

MANAGEMENT OF THE COUNTRY'S DEFENCE CAPABILITIES, STRATEGIC DIRECTIONS FOR THE DEVELOPMENT OF THE UKRAINIAN ARMED FORCES, AND ENVIRONMENTAL DEGRADATION DURING WAR

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Abstract. This article examines the strategic priorities of the Armed Forces of Ukraine regarding economic and military defence, as well as the selection of an effective defence strategy based on economic capabilities and the actions of aggressor states. *Methodology.* The latest methodological strategies and technologies. The focus of the analysis is on the proliferation of technologies designed to support military operations, which have become central to strategies for defence capability and an appropriate response to an aggressor. *Results.* According to the table provided in this paper, the main problems facing Ukraine in the pre-war period were the underdevelopment of the following defence strategies: the creation of an effective system for recruiting and manning the defence forces; the underdevelopment of the intellectual capacity to supply weapons produced by the defence industry; the contamination of the sites of Ukraine's production facilities and the lack of fortifications; low levels of overall firepower and durability; the lack of a clear transition to NATO standards; the public's lack of readiness for war; a large pro-Russian population; and the government's weak stance on issues relating to the Constitution of Ukraine. *Practical implications.* Assessing a country's defence capabilities and the impact of various types of pollution on the environment requires a detailed examination of the indicators that influence these factors in practice, and the application of these practical findings. This paper examines the strategic directions for the development of the Armed Forces of Ukraine and the losses incurred by Ukraine as a result of environmental pollution during wartime. Assessment of the impact of various types of pollution on the environment. There are three clusters in which losses are taken into account: 1. Losses in underestimated monetary terms, mainly related to wildlife; 2. Average losses resulting from air pollution, damage to wildlife and land resources; 3. Losses of water resources. Environmental pollution in Ukraine during the war remains outside the scope of intellectual capital for strategic thinking. The use of weapons is not always guided by artificial intelligence tools to adjust decision-making and combat operations with minimal losses. Ukraine possesses a variety of powerful ground- and sea-based strike drones capable of intercepting enemy assets. *Value / Originality.* Ukraine possesses a diverse range of powerful land- and sea-based strike drones capable of intercepting enemy targets. The specifications of most of them remain classified, but this is what determines the key strategic advantages in the war against the aggressor. Weapons that surpass the capabilities of nuclear weapons may also feature in military operations.

Keywords: strategic priorities, intellectual capital, clustering, indicators, war, environment.

JEL Classification: C53, O31, K14, F35

1. Introduction

The end of the second decade of the 21st century was marked by a global landscape of significant military conflicts between states, in which, as a rule, the

militarily stronger state disregarded the interests of its neighbours. First and foremost, Russia refers to states such as Georgia, Moldova and Ukraine (Porokhnya & Ostapenko, 2019). In the pre-war period, Ukraine did

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not prepare adequately for this war. In many respects, the authorities paid no attention to Russia's rearmament and preparations for an attack (Mearsheimer, 2014). Ukraine weathered the first months of the war thanks to the spirit of the Ukrainian people, who have preserved their glorious heritage. The aim of the study is to outline strategic directions for the development of the Armed Forces of Ukraine and environmental protection by integrating intellectual capital and artificial intelligence into the country's defence capabilities (Porokhnya, Mashchenko, & Semenov, 2025).

In Ukraine, energy capacity has fallen sharply, environmental disasters are on the rise, and these issues are having a constant impact on the country's economic situation; they must be addressed urgently, swiftly and decisively (Tollefson, 2022).

Recently, researchers in Europe have been paying less and less attention to military developments in Ukraine. This is confirmed by the trend in military-related publications, which is declining month on month and has already fallen by more than 50%. Sport, art and culture in a state of war have become more interesting to countries that have forgotten that they, too, are sitting on a powder keg (Sobolieva, Labov, Nielsen, 2026).

Research in this field relies heavily on references and publications, as it is still in its early stages of development and most studies do not draw on the actual situation that has arisen in this war against the aggressor. It is based on real data and is significant.

2. Theoretical Basis

General Valerii Zaluzhnyi has largely outlined theoretical approaches to defence strategy in the development of combat strategies, which were put into practice during the defence of Kyiv, Kharkiv and other Ukrainian cities, placing great emphasis on innovation as the foundation of a strategy of sustained resistance, as well as on Ukraine's experience regarding the future security of Europe. These are usually published in world-renowned newspapers, but there is a need for further research into the military issues mentioned, which sometimes arose for the first time on the front lines of military operations. This marks the first instance in Ukraine where the use of various drones is being established, and the first time an institutional methodology has been developed; this methodology has gradually been developed and researched by both domestic and international scholars, such as Jeff Tollefson, John J. Mearsheimer, M. Krasikov, S. Grinchuk, O. Ovchynnikov, O. Mashchenko and O. Ostapenko.

The relevance of military research lies in producing results that will accelerate its impact on the actual resources deployed in warfare and determine the

effectiveness of military operations. Through scientific doctrines, the world will find ways to combat evil.

3. Results

The central question is whether Ukraine will be capable of formulating an effective defence strategy, both economically and militarily, in accordance with its economic capabilities, and in the face of aggression from invading states. In order to trace the development strategy of the country's defence capabilities, it is necessary to examine the data from previous years, as illustrated in Table 1.

If one looks at the indicators for countries such as the US, Russia, China, Poland and Turkey, which played a significant role in economic policy and political relations in the pre-war period up to 2022: GDP, in billions of US dollars, imports/exports, imports and exports of goods and services, value added in the manufacturing sector, household expenditure, gross capital formation, market capitalisation of companies, GDP per capita, net government debt, net outflow of foreign direct investment, net inflow of foreign direct investment, primary energy production, primary energy consumption, net energy imports as a share of energy consumption by countries – it should be noted that Ukraine's entry into the war period was challenging (Porokhnya & Ostapenko, 2019).

In order to obtain indicators of a country's economic and military security, reference will be made to the results of their assessment based on the Global Firepower Index, the Military Capability Index and the Credit Suisse Institute's indicators, as derived from previous studies (Porokhnya & Ostapenko, 2019). A comparative analysis will also be carried out in Table 2.

Table 3 shows the possible proportions of support for the development strategies of the Armed Forces of Ukraine in the pre-war period, indicating that, within the limits of its defence capabilities, Ukraine faces challenges in terms of arms production (Porokhnya & Ostapenko, 2019).

According to the table above, the main problems facing Ukraine in the pre-war period were the underdevelopment of the following defence capability strategies: 1. The establishment of an effective system for recruiting and manning the defence forces; 2. The underdevelopment of intelligent weapon systems produced by the defence industry (DI); 3. The contamination of Ukrainian production facilities and the lack of fortifications; 4. Low levels of overall firepower and durability; 5. The lack of a clear transition to NATO standards; 6. The moral unpreparedness of society for war; 7. A large pro-Russian population and the government's weak stance on these issues, which relate to the Constitution of Ukraine.

Table 1

The influence of criteria on the selection of alternatives (properties) in decision-making

Indicators	Ukraine	Russia	Difference	Russian losses
Total Population, million	43306477	141698923	98392446	0
Population Fit for Military Service	15460412	46477247	31016835	0
Active Military Personnel	900000	1320000	420000	0
Reserve Personnel	1200000	2000000	800000	0
Military Personnel (persons)	100000	250000	150000	1300000
Defence Budget (billion)	42000000000	109000000000	67000000000	0
External Debt (billion)	500000000000	120000000000	380000000000	0
Foreign Exchange Reserves	30697000000	63224200000	60154500000	0
Purchasing Power Parity (PPP)	379893000000	407800000000	369810700000	0
Total Aircraft	321	4255	3934	435
Fighter Aircraft	72	809	737	0
Transport	24	453	429	0
Helicopters	130	1547	1417	0
Attack Helicopters	33	559	526	350
Tanks	1777	14777	13000	11841
Armored Vehicles	22110	161	139272	24368
Artillery	1205	6208	5003	39600
Missile Systems	491	3065	2574	4517
Naval Fleet	104	0	677	33
Submarines	0	0	65	2
Destroyers	0	14	14	0
Corvettes	0	83	83	0
Drones (UAVs)	0	0	0	225341

Table 2

Ranking of countries in the pre-war period according to the Global Firepower Index (GFI), the Military Capability Index (MCI) and the Credit Suisse Index (CSI)

Country	MCI	Priority based on the MCI	GFI	GFI Priority	CSI
Ukraine	0.96	3	0.54	4	30
Poland	0.70	4	0.43	3	17
Russia	1.93	1	0.08	2	2
Turkey	1.17	2	0.22	2	10

It is well known that many of the criteria in this task relate to intangible assets and can be assessed using Kaplan and Norton’s strategic maps.

The protracted war with Russia, which invaded Ukrainian territory, has shown that the pre-war defence strategy of Ukraine, and indeed of Europe, was ill-suited to modern warfare in the context of international armed conflicts. It is therefore necessary today to reform military standards not only at NATO level, but first and foremost within Ukraine. If one consider strategic priorities in percentage terms, the focus in these matters should now be on the following actions, as shown in Fig. 1 and Table 4.

In order to identify the key factors to consider when enhancing defence capabilities, the petal diagram should be referred to.

Figure 1 shows a petal diagram with indicators of the implementation of the relevant strategies, the areas of which represent the key characteristic of a state’s defence capabilities.

As illustrated in Figure 1, the primary factor influencing defence capabilities is the augmentation of knowledge, skills, experience, intellectual capital and the defence industry budget.

In summary, it is a specific approach to utilising intellectual capital.

Table 3

Pre-war strategies for the development of the Armed Forces of Ukraine

Strategies	Knowledge	Expenditures	Military Capability	DI	Budget DI	NATO
Focus on Air Defense	30	20	10	15	15	20
Focus on Missile Forces	20	20	10	15	15	20
Adoption of NATO Standards	20	15	15	10	15	25
Focus on Nuclear Weapons	25	10	15	20	20	10

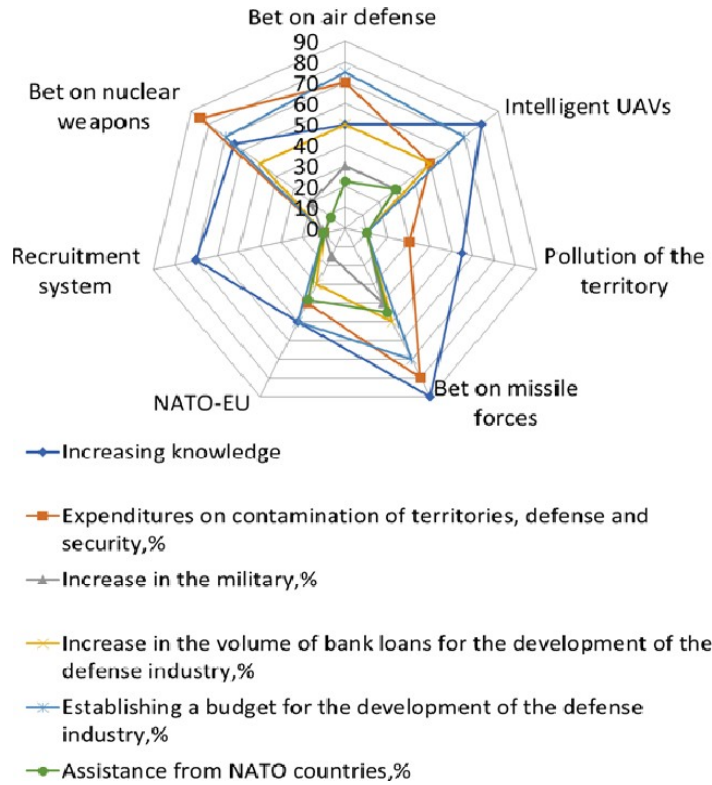


Figure 1. Characteristics of strategic directions for enhancing the country's defence capability

Table 4

The Ukrainian Armed Forces' strategies for modern warfare in the context of international armed conflicts

Strategies	Knowledge	Contamination	Military Capability	DI	Budget DI	NATO
Focus on Air Defence	20	20	10	15	15	20
Intelligent UAVs	30	30	5	10	15	10
Territorial Contamination	30	30	10	15	20	15
Focus on Missile Forces	20	20	10	20	25	20
NATO-EU Integration	20	15	10	15	15	20
Personnel Recruitment System	30	15	10	15	20	10
Focus on Nuclear Weapons	30	15	15	15	15	10

The evaluation of a nation's defence capacity necessitates a comprehensive examination of the factors that impact it. The grouping of these factors enables a focus to be placed on indicators of paramount importance, as demonstrated in Table 5 and Figure 2.

According to Table 5, the first cluster comprises the indicators on which the management strategy

primarily focuses, specifically the promotion of intelligent UAVs and missiles. The second cluster is of particular significance and is comprised of the following indicators: the share of high-tech exports, the Human Development Index, and the availability of UAVs. The third cluster depends on the proportion of environmental protection expenditure within the total

Table 5
Indicators (shares) characterising a country’s defence capability

Strategies	Share	Wtght	Result
High-tech products in export	0.73	0.8	0.58
Human Development Index	0.78	0.8	0.64
Social Health Index	0.65	0.9	0.59
Military (man) for the Russians	0.4	0.7	0.28
Spend on the development of defense	0.6	0.9	0.54
The presence of missile and space forces	0.2	0.5	0.1
The presence of strategic missile forces	0.4	0.9	0.36
Part of the budget in the global budget	0.6	0.8	0.48
The presence of UAVs	0.7	1	0.7
Intelligent UAVs and missiles	0.6	0.9	9.54

military budget. The fourth reflects the strategy for future periods: the ratio of military personnel to the presence of Russian forces; the presence of strategic missile forces; and the presence of strategic missile forces.

During the war, there was significant environmental pollution: 1. Atmospheric pollution caused by harmful substances, leading to the greenhouse effect. 2. Environmental disasters, such as the explosion at the Kakhovka hydroelectric power station and the discharge of pollutants into water resources; 3. The destruction of land resources by explosives, which often leads to fires on land and in forests with catastrophic consequences; 4. The destruction of wildlife and vegetation; 5. The extraction of land and water resources, leading to unforeseen destruction and pollution of territories in Ukraine.

Unfortunately, environmental pollution in Ukraine during the war is generally overlooked in

terms of intellectual capital and strategic thinking. The development, deployment and use of weapons in warfare do not yet take into account the environmental damage they cause. In such cases, weapons are equipped with artificial intelligence tools that enable combat operations to be adjusted with minimal losses. The first two years of the war brought significant suffering to Ukraine. In addition to the pollution of air, soil and water, the environment was damaged, and approximately 175 million tonnes of carbon dioxide equivalent were emitted (Ovchynnikov, 2024). According to the organisation Ecodia, 150 million tonnes of CO2 equivalent were emitted into the atmosphere (Ovchynnikov, 2024; Grinchuk, 2025). Emissions resulting from military operations are estimated at approximately 37 million tonnes of CO2, whilst the corresponding emissions from fires amount to 22.2 million tonnes. Environmental restoration accounted for 57 million tonnes of CO2 equivalent.

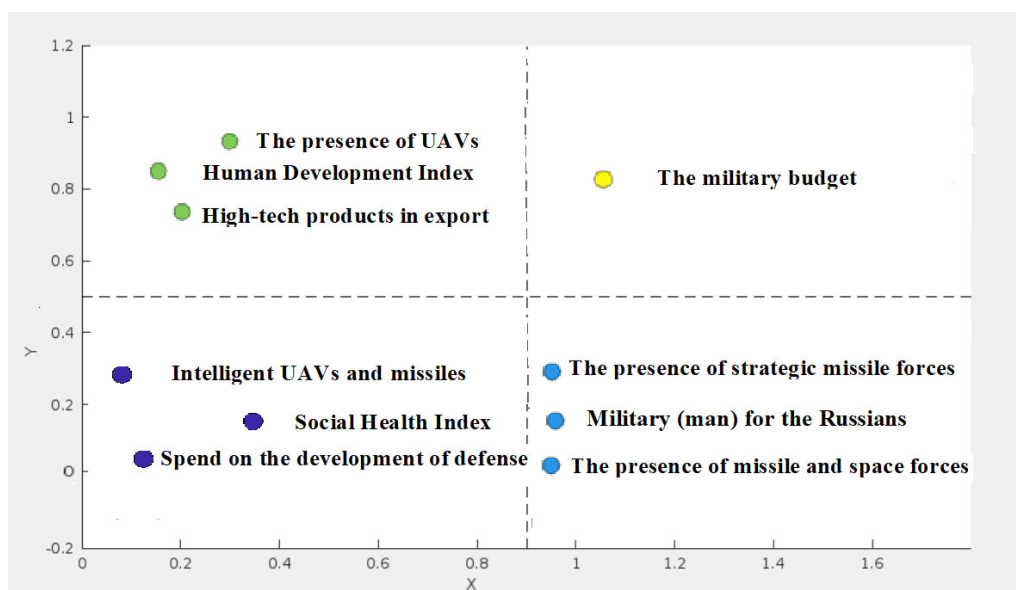


Figure 2. Cluster Analysis of Defence Capabilities

The methodology for assessing greenhouse gases is set out in Ecodia's report 'Climate Damage Caused by Russia's War in Ukraine' (Severyanin, 2024). Experts have estimated the cost at 64 tonnes of CO₂ equivalent for 2022–2023, amounting to nearly 9.6 billion USD. Looking at Ukraine's losses from the start of the war until September 2024, the following aspects of the natural environment have been significantly affected: atmospheric air; wildlife; and land and water resources.

It is estimated that Ukraine has suffered considerable losses since the onset of the war, with figures reaching millions of tonnes and billions of dollars. Therefore, the corresponding values for atmospheric air are 113.4/17.7; for the animal world, 75.0/15.2; for land resources, 20.8/27.9; and for water resources, 68.8/2.1.

The present study aims to assess the extent to which different types of pollution affect the environment. The results of the cluster analysis of the data are presented in Figure 3, based on the following input data:

$P(1,:) = [113,4 \ 75,0 \ 20,8 \ 68,8 \ 150 \ 90 \ 40 \ 130]$ (billion USD);

$P(2,:) = [17,7 \ 15,2 \ 27,9 \ 2,1 \ 20 \ 30 \ 40 \ 10]$ (millions of tons);

Figure 3 shows three clusters: 1. Losses in underestimated monetary terms, mainly related to wildlife; 2. Average losses from air pollution, damage to wildlife and land resources; 3. Losses of water resources. The destruction of the Kakhovka dam and, consequently, the hydroelectric power station has become a familiar occurrence in Europe and America. These events have been etched forever in the memory of Ukrainians. Naturally, Ukraine will continue to remind the world of 'who is who' in this war.

At the international conference in Rome on the reconstruction of Ukraine, URC-2025, according to Svitlana Grinchuk, the environmental damage caused by the war has already reached 108 billion euros – reconstruction is a matter not only of national security, but also of the security of the entire continent (Grinchuk, 2025). It is worth noting that this

includes the destruction of the Kakhovka dam, the Chernobyl disaster, and possibly the Enerhodar incident. Therefore, in addition to the aforementioned strategies of the Armed Forces of Ukraine, Ukraine's intellectual capital must now take into account all possible consequences, assessing not only military actions.

Table 6 presents enterprises of the Russian military-industrial complex that have caused environmental damage in Ukraine. For the Armed Forces of Ukraine, the location of these research and development enterprises is an important factor in strategic decision-making. Among them are the Raduga Machine-Building Design Bureau (Dubna), the Energetika Plant, Splav Research and Production Association (Tula), the Kalashnikov Concern, the Titan-Barrikady Plant (Volgograd), and the Novator Design Bureau (Porokhnya & Ostapenko, 2019). More recently, the Kalashnikov Group of Companies in Izhevsk, which began the production of ZALA Lancet unmanned aerial vehicles in 2019, has attracted particular attention from the Armed Forces of Ukraine. A production facility for Shahed drones was established in Alabuga, while the Raduga Design Bureau in Dubna is responsible for the design and manufacture of cruise missiles. Although the number of such enterprises is considerable, Ukraine continues to monitor them closely and treat them as potential strategic targets of interest. It is well known that a large number of missiles launched by Russian forces against Ukrainian cities in 2025, and an even greater number in 2026, originated from facilities associated with the Russian defence industry. This trend is illustrated in Figure 4.

As can be seen in Table 7, Ukraine's missile forces have created an almost insurmountable barrier for the enemy in the short period of the war thanks to their formidable missile arsenal, which clearly surpasses the capabilities brought by the aggressor from Russia. Thanks to their arsenal of advanced weapons and new tactics, the Ukrainian Armed Forces are now capable

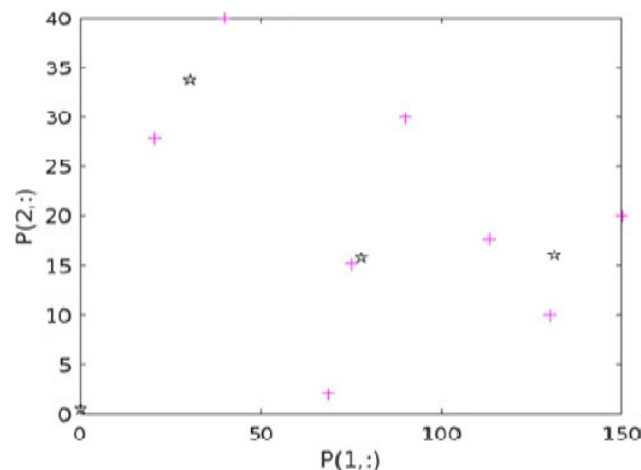


Figure 3. Cluster Analysis of Data

951 MISSILES LAUNCHED BY RUSSIA IN 2025

Number of missiles launched and intercepted in 2025, units*

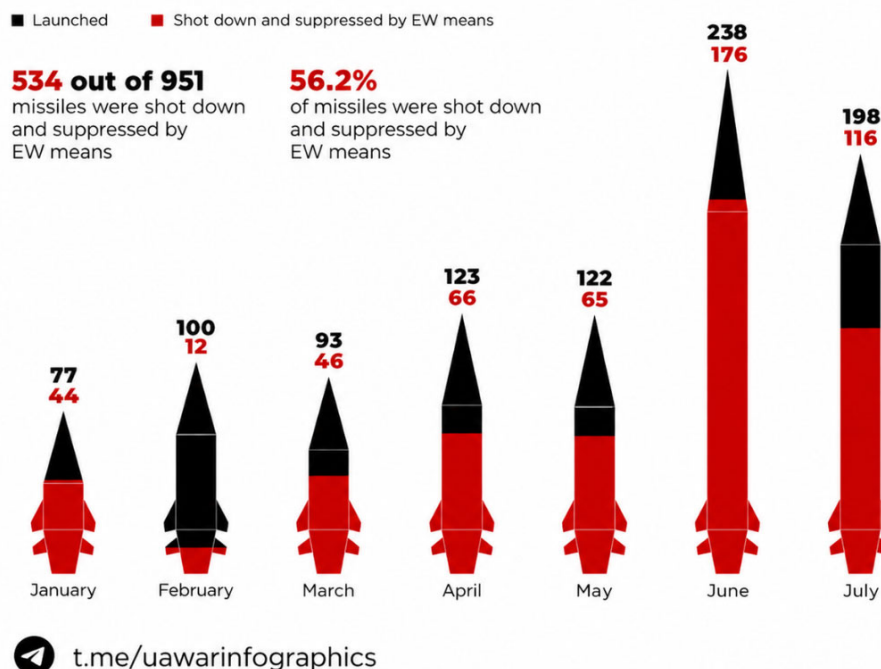


Figure 4. Missiles launched by the Russians in 2025, according to the General Headquarters of Ukraine

Table 6

Russian defence industry and its contribution to environmental damage in Ukraine during the war

Types of Weapons	Defence Industry Enterprises (Russian Federation)	Waste Weapons	Environmental Damage
Missiles:	Raduga Design Bureau, Energiya, Alabuga	3.0	62.9 billion
Kalibr, S-400, Iskander, Kinzhal			
Tanks and UAVs:	Arzamas, Chelyabinsk, Uralvagonzavod		4.51 billion
Artillery Systems:	Uralmash	284.5	
Guns and Howitzers			

of launching a counter-offensive and demanding that the aggressor voluntarily withdraw from Ukrainian territory.

As for missiles, these include the Flamingo, Neptune and Sapsan missiles, ballistic missiles, as well as various types of UAVs. The manoeuvrability of cruise missiles and UAVs has increased. Some UAVs serve as missile carriers or have been converted into cruise missiles, and, like cruise missiles, are equipped with a combined guidance system capable of using satellite navigation and infrared cameras. Consequently, the end of the war will come in the near future, which depends to a large extent on the intellectual capital accumulated within the Armed Forces of Ukraine. Alongside artificial intelligence, which is guided by intellectual capital in

the creation of the Ukrainian Armed Forces' missile forces, environmental pollution in both the aggressor's territories and in Ukraine is taken into account.

In this regard, cognitive operations play a significant role. They are designed to exert psychological pressure on the enemy regarding the damage inflicted on Ukraine's resources: water, energy, oil and arms production. This is a war for the survival of human resources, and intelligence plays a key role in it.

The US and Europe, particularly Russia, do not recognise Ukraine's intellectual capital, but the FP-7 and FP-9 ballistic missiles and UAVs developed domestically could change this misconception about the country's capabilities. Military experts' views on warfare vary somewhat depending on the characteristics of modern

Table 7

Some of Ukraine's missile systems, designed to counter the aggressor, have recently

Specifications	Flamingo	Sapsan	Neptune 360	Neptune's Land	Vilkha M2
Navigation elements	Combined	Combined	Combined	Combined	Combined
Range, km	3000	500	400	1000	202
Missile length, mm	6000-7000	7200	5050	5050	7600
Missile weight, kg	6000	3500	870	870	860
Weight of the warhead, kg	1150	480	150	350	170-236
Speed	950 km/h	6370 km/h	900 km/h	900 km/h	3.4 Mach
Similar types	Kalibr (b/h)	Iskander	Harpoon	Harpoon	Tornado-S

weapons, such as: the FP-7 ballistic missile (range up to 300 km, speed up to 1,500 m/s, warhead weight 150 kg, accuracy 14 metres, flight altitude approx. 65 km), FP-9 (range 855 km, speed 2200 m/s, warhead weight 800 kg), accuracy 20 metres, flight altitude around 70 km, 13–15 minutes to target, missile cost up to 2 million dollars) and the Flamingo-type cruise missile – range around 3,000 km. In such a scenario, enemy air defences would be unable to prevent the missile from penetrating their territory, both within Europe and beyond the Urals (Krasikov, 2025).

Ukraine possesses a diverse range of powerful land- and sea-based strike drones capable of intercepting enemy assets. The specifications of most of these remain classified, but this very fact determines the key strategic advantages in the war, as the aggressor has become preoccupied with copying the latest weaponry. Weapons that exceed the capabilities of nuclear weapons may also feature in military operations.

3. Conclusions

The key factor influencing defence capabilities is the growth in knowledge, skills and experience, which constitute intellectual capital. A budget has been

allocated for the development of the defence industry. Overall, the need to give particular consideration to the use of intellectual capital when assessing a country's defence capabilities requires a detailed examination of the indicators that influence it. Assessment of the impact of various types of pollution on the environment. There are three clusters in which losses are taken into account: 1. Losses in underestimated monetary terms, mainly related to wildlife; 2. Average losses resulting from air pollution, damage to wildlife and land resources; 3. Losses of water resources. Environmental pollution in Ukraine during the war remains outside the scope of intellectual capital for strategic thinking. The use of weapons is not always guided by artificial intelligence tools designed to optimise decision-making and combat operations with minimal casualties. Ukraine possesses a diverse range of powerful ground-based and maritime strike drones capable of intercepting enemy assets. The specifications of most of these remain classified, but this is what defines the key strategic advantages in the war against the aggressor. Weapons that surpass the capabilities of nuclear weapons may also feature in military operations.

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