political and man-made objects on the critical information infrastructure of state security, assessment of the defense of its elements, creating capabilities to detect and prevent cyber attacks, including automated security management systems of critical infrastructure.

V. CONCLUSIONS

Acute socio-political crisis in terms of foreign military intervention into the internal affairs of Ukraine, a sharp increase of extremism and terrorism, an unprecedented increase in crime, including using weapons, the scale of humanitarian crisis in eastern Ukraine, destruction and damage of many businesses, infrastructure facilities is a reality, which exists today in Ukraine which has to ensured the safety of its citizens.

Analysis of international experience shows that for ensuring the protection of critical infrastructure it is necessary to resolve a number of issues, including:

- Harmonization of national legislation on the protection of critical infrastructure not only in the countries of EU;
- Creating the protection of not only the national critical infrastructure of the state, but also foreign objects that have transboundary significance of a particular state.

Therefore, introduction of the terming of critical infrastructure is vital to modernize the legal system of the national security of Ukraine. Today Ukraine's security sector needs radical reform, which should be based on international experience and aimed to European integration. These factors in present conditions make the problem particularly acute in introducing in our country conceptual concept of "critical infrastructure protection", which is widely used in leading Western countries.

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