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BORDER ACTIVITIES AS A SYSTEM OF MEASURES AND ITS SCIENTIFIC SUPPORT

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Abstract. Border activities are aimed at ensuring national security in the border space. They can be treated as a system of preventive measures (border prevention and containment), security and control measures (border service and search), and protective and combat measures (special and combat actions, operational actions). Functions (stages of the activity cycle) are assigned to each type of boundary measure. Border measures can be implemented via operations carried out throughout the country, one or several federal subjects according to a single plan for achieving a specific goal. The problems of border activities are investigated in the science of border activities—the system of knowledge to ensure border security, build state border organizations, prepare and conduct border activities, and provide comprehensive support of border activities. The substantial aspects of the science of border activities are studied. The principles of border activities are systematized as follows: activity, the secrecy and surprise of actions, flexibility, complex use of forces and means, the continuity of actions in place and time, the concentration of main efforts on the key directions and tasks, interaction, international cooperation, the main link, the balance of security and freedom, deterrence, reliance on the local population, the primacy of preventive measures, a combination of traditional and new technologies, and a comprehensive assessment of border security.

Keywords: border activities, system of border measures, principles of border activities, preventive measures, security and control measures, protective and combat measures, basic border security models.

INTRODUCTION

Border activities are the activities (system of measures) carried out by state bodies, local government bodies, organizations, public associations, and citizens to ensure border security [1].

Border security (national security in the border space) is the process and result of the activities of state and social institutions to control and protect the interests of the state and society in the border space. The border space includes the state border and border territory, the underwater environment and airspace of the state, the exclusive economic zone, the continental shelf, and other maritime spaces within which the state has sovereign rights and exercises jurisdiction [1, 2].

Border security is an element of national security and defense potential. For example, border legions in the Roman Empire constituted 2/3 of the total number of the armed forces. Moreover, in the third century (years 212 and 284), the border security density (the number of border guards per kilometer of the border) ranged from 2 (Africa, Mauritania) to 15–20 (Syria, Germany, etc.). Built between 122 and 128 A.D., Hadrian's Wall included a whole system of military and border architecture elements. In the later period of the Roman Empire, the border security density was further increased. Border structures with walls or ramparts protected about one-tenth of the border, and a foothold system with fortresses, observation posts, and other security elements protected about two-tenths of the border. Those border equipment and protection measures allowed repelling many invasions of foreign tribes into the Roman (Byzantine) Empire [3]. For comparison, the border security density on the U.S.-Mexican border is 6.3 border guards per km. There are concrete fences, infrared cameras, and sensors along

the border's perimeter. Unmanned aerial vehicles are constantly used, and over 20 thousand American border guards ensure the border's security [4].

Russia has the longest borders in the world. A wide range of threats and challenges in the border space requires applying a system of measures to neutralize them. This work is devoted to the scientific classification and characterization of the system of border measures.

1. BORDER ACTIVITIES AS A SYSTEM OF BORDER MEASURES

The "romantic" period [5] in the development of cybernetics and its first achievements motivated the leaders to organize research into using automation tools and mathematical models in border security management (the 1950s–1960s). The commanders and chiefs of staff were given courses on operations research and the implementation of operational-tactical calculations to improve the quality of state border security [6]. The mathematical models developed in the late 20th–early 21st century can be conditionally divided into three groups: game-theoretic models of using single border means, descriptive theoretical and probabilistic models of border security at the subdivision section, and aggregated models of border security at the regional section [6–8]. For estimating the model parameters, the border statistical data were used.

In the 1990s, the emphasis in the organization of border activities gradually shifted to using information technology and systemic studies of border security. In the 2000s, the concept of a border management system appeared [9, 10]. The book [9] specified the targets of border management: preventing and combating illegal migration, smuggling of weapons and drugs, the threat of terrorism, the spread of diseases and epidemics, and promoting the development of international trade, scientific and educational environment, and tourism. Border management is considered at the global, interstate, and national levels. Let us concretize the concept to the regional level.

The measures (actions or a set of actions and means for implementing or achieving something) to ensure border security are divided into legal, political, diplomatic, economic, defensive, border, customs, environmental, sanitary and epidemiological, ecological, and others [2].

Figure 1 shows the main elements of the system of border measures at the regional level. This diagram was developed by the authors, particularly based on the analysis of [1, 2, 11–15]. The system of border measures includes preventive (border prevention and containment), security and control (border service and search), and protective and combat measures (special and combat actions, operational and combat actions).

According to the border statistics analysis, the most important target of securing the USSR's state border—prohibiting any violations of the border and border regime—was achieved mainly using prevention and containment.

Border prevention is the direct and indirect impact on the border population in order to: involve citizens and organizations in defending and protecting the interests of the state in the border area; identify and eliminate the causes and conditions conducive to illegal activities in the border area; educate persons for preventing offenses in the border area.

Border containment is the impact of border forces and means on potential violators to make them refuse any illegal activities under the threat of being detained and punished.

Security and control measures and *protective and combat measures* aim to maintain legal regimes in the border space and neutralize the subjects of danger.

2. BORDER PREVENTIVE MEASURES

The subjects of preventive activities are as follows:

– the officials of border authorities;

– state bodies, federal executive bodies, local government bodies;

– vigilante and Cossack groups;

– media and art.

The objects of preventive activities are as follows:

– society as a whole, including public organizations and other associations of citizens;

– the local population of border areas;

– vigilante and Cossack groups;

– individuals and their family members;

– criminal communities.

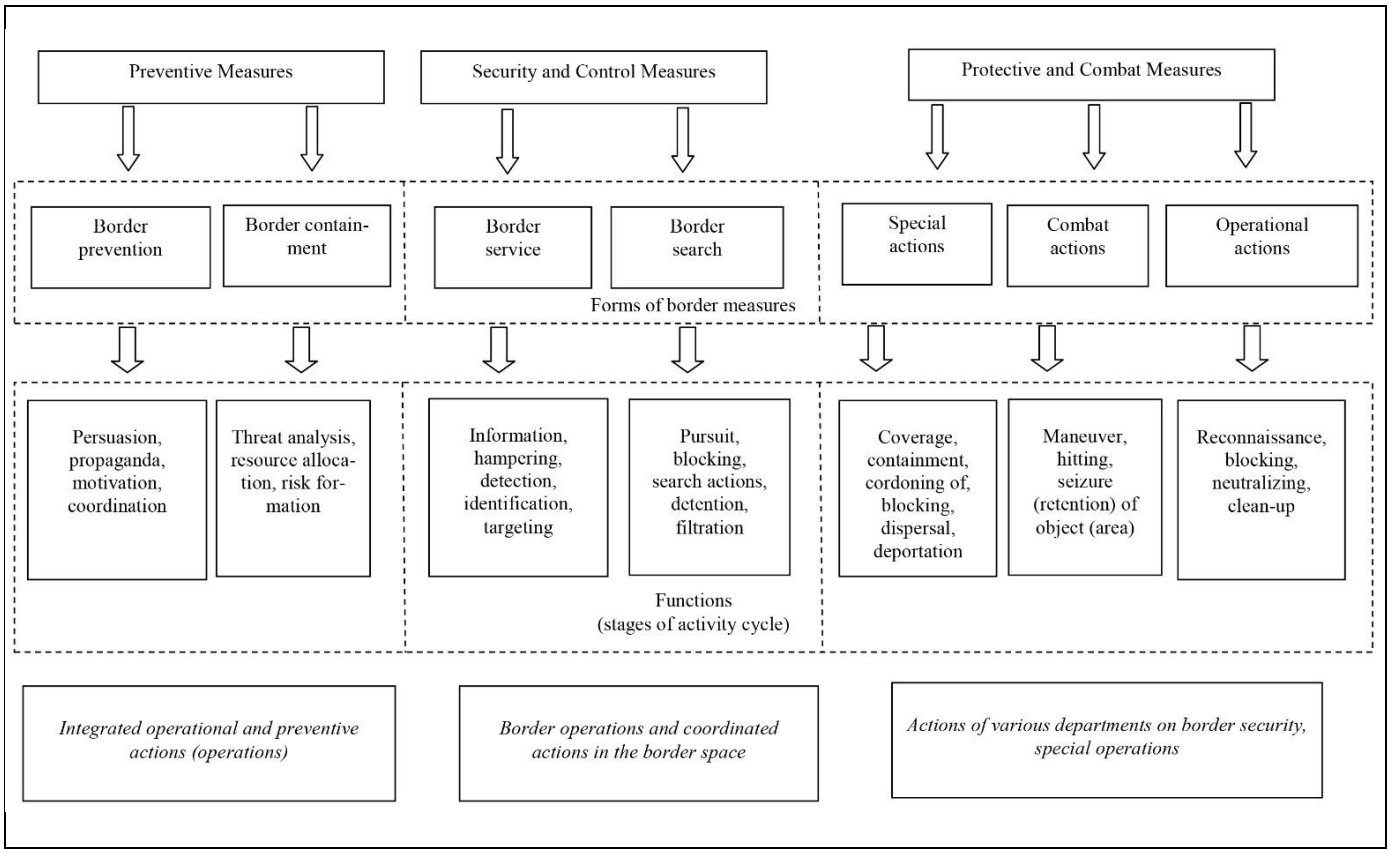

Fig. 1. Elements of the system of border measures.

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– individuals and their family members;

– criminal communities.

The tasks of preventive activities are as follows:

– forming a positive attitude towards the border authorities among the local population and increasing their loyalty;

– propagating the activities of border authorities and covering the issues related to border activities;

– involving the local population in the state border security and safety activities on a public basis, including motivation;

– increasing the efficiency of interaction with state and municipal authorities and executive authorities.

The forms of preventive activities include:

– information and propaganda activities;

– preventive work with the local population;

– coordination with state bodies, federal executive bodies, and local government bodies.

Depending on these forms, the following *methods of preventive activities* are distinguished*:*

• information and propaganda activities:

– covering the activities of border authorities through interaction with the media and art representatives to increase the loyalty of the local population;

– implementing counter-propaganda to neutralize negative informational impacts on society and social groups;

• preventive work with the local population:

– performing preventive and explanatory work to increase the level of literacy in the administrative and legal regime of the state border;

– performing preventive work to identify potential violators among the local population and prevent their illegal actions;

– motivating the local population to participate in the state border security and safety activities;

– performing educational work with youth and children in educational organizations.

• coordination with authorities and local government bodies:

– executing activities of coordinating bodies, for example, border commissions for the constituent entities of the Russian Federation;

– organizing the interaction between the subjects of preventive activities;

– organizing joint actions in the interests of border prevention.

The border prevention means[1] are as follows*:*

– publications in the media and Internet, including social networks and messengers;

– movies, literary works, etc.;

– preventive measures carried out by border officials among the local population;

– normative legal acts regulating the activities of vigilante and Cossack groups;

– administrative and legal regimes as a set of legal and organizational means.

For the first time, *border containment* was mentioned when fighting illicit trade (smuggling) in prerevolutionary times. On the initiative of N.Kh. Bunge, the Minister of Finance of the Russian Empire, the Baltic customs cruiser flotilla was formed in 1873. The Minister of Finance described its activities in the following way: "The small number of arrests of smuggled goods by vessels is not a serious argument proving the flotilla's passivity. Concerning the practical results of the vessels' activities, they should be assessed not in quantitative terms when prosecuting illicit trade, i.e., not by the number of arrests of smuggled goods made by the vessels, but by its overall impact on illicit trade. The flotilla is a preventive guard. The effect of the cruiser flotilla is manifested mainly not in increasing the total amount of detained smuggled goods but in higher riskiness of illicit trade itself, heavier overhead costs, and extra time for choosing a convenient place to return to the shores, which finally reduces the profitability of illicit trade." [16, p. 363]. The main difference between containment and preventive activities lies in the narrower object of impact: containment measures are aimed at potential violators who plan illegal activities.

The border containment tasks are as follows*:*

– convincing potential violators in the inevitability and severity of punishment for illegal activities carried out across the state border;

– equipping the state border at a necessary level to prevent illegal activities;

– utilizing border forces and means effectively.

The containment measures include:

– informational measures, similar in forms and means to the preventive measures of information and propaganda, but differing in the goals and object of impact;

– measures for equipping the state border, including the use of visible informing, barrage, control, and other means;

– measures on using border forces and means (for example, the creation of sufficient security densities, in the entire section or single directions), lighting equipment, demonstrative actions, etc.

Particular indicators characterizing the efficiency of border containment are:

– the density of state border security (the number of guards per km);

– the density of installed (used) homogeneous technical means of border security (the number of units per km);

– the intensity of demonstrative actions near the state border;

– the maximum speed of violators and its reduction by barrage means;

– the maximum speed of border vehicles;

– the share of uncontrolled border sections;

– the density of informative signs and means, etc.

A promising scientific and practical task is to adapt the basic control mechanisms for managing preventive and containment measures and develop new ones.

3. SECURITY AND CONTROL MEASURES. PROTECTIVE AND COMBAT MEASURES

In the model law[2] "On Border Security" [1], *security and control measures* are understood as measures to maintain administrative and legal regimes in the border space (state border regime, border regime, etc.). *Protective and combat measures* (law-enforcement, military, reconnaissance and search, and other special measures) are intended to counter the existing threats and neutralize the subjects of danger.

The classification of such measures in other states may differ depending on the military-political, social, and economic situation in the border space and the national traditions of border security. Particularly in the United States, the complex of measures to ensure border security depends on the level of threats and is divided into [17]:

[1] A means is a technique or way of actions to achieve something.

[2] A model law is a legislative act of recommendatory nature that contains typical norms and provides normative guidance for legislation.

– Border Control (security from the illegal entry of people and goods through the border, perceived as a low-level threat);

– Border Safety (the measures implemented to protect against medium-level threats such as violence, criminals, smuggling, etc.);

– Border Security (the measures to counter-terrorism).

The border structure must be flexible to ensure border security. As noted by experts [17], law-enforcement functions at the border can potentially spill over into the functions of national defense. This fact will require the constant presence of the National Guard units at separate sections of the border and other measures.

When implementing security and control measures and protective and combat measures, *the subjects of control* are:

– federal government bodies;

– regional government bodies;

– officials of border authorities, etc.

When implementing security and control measures and protective and combat measures, *the objects of control* are:

– forces and means (subdivisions, organizations, etc.) allocated to maintain the administrative and legal regimes and neutralize the subjects of danger in the border space;

– regime legal means (regulations, acts of exercising the rights and obligations of subjects, law- enforcement acts, measures of encouragement and coercion, legal sanctions, methods, and techniques of administrative activities);

– territory where administrative and legal regimes are valid, etc.

Security and control measures and protective and combat measures *aim* to prevent any violations of the border regime and detain (neutralize) violators.

Security and control measures and protective and combat measures are managed using the principles of military strategy, border security and safety, and the functions of border forces and means [11].

4. SCIENCE OF BORDER ACTIVITIES

The science of border activities[3] is a system of knowledge to ensure border security, build border organizations, prepare and conduct border activities, and support them comprehensively (Fig. 2).

According to the analysis of Russian and foreign publications, the science of border activities includes such disciplines as border art (border policy, border strategy, and border tactics), border history, border statistics, the mathematical theory of border security control, legal foundations of border security and border activities, philosophy of border security, psychology and sociology of border activities, the theory of border training and education, the theory of comprehensive support of border activities, and the theory of development, application and operation of technical and special means of border activities. Note that this list is not exhaustive.

Border art is the theory and practice of preparing and conducting border activities. It includes state border policy, border strategy, and border tactics.

As a branch of social statistics, *border statistics* studies quantitative indicators related to the qualitative characteristics of such phenomena and processes as border security, border activities, and the results and consequences of operational and service activities and combat activities in the border space. It also explores the patterns of these phenomena in particular historical and regional conditions. The most important tasks of border statistics are the identification, acquisition, scientific processing, and analysis of statistical data, particular phenomena, and processes of border security and border activities.

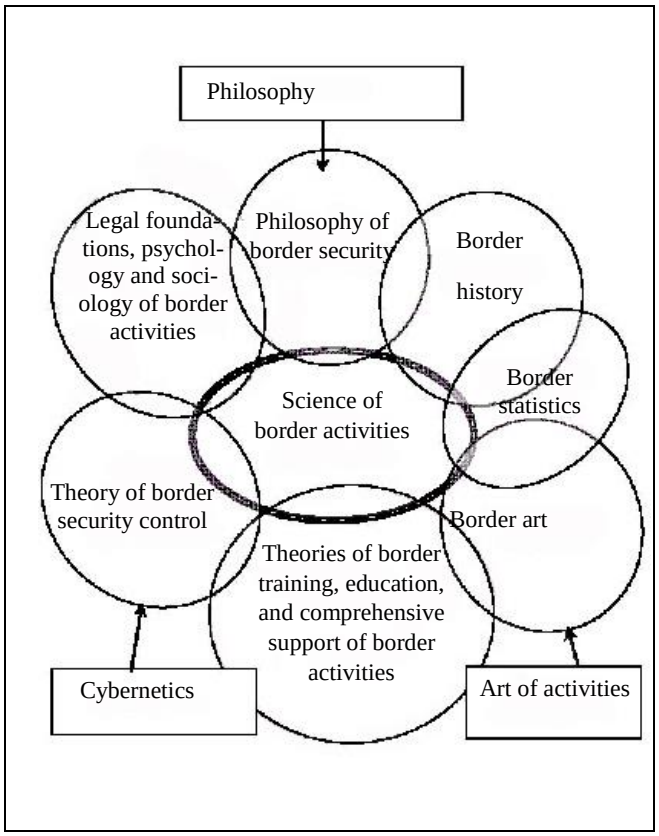

Fig. 2. Basic disciplines of the science of border activities.

[3] Some researchers also use the term "borderology."

The theory of border security control is reliable scientific knowledge about border security, border activities, and their control. It represents a system of interrelated statements and evidence, contains methods for explaining and predicting phenomena and processes in the subject area, and reduces the regularities revealed to a single unifying principle.

Figure 3 shows the subject area of the theory of border security control.

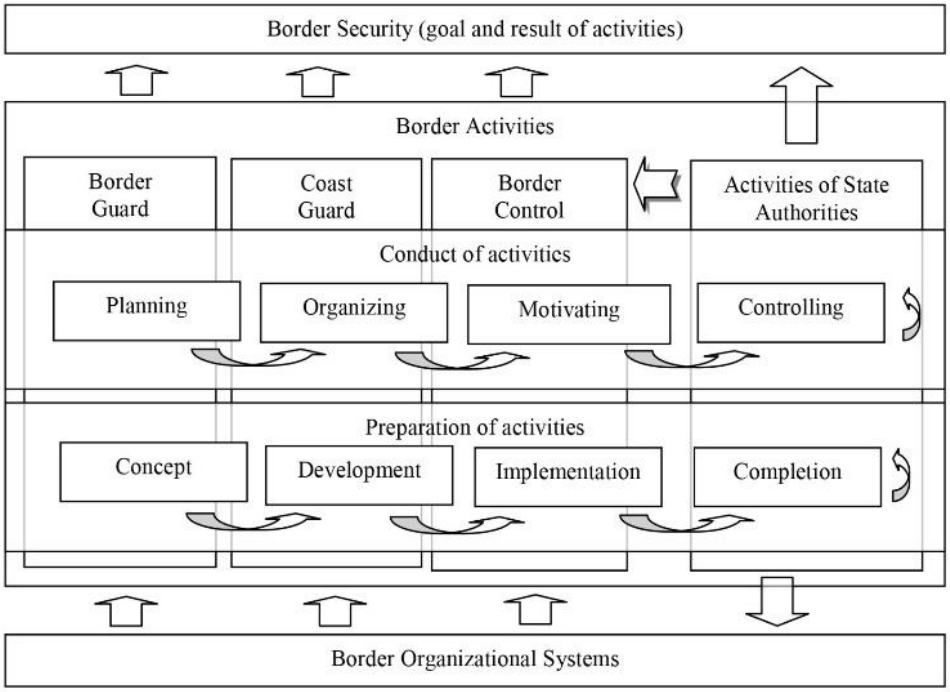

Fig. 3. The theory of border security control: subject area.

Border activities are aimed at securing and saving land and water (lakes and rivers) sections of the state border (border guard), protecting the economic and other interests of the state in the maritime border space (coast guard), passing persons, vehicles, and cargo through the state border (border control). Border activities include the coordinated (joint) actions of state authorities and control authorities.

There are two types of border activities: preparation of border activities (project activities) and conduct of border activities (process activities). They are organized as the sequential implementation of common stages (cycles).

Historically, the study of problems of activities and control was the prerogative of philosophy. Nowadays, philosophy is understood as reflexion over the foundations of all sciences: it does not consider particular problems of activities. The philosophy of border security can be defined as a science of the meaning of border activities and border security.

As is well known, the term "control science" is often unreasonably narrowed to the formal (mathematical) theory of control. However, control science includes a set of such theories [18]. The science of border activities also includes "strong" and "weak" disciplines (in the terminology of D.A. Novikov).

5. BASIC MODELS OF BORDER SECURIY

Let us present the basic models of border security and describe them in brief. (A basic model is an elementary model that can be extended by considering more factors and conditions.)

Model of regional security assessment. The security U_i of region i of a given state is assessed by the following formula [11]:

$$U_i = K_i \left(\frac{\zeta_i}{z_i} \right)^{\delta_i \mu_i},$$

where K_i specifies the level of social and economic development of region i; ζ_i and z_i are the sizes of regional (title) ethnos and regional population, respectively; $\delta_i > 0$ denotes the ethnic attraction parameter of the title ethnos; $\mu_i \geq 1$ is the interethnic heterogeneity parameter.

The model is used to assess security in regions with a mixed population and high interethnic differences (Transnistria, Abkhazia and South Ossetia, Nagorno-Karabakh, etc.), where conflicts on ethnic grounds periodically flare up. Such conflicts are very difficult to resolve.

Model of international migration. The migration flow M_{ij} from country i to country j takes into account migration laws and is estimated by the following formula [19]:

$$M_{ij} = k_{mi} \frac{(1 - R_{ij}) w_j D_j (V_j / V_i)}{(\mu_{ij})^2 \sqrt{r_{ij}}},$$

where k_{mi} denotes the migration parameter of country i (reflects social stability in a given state); w_j is the basic sovereignty of state j (the capacity of its migration market depending on the size of population and the

area of country j); V_i and V_j are the per capita gross domestic products of countries i and j, respectively; D_j specifies the share of urban population in country j; r_{ij} gives the relative distance between countries i and j; μ_{ij} stands for the interethnic heterogeneity parameter of the countries; $0 < R_{ij} < 1$ is the degree of regime and legal restrictions on population migration from country i to country j.

Figure 4 shows the graph of long-term migration from Ukraine in 2011–2012.

Clearly, the largest migration flows are towards large countries with ethnically similar populations or countries with a high living standard and a significant capacity of the migration services market. The migration parameter k_{mi} characterizes the share of the country's population ready to leave (temporarily or permanently) for better living conditions. The value of this parameter increases during periods of the state's internal instability.

With the growth of migration flows, the flow of terrorists and smuggling grows, explaining the importance of migration forecasting for national and border security.

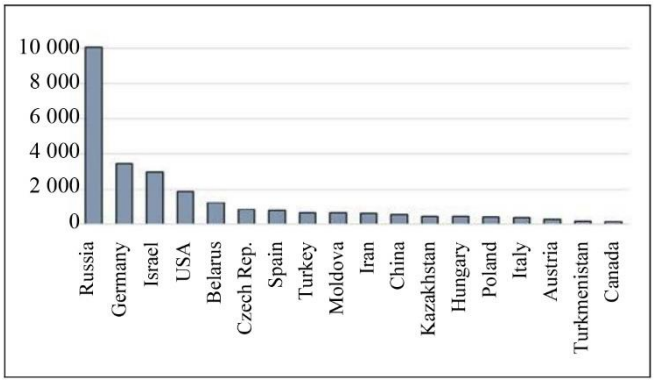

Fig. 4. Long-term migration from Ukraine in 2011–2012, people.

Model of social and informational impact. Border prevention largely depends on the actions of the border population and the awareness of citizens. Individuals form their picture of the world based on their perceptions (sensory-visual images produced by personal contact with reality, through the senses) and representations (sensory-visual images produced without the direct impact of the objects and phenomena of reality). For an indicator $\theta \in [\theta_0, \theta_1]$ (a probability $\theta \in [0, 1]$), a belief (perception) function $B(y, x, \theta)$ is defied under external impacts $y \geq 0$ ($x \geq 0$) directed to increase (decrease, respectively) the belief about this indicator. For probabilistic indicators (e.g., the probability of detention for violators, the degree of border cover, and others), the belief function [11] has the form

$$B(y, x, \theta) = \alpha B_+(y, \theta) + (1-\alpha) B_-(x, \theta),$$

$$B_+(y,\theta) = \frac{\theta \exp(z_y)}{1-\theta+\theta\exp(z_y)}, \quad z_y = \frac{k_y}{\nu+1} y^{\nu+1},$$

$$B_-(x,\theta) = \frac{\theta \exp(-z_x)}{1-\theta+\theta\exp(-z_x)}, \quad z_x = \frac{k_x}{\upsilon+1} x^{\upsilon+1},$$

where $0 < \alpha < 1$ is the optimism–pessimism parameter (the degree with which a particular individual will learn the impacts of definite direction); $\nu \geq 0$ and $\upsilon \geq 0$ are the modality parameter of the impacts; $k_x \geq 0$ and $k_y \geq 0$ denote the dimensionality coefficients of the impacts.

The model parameters were estimated and verified on social actions associated with the U.S. wars in Korea and Vietnam. According to military losses data and sociological surveys, the degree of modality for informational impacts lies within the range [0, 1], whereas the degree of modality for social impacts is greater than 1.

Note that for interval indicators (expected income, public welfare losses due to terrorism and drug trafficking, etc.), the belief function $B(\cdot)$ depends linearly on θ.

Model of illegal activities containment. The containment model is based on H. Becker's model (the utility of illegal activities) and the border production function. The goal of a border system is to maximize the efficiency of border security, i.e., the prevented losses $F(x, y)$ minus the expenses R on border security [10]:

$$F(x,y) = \sum_{i=1}^{k} u^i \left(y_0^i + \sum_{j=1}^{n} p_j(x_j) y_j^i \right) - R \to \max, \quad (1)$$

$$p_j(x_j) = 1 - \exp(-\lambda_j x_j),$$

where u^i denotes the expected losses incurred by the violator of group i; $p_j(\cdot)$ specifies the probability of violator's detention in section j; y^i_j is the number of violators i selecting section j (if $j = 0$, the violator refuses violation); x_j gives the resource allocated to section j; λ_j means the parameter of the border production function; k and n are the numbers of violators' groups and sections, respectively. (Losses are prevented if the violator refuses to intrude the border or if he is detained.)

Acting independently, the violators of group i maximize their utility:

$$f_i(x,y) = s^i y_0^i + \sum_{j=1}^{n} U_j^i y_j^i \to \max, \quad (2)$$

where s^i is the expected income from the illegal activities of violator i; U^i_j denotes the expected utility of violator i on section j, estimated within Becker's model.

For special cases, analytical and numerical solutions of the zero-sum two-player game with the payoff functions (1) and (2) were found.

Model of timely detection of border violation signs by patrol. Border security means are generally divided into posts (stationary control), sentries (control of a section of a limited length), and patrols (mobile control of a section). Assume that the patrol's task is to detect border violation signs before a lead time t_y. Then

the optimal mixed strategy of patrolling in the daytime (i = 1) or nighttime (i = 2) has the form

$$p_i = \frac{\rho_{-i} T_i}{\rho_1 T_2 + \rho_2 T_1},$$

where ρ_1 and ρ_2 are the probabilities of signs' detection in the daytime and nighttime, respectively; ρ_{-i} is the probability of signs' detection in the other time of the day; T_1 and T_2 specify the duration of daytime and nighttime, respectively. The game value—the probability of timely detection of border violation signs within 24 hours – is calculated as

$$\nu = \frac{n t_y \rho_1 \rho_2}{\rho_1 T_2 + \rho_2 T_1},$$

where n gives the number of patrols send to a section within 24 hours.

Model of victory in a battle. Border security measures (protective and combat measures) are aimed to suppress and resolve armed conflicts and military clashes. According to [20], side 1 wins in a battle with the estimated probability

$$p_x(x, y) = \frac{(\beta x)^m}{(\beta x)^m + y^m} = \frac{q^m}{q^m + 1}, \; q = \frac{\beta x}{y}, \quad (3)$$

where m denotes the physical form parameter; x and y are the numbers of combat units of sides 1 and 2, respectively; $\beta > 0$ is the parameter of the combat (moral and technological) superiority of side 1 over side 2; q gives the ratio of their forces.

In particular, the model (3) can be used for solving the offense-defense game: find an optimal distribution of forces and means between tactical tasks and points of defense.

6. PRINCIPLES OF BORDER ACTIVITIES

Historically, border science emerged as an integral part of military science. Golovin [21] ascertained that the science of war will seek to discover laws, whereas the theory of military art generalizes war phenomena into principles. According to Golovin, principles are directly related to goal-setting and task-setting, representing the main idea and regulating creativity without imposing constraints on it.

Like the principles of any practical and managerial activities (e.g., the principle of ethics or legality), the principles of border activities were highlighted in [13, 16, 22–30]. Let us systematize and present them in the author's interpretation:

1. *The principle of activity.* The activity aims to create conditions preventing or limiting the actions of border violators and ensuring a high probability of their detection and impact on them. Activity is achieved by: continuously obtaining information about possible violations, techniques, and tricks used by violators; permanently searching for violation signs of the legal regimes in the border space; anticipating the actions of violators and imposing their will on them; showing courage and reasonable initiative in decision-making. Proactive actions will require comprehensive control and oversight. Creativity in security technologies and procedures is encouraged. New security systems must be quickly implemented for testing, and successful systems must be deployed across the entire border. The legal basis is reoriented from reactive approaches to preventive actions.

2. *The principle of secrecy and surprise of actions.* Secrecy and surprise allow achieving maximum results with the least consumption of forces, means, efforts, and time. Surprise is achieved by: keeping the plan of actions in secret; misleading the enemy about intentions; anticipating the enemy in actions; performing the assigned tasks promptly; using new means and methods of actions unknown to the enemy, particularly border cunning; camouflaging and countering enemy reconnaissance; satisfying the requirements of covert management and secrecy regime, etc.

3. *The principle of flexibility (mobility).* Flexibility is achieved by: excluding stereotypes in the forms and methods of actions; making the actions of forces and means mobile; performing timely maneuvers and quickly changing the forms of service actions to optimal ones.

4. *The principle of the integrated use of forces and means.* The integrated use of forces and means increases the efficiency of border operations by following a single concept and plan. Efforts should prevent, identify, preclude, and neutralize violators, reduce losses and destruction, guarantee fast response, and decrease alarms.

5. *The principle of focusing main efforts on key directions and tasks.* This principle expresses the ability to make decisions under a wide range of potential bor-

der security threats and prevent the existing vulnerabilities from passing into inevitable terrorist attacks and border violations. Violators can act anywhere and anytime. The round-the-clock continuous security of all border sections is impossible. The actions should not be reactive and excessive.

6. *The principle of continuous actions in place and time, in functions and tasks.* Continuity consists in the permanent implementation of actions of different forces and means coordinated in place and time. Under insufficient forces and means, continuity is achieved by using them in an order unpredictable for violators.

7. *The principle of the main link.* The main tasks of fighting violators are solved at the border guard, ship, crew, or employee level. Hence, it is required to increase intelligence capabilities at the local level, eliminate bureaucratic barriers to exchanging intelligence information, and develop and apply modern technologies.

8. *The principle of containment.* The prevention of border violations and criminal acts cannot be a criterion for the efficiency of border security measures due to the complexity of the assessment. The following goals should be quantified: the containment of violators (terrorists, smugglers, or illegal migrants), the detection of violators, and difficulties for criminal acts (reducing the potential benefit received by criminals).

9. *The principle of reliance on the local population* (through knowledge of traditions, culture, and language). This principle means educating the public, helping citizens assess the dangers and everyday risks, and creating a security culture. Local forces (vigilante and Cossack groups) should be prepared and used to ensure border security.

10. *The principle of coordination and interaction.* This principle includes the following: integrated efforts of departments, the public, and private individuals to fight cross-border threats at the President's level; an intelligent approach to ensuring border security using somewhat redundant security layers and proper consideration of interaction effects for implemented programs and measures.

11. *The principle of international cooperation.* International and bilateral cooperation of states fighting cross-border crime increases the efficiency of border activities.

12. *The principle of the primacy of preventive measures.* This principle expresses the primacy of preventive activities over law-enforcement ones; in preventive activities, the primacy of measures to provide social assistance to those in need over the legal restrictions and the priority of persuasion over coercion. Regional economic development plans should be aimed at preventing illegal economic activity. Efficient border security is achieved by early monitoring persons and goods from the point of departure and tracking the persons suspected of illegal cross-border activities.

13. *The principle of the security–freedom relation.* Security and freedom should not be converted into currency. Security measures should not restrict freedom. Freedom can be threatened by trying to eliminate all risks.

14. *The principle of combining traditional and new technologies, stationary and mobile border guard forces.* New technologies do not cancel the traditional ones (e.g., service dogs in border security) but supplement them. Reducing the costs of implementing contact and barrier functions is achieved through the efficient use of information and technology. The implementation of new technologies does not always cut the staff. New systems require experienced operators and quality control and test specialists, which is often neglected in budgeting.

15. *The principle of the integrated assessment of border security.* Resource allocation should be based on risk assessment. Rigorous analysis of security costs and security profits is difficult to implement because terrorist attacks and border violations with high social costs are rare, and the consequences of large-scale attacks are not easy to quantify. It is also difficult to estimate the consequences of drug trafficking and interethnic conflicts caused by uncontrolled migration in economic terms.

In the table below, these principles are associated with the types of border activities.

Table

Principles and types of border activities

Types of activities	Principles of border activities
Conduct of border activities	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15
Preparation of border activities	1, 7, 9, 10, 11, 12, 13, 14, 15

The principles of border activities, in combination with system analysis methods, allow solving many topical problems. Let us mention some of them: the integrated assessment and ranking of border forces and means according to their efficiency [31]; the formation of a promising image of border units; the equipment of the border.

At the tactical level, the following functions of border means are implemented in the border service: informing, tactical containment, barrage, detection, recognition, movement, targeting, detention, fixation of violation signs. Modeling involves criteria based on

the principles of border activities. For the principle of the integrated application of forces and means, this criterion is the number of functions implemented by border means; for the principle of continuous actions in place and time, the continuity coefficient of using border means in different directions and time; for the principle of flexibility (mobility), the speed of motion and maneuvering of border means; for the principle of continuity in functions and tasks, the uniform distribution coefficient of border means by their functions.

Note that 20–50 years ago, the main tasks of border security were solved by a border post (subdivision). Modern means, technologies, and weapons create prerequisites for implementing the principle of the main link: a border patrol should now solve the tasks previously solved by a subdivision.

CONCLUSIONS

The concept of a border management system has been developed by studying border activities as a system of measures to ensure national security in the border space. The system of border measures at the regional level includes preventive measures (border prevention and containment), security and control measures (border service and search), and protective and combat measures (special and combat actions, operational actions). The criteria, tasks, forms, methods, and means of activities have been determined for border measures.

The science of border activities—a system of knowledge to ensure border security, build border organizations, prepare and conduct border activities, and support them comprehensively—has been structured. This science includes such disciplines as border art (border policy, border strategy, and border tactics), border history, border statistics, the mathematical theory of border security management, the legal foundations of border security and border activities, the philosophy of border security, psychology and sociology of border activities, the theory of border training and education, the theory of comprehensive support of border activities, and the theory of development, application, and operation of technical and special means of border activities.

The most important element in the science of border activities is the theory of border security control—reliable scientific knowledge about border security, border activities, and their control. It represents a system of interrelated statements and evidence, contains methods for explaining and predicting phenomena and processes in the subject area, and reduces the regularities revealed to a single unifying principle.

Extensions of the basic border security models create prerequisites for bettering decisions and increasing the efficiency of border activities.

While sciences strive to discover laws and patterns, border art generalizes phenomena, processes, and impacts to principles. The authors have systematized the principles of border activities.

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