

DETERMINING MILITARY RESISTANCE IN THE REPUBLIC OF ARMENIA'S BORDER SETTLEMENTS WITHIN SPATIAL PLANNING



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Abstract: Due to the military operations conducted by the opponent during and after the 2020 Artsakh war, as well as potential future risks and threats, the Republic of Armenia faces the challenge of ensuring the secure livelihoods of border settlements and implementing programs aimed at territorial development. Therefore, raising the issues regarding the resistance of these settlements to possible military operations is of strategic importance and demands immediate attention.

The research examines normative and technical documents adopted from both international and local experiences to mitigate the impact of military attacks. It delves into the potential for reducing casualties and material damage by organizing the spatial environment of settlements. Furthermore, it emphasizes the necessity of defining new terminology and formulating key assessment criteria. The proposed solutions can be the basis for proposing a new scientific theory in architecture and contributing to the development of new resistance solutions in architecture along with military technologies.

Keywords: Armenia, architecture, military resistance, passive defense, warfare, spatial planning.

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Received: 10.01.2023

Revised: 11.02.2024

Accepted: 27.02.2024

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Introduction

The deployment of advanced combat weaponry in contemporary military conflicts has led to extensive destruction in settlements, damaging buildings, structures, historical monuments, and resulting in significant civilian casualties¹. Technological advancements, such as the incorporation of unmanned aerial vehicles in aviation and the evolution of networked control systems in military science, offer the opportunity to create highly precise armaments capable of targeting without regard to distance or positioning.

A retrospective analysis of military experts' perspectives, coupled with an examination of the current state of potential theaters of military operations, reveals a notable gap in military science concerning the study of military geographical aspects of urbanism [1]. This gap is particularly concerning given the prevailing trend of armed confrontations in urban areas, as evidenced by recent wars and conflicts (such as those in Syria, Artsakh, Ukraine, Israel, and Palestine). The relevance of addressing this issue is paramount, especially considering that even after the conclusion of the Artsakh war, existential challenges persist for the Republic of Armenia.

Therefore, in the border settlements, it is important to note that the defense of the state is structured not solely within the military but across all spheres of activities. This defense is an ongoing process, operational not just during wartime but persistently in times of peace as well [2]. Therefore, within these settlements, apart from devising military strategies such as anti-aircraft defenses, there is a crucial need to implement a comprehensive system ensuring resistance through spatial planning. This necessitates the establishment of scientific and methodological principles that align with the substance and strategy of contemporary military operations. In this sense, this research delves into historical precedents and contemporary approaches to

¹ PAX / Article 36, Areas of Harm, ISBN 978-94-92487-05-6/NUR 689, 2016, 6-12.

settlement defense, concentrating on their relevance within the context of the Republic of Armenia. Notably, the accumulated experiences of nations like the State of Israel, the Swiss Confederation, the United States of America, and the Islamic Republic of Iran serve as valuable study materials. These countries have developed normative-technical frameworks encompassing technical directives and requisites for territorial and civil protection. However, none of these states has released an all-encompassing solution adaptable to the specific needs of the region under consideration.

In cases where a settlement becomes a local theater of military operations, prioritizing the safety of the civilians demands the creation of an environment that not only ensures the safety of human lives but also doubles as a defense infrastructure. Simultaneously, it should offer conducive living conditions during periods of relative peace. Moreover, settlements play a pivotal role in a country's economy, serving as the lifeblood and supplying vital resources, particularly in border regions, crucial for the armed forces. Consequently, the resistance of these settlements significantly influences the combat readiness of the armed forces [1].

The methodology employed in this article integrates scientific principles with empirical data. It utilizes research methodological approaches, factual materials, analysis results, comprehension of terminology, and essential scientific-methodological principles to formulate and implement a novel concept concerning special architectural measures for organizing the spatial environment in border settlements of the Republic of Armenia (RA). In the context of this article, the term "border settlements" of the Republic of Armenia refers to the Decision of the Government of the Republic of Armenia on approving the list of communities of border settlements of the Republic of Armenia, N713².

The research aims to analyze existing international and local norms and technical solutions, highlighting the imperative of incorporating the theory of spatial environment resistance to military operations into architectural and urban planning activities for the border settlements of the Republic of Armenia.

Materials and Methods

The analysis encompasses a range of methodologies to conduct a comprehensive study on the subject. This includes reviewing existing terms in scientific literature, studying normative-technical, archival documents, employing photo-fixation for visual documentation, examining legal frameworks, and analyzing analogies in their formation.

The assessment of military resistance for buildings and structures in this research is based on specific criteria, enabling conclusive findings within its framework. The following criteria are recommended as the foundation for developing the methodology for assessing military resistance:

1. Location of livelihood facilities,
2. Assessment of the minimum and maximum damage inflicted by the employed weapon,
3. Planning and Designing Solutions for Buildings and Structures Positioned within the Immediate Danger Zone,
4. Assessing the Maximum Distances between Buildings and Structures in the Spatial Environment,
5. Choosing Construction Materials for Building or Structure Construction and Reconstruction.

Results and Discussion

Significance of defining the term "Military resistance"

The mitigation of human casualties and material devastation during military assaults on settlements can be attributed to various factors. These encompass distinctive architectural designs of buildings and structures, their potential for future restoration, as well as the nuances of spatial planning and architectural arrangements.

² Decision of the Government of the Republic of Armenia on approving the list of communities of border settlements of the Republic of Armenia, N713 of November 17, 1998, Yerevan (in Armenian).

The layout and interconnectedness of buildings and infrastructures within the spatial environment play a pivotal role in enhancing territorial defense capabilities and minimizing vulnerability [3].

The organization of territorial defense stands as a pivotal aspect of a nation's defense strategy. It holds particular significance for smaller states lacking extensive military fronts and strategic rear areas [4]. Notably, from the adversary's perspective, a "successful" military offensive often involves disrupting the normal livelihood in settlements along the frontline. Hence, settlements can serve as integral components of territorial defense, underscoring the critical importance of implementing measures to bolster the defense capabilities within these areas [2].

The Construction Standards for Civil Defense Structures in the Republic of Armenia are applicable within the country. According to these norms, underground buildings situated within the building's basement or separately constructed within settlement territories are classified as Civil Defense Structures (CDF)³. Their primary function is to provide shelter and ensure the safe evacuation of civilians, serving as integral components of passive defense measures.

Passive defense strategies aim to mitigate potential human and material losses during significant natural disasters or hostile actions by adversaries in times of war. Unlike active defense, which involves military tools and actions to counter threats, passive defense relies on non-combative, unarmed strategies [5].

Within the scope of civil defense, blast resistance, and defensive architecture play pivotal roles. Explosion-proof measures aim to safeguard environments from explosive weapons. In the United States, this term encompasses governmental actions dedicated to shielding society from terrorism, lawlessness, and insurgency. In contemporary parlance, defensive architecture, extending beyond traditional notions of fortifications and military structures⁴, embodies a suite of control mechanisms governing public spaces. These mechanisms contribute to defining the "disciplinary" nature within urban settings [6].

As a parallel example, the existing normative document system in construction includes earthquake-resistant building construction norms⁵. The profound impact of the devastating 1988 earthquake in Armenia reverberated through the region's architectural landscape. This seismic event prompted a comprehensive reassessment of building construction and seismic mapping. Despite the perennial occurrence of earthquakes in Armenia, legislative action and systematic solutions addressing this issue were only initiated after a significant earthquake event, prompting a revision of the Richter magnitude scale from 8 to 9.

These principles encompass fundamental guidelines including volume-planning solutions, allocation of stiffnesses and masses, and specifications for constructing load-bearing elements. They are imperative to adhere to during the design and construction of buildings and structures in regions prone to earthquakes⁶. When comparing the seismic impacts with those induced by projectile use, distinct similarities and differences become apparent.

Unlike seismic effects, the forces resulting from the use of projectiles can manifest in all spatial dimensions, including aerial ones. In addition to propagating pressure waves through the air, some of the weapon's energy is transmitted through the ground. This phenomenon resembles a high-intensity, short-duration earthquake, inducing shock pressure at the interfaces between structures and soil [7]. In both cases, structural damage, destruction, and human casualties can result if the building is not designed to withstand such forces. The logic behind earthquake resistance involves extensive scientific studies aimed at comprehending the forces and repercussions of earthquakes on buildings and structures. Similarly, when addressing the challenge of

³ Construction Standards for Civil Defense Structures in the Republic of Armenia, 31-03.02-2022 Order No. 06-H, dated April 4, 2022, issued by the Chairman of the Urban Development Committee of the Republic of Armenia, <https://www.arlis.am/DocumentView.aspx?DocID=161785> (in Armenian).

⁴ Cambridge Dictionary, <https://dictionary.cambridge.org/dictionary/english/defensive-architecture>.

⁵ Earthquake-resistant construction standards, CNRA 20.04-2020, Normative documents in construction, construction norms of the Republic of Armenia, Committee of the Republic of Armenia, Yerevan, 2020, <https://www.arlis.am/DocumentView.aspx?DocID=172012> (in Armenian).

⁶ Ibid.

confrontations utilizing military means within settlements, conducting scientific studies to grasp the effects of military operations on buildings and infrastructure becomes equally crucial.

In examining the Defense Law of the Republic of Armenia, it is essential to note the observation regarding the organization of Armenia's defense. It is crucial to note that the defense organization of the Republic of Armenia is the "resistance" to armed attacks, immediate threats, and military operations within its borders⁷.

Examining the aforementioned concepts within the scope of territorial defense, especially concerning spatial development in border settlements, highlights the necessity for a systematic scientific exploration within local science. This exploration should focus on researching the resistance of buildings and structures.

Exploring the factors defining the resistance of buildings and structures amidst military operations underscores the necessity for an integrated scientific framework. This comprehensive system should interconnect these concepts and incorporate them within a unified strategic framework. The currently existing civil defense system in the Republic of Armenia does not meet the current military-scientific challenges, because they are based only on the features of building basement shelters and does not meet the requirements of the urban warfare that have become characteristic of the 21st century and increasing the resistance of the spatial environment of the settlement.

Drawing from the Defense Law's directives regarding military threats, the rationale for establishing a normative document system, and the specific application of the aforementioned concepts, the following conclusion is derived:

The term "military resistance" is proposed to encompass the array of methods and tools employed to counter military threats, facilitating the achievement of the goal outlined in this research.

Military resistance pertains to the ability of facilities within areas of immediate military peril or ongoing operations to resist the effects of weaponry and tools in use, as well as their aftermath, ensuring the continuity of the livelihood facilities.

Currently, the concept of military resistance lacks a comprehensive scientific foundation. Establishing the military resistance of settlement or vital facilities necessitates a multifaceted approach, commencing with situational analysis and spatial planning, and extending to technical solutions.

The planning of spatial environments and the design solutions for vital structures directly align with the field of architectural and urban planning science. Consequently, within the realm of ensuring military resistance, architecture plays a distinctive and vital role. Given the nature of the discussed subject matter, it necessitates a specific scientific-methodological theory. Hence, the primary objective of the theory of military-resistant architecture lies in fortifying the resistance of spatially organized structures and facilitating the continuation of daily life activities by implementing architectural strategies resistant to measures employed during military operations. Similar to any scientific theory, it should encompass fundamental concepts, principles, and foundations based on empirical experiences and their interconnecting patterns. The theory of military-resistant architecture will entail a coherent model for comprehending observable phenomena, coupled with an internal structure and a sequence of action mechanisms. The scientific value of a theory hinges on its effectiveness in fulfilling these fundamental functions.

Criteria for Assessing Military Resistance

The primary determinant in assessing military resistance involves the specific characteristics of a building, structure, or any object. As the distance from the attacker increases, the necessity for more long-range methods to strike the target grows. Consequently, these methods may entail a restricted payload or warhead. Within the scope of the discussed issue, it is pertinent to examine spatial planning features through the lens of military resistance across three dimensions [8]:

⁷ Law of the Republic of Armenia on Defense, Chapter 1, Article 5: Basic Concepts of the Law. <https://www.arlis.am/documentview.aspx?docid=117631>

- a) When livelihood facilities are located close to the direct contact line of the border or within the combat zone, it's crucial to consider not only the possible utilization of vertical air assets but also the risks associated with skirmishes, military offensives, and the deployment of other military resources in the horizontal plane. This consideration is especially pertinent in the border settlements such as Aygepar and Shurnukh.
- b) When livelihood facilities are situated within the rear zone of the border but remain within the potential range of enemy weapons, it becomes imperative to consider the risk of airstrikes. This concern is particularly pertinent settlements such as Ijevan and Vayk.
- c) When livelihood facilities are situated far from the military contact line, within a relatively safe zone, spatial planning measures become crucial for rapidly organizing and furnishing the spatial environment in response to a military threat. This is particularly pertinent in a city like Yerevan.

Taking the Syunik Region as an example, it is noteworthy that the main settlements within the region are border settlements located within Zones a) (Fig.1).



Fig. 1. Map of Border Settlements in the Syunik Region of Armenia

The military resistance of buildings and structures is significantly influenced by the physical terrain, tectonics and spatial planning characteristics. Natural landscape features, especially in mountainous areas, serve as natural barriers, both between buildings and for underground infrastructure placement. Blast waves refracted by the ground are subject to reflection by terrain type and elevation irregularities. Depending on the slope of the ground, these waves can bounce backward or forward. In this context, the selection of materials to cover the environment and their fragility become crucial factors aimed at minimizing the generation of destructive fragments during an explosion [7]. In this regard, Armenia, known for its mountainous terrain and a historical legacy of leveraging landscape features for strategic defense since ancient times, holds significant potential to utilize its physical terrain for enhancing modern national security measures. So, the integration of landscape characteristics with construction forms and density is a complex system that profoundly affects the military resistance of a settlement⁸.

For instance, ground characteristics in residential areas play a crucial role as they determine the varying effects of weapons based on the surrounding ground attributes (Fig.2).

The analysis of military-geographic characteristics of settlements and the implementation of military resistance measures will serve as a basis for the development of various military theories, and the creation of spatial environments adapted for the use of special military equipment and weapons for combat operations [1].



Fig. 2. *The impact crater in a residential neighborhood in Stepanakert, Sasountsi David Street after aircraft attack, 2020, photo source: Human Rights Watch*



Fig. 3. *Effects of a Smerch Artillery Rocket Strike on the Maternity Ward of the Republican Hospital in Stepanakert, 2020, photo source: Human Rights Watch*

The nature of weaponry employed by the adversary stands as a crucial factor. Understanding the arsenal of military resources at the opponent's disposal allows for predictions regarding the potential minimum and maximum impact of their means. Each weapon category possesses distinct characteristics, causing specific forms of damage and impact [9].

Assessment of damage to buildings and infrastructures typically involves evaluating the effects of these phenomena on diverse structures. This assessment considers the construction materials, design principles, and the resulting post-damage condition.

For example, during the 44-day Artsakh War of 2020, long-range rocket launchers were widely used. There were both high explosive and cluster projectiles in them. According to the analyses carried out by the research centers in 2021, it was recorded that the mentioned weapons are still present in the arsenal of the Republic of Azerbaijan [10]. This observation suggests the potential future deployment of these weapons by Azerbaijan, not only against the armed forces of the Republic of Armenia but also towards civilian settlements, should further conflicts occur (Fig.3).

⁸ Headquarters, Department of the Army Washington United States. Intelligence Support to Urban Operations. 2015. – C. 0110, pp 1(2)-1(3).

Considering that essential livelihood facilities might exist within the immediate danger zone; a primary requirement is to plan these facilities strategically [11]. This planning aims to ensure the population's shelter in a relatively secure manner and the resistance of the buildings. Architectural typologies can make military-resistant architectural solutions and can significantly mitigate damage caused by bombings [12]. Consequently, the ergonomic attributes of the architectural environment stand as pivotal factors in enhancing military resistance [13] (Fig.4).

In this context, planning and designing buildings and structures should facilitate:

- Mitigation of explosion aftermath,
- Establishment of systematic and streamlined crisis management strategies,
- Creation of conditions enabling the continuity of daily life activities during military operations [9],
- Adapt the settlement for territorial defense.

While organizing the territory, it is crucial to plan construction solutions facilitating safe and swift population evacuation and minimizing the impact of unit projectiles in the spatial environment.

Construction density. When developing projects for planning and constructing settlements in the border zones of the Republic of Armenia, it is essential to consider factors that directly impact increasing military resistance. The first aspect to address in enhancing military resistance is the density of construction in the area [3]. Unlike urban environments, which typically feature dense construction, rural areas tend to have more dispersed development. The extent of damage caused by a military weapon employed by the enemy is directly proportional to the density of the built-up area. Higher building density results in greater damage from a single shelling or bombing incident.

As illustrated in Figure 5, shelling often leads to damage to several attached residential houses at once, rendering them unusable and causing extensive injuries across a large area. Thus, it can be inferred that maintaining a certain distance between buildings and structures of different significance is a critical factor in increasing military resistance. Depending on the characteristics of the explosion - such as distance, caliber, and type of weapon, as well as the height of the explosion - the extent of injuries can also vary.

To address these concerns effectively, urban planners and architects should prioritize designs that incorporate appropriate spacing between structures. This strategic approach minimizes the impact of attacks, reduces collateral damage, and enhances the resistance of settlements in border zones. Additionally, implementing defensive measures and fortifications where feasible further strengthens military resistance and ensures the safety and security of residents.

During spatial planning, it's crucial to consider the positioning of residential buildings, structures, and infrastructures concerning strategic targets. This is because during military operations, hitting a target may cause damage to adjacent buildings of varying importance simultaneously. Special attention should be given to the military resistance of residential and public buildings located near potential military targets, ensuring a safe distance between them.



Fig. 4. A residential building destroyed by shelling in Borodyanka, 2022, photo source: Reuters Photo



Fig. 5. Residential houses after shelling, Artsakh 2020, photo source: Armenian Unified Infocenter

For instance, in 2020, an attack on the electric substation of Stepanakert resulted in at least 10 impact sites within a 300-meter radius. Some of these strikes directly targeted the main control building for transformers and sub-transmission lines, leading to damage to the substation and several nearby residential and commercial buildings. Additionally, strikes targeted the courtyard of School No. 10 (Fig.6)⁹. From this, it's evident that maintaining a specific safe distance and establishing a neutral zone is imperative.

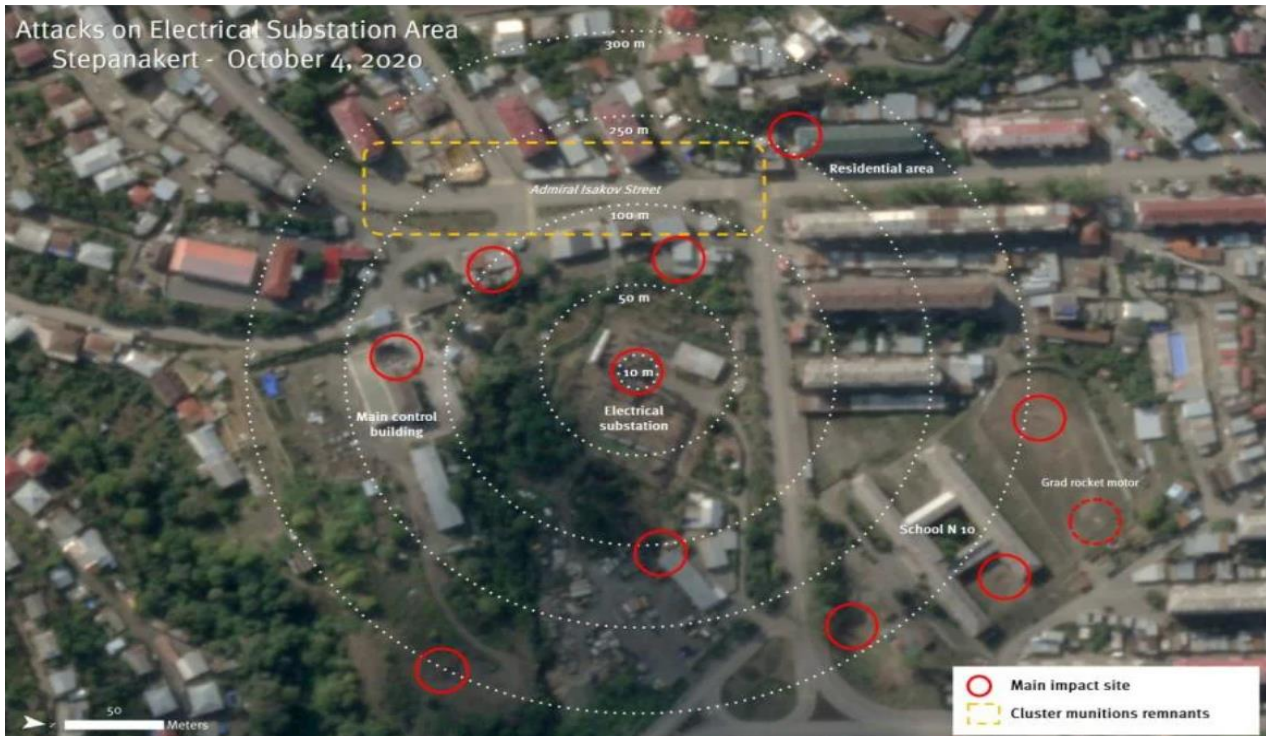


Fig. 6. Attacks on Electrical Substation Area, Stepanakert, October 4, 2020, photo source: Human Rights Watch

Military resistance demands theoretical analysis coupled with derived technical solutions. The nature and accumulation of debris hinge not just on the weapon type but also on building and structure types, construction materials, and density. Hence, considering the selection of construction materials and the potential risk of debris collapse is vital when situating emergency transit exits.

Conclusion

The specific cases outlined in this research offer a foundation for drawing overarching conclusions concerning the resistance of buildings and structures against the destructive impact caused by combat munitions.

The Republic of Armenia, despite its small territory, hosts a relatively large number of border settlements, leading to significant security challenges. Addressing these challenges necessitates a comprehensive approach that incorporates insights from military science, spatial planning, and architectural considerations.

The analysis of various scientific and research studies pertaining to contemporary armament, alongside an examination of international territorial defense concepts and existing normative and technical documents, underscores the significance of employing terms like "military resistance" and "military-resistant architecture" to characterize the spatial environment of border settlements in the Republic of Armenia in the context of military operations. This is particularly emphasized through the delineation of specific scientific and methodological principles required for the development of the theory of military-resistant architecture.

⁹ Azerbaijan: Unlawful Strikes in Nagorno-Karabakh, Investigate Alleged Indiscriminate Attacks, Use of Explosive Weapons, December 11, 2020 3:00AM EST

- They define minimum mandatory requirements for ensuring the military protection of buildings and structures, considering the problem in the spatial planning system. These fundamental requirements are suggested for incorporation into normative and technical documents.
- The considerations concerning the military resistance of border regions warrant a distinct level of analysis compared to general assessments. Spatial planning for each border area should meticulously integrate criteria for military resistance, considering whether the area is integrated into the territorial defense system or not.
- When evaluating military resistance, the assessments must be based on analyses of existing high-precision weaponry and their impact, historical prototypes, and technical and methodological attributes.
- Maintaining a certain distance between buildings and structures of different significance is a factor of increasing military resistance.

Conflict of interest

The author declares that there is no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

Financing

The study was performed without financial support.

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