



STRATEGIC IMPACT OF TERRAIN ANALYSIS ON CHAD'S MILITARY OPERATIONS AGAINST TRANSNATIONAL SECURITY THREATS IN THE WEST AFRICAN SUB-REGION

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ABSTRACT: Military operations across the globe have taken numerous dimensions, becoming more dynamic, dangerous and complex, and, of course, entail an acceptance of risks, while the African states' military formations are not spared. Over a decade, the Chadian Armed Forces have suffered more non-combat than combat losses from Boko Haram/ISWAP terrorists and other transnational security threats in the West African sub-region. This is due to a rapid change in physical environment, equipment failures, speed and high frequency of operations and human error arising from poor terrain analysis of the battle space. Previous studies focused on the Boko Haram insurgency in Chad and its implications for national security, with little attention paid to the strategic impact of terrain analysis on the country's military operations against transnational security threats. This study examines the key elements of terrain analysis, methods of conduct, strategic impacts, and its challenges in the Chadian military operations. The paper reveals that terrain analysis encompasses the process of evaluating and interpreting the natural and man-made features on the earth's surfaces for the purpose of planning military operations and environmental studies with tools like digital elevation models and Geographic Information Systems (GIS) for accelerated accuracy. Systematic evaluation, field surveys, and aerial reconnaissance utilizing aircraft, among others, were the methods of conducting it. Terrain analysis plays strategic roles in the evaluation of landscape, allowing for understanding the nuances of terrains for advantageous positioning of the forces for war, among others; while the problem of integrating diverse data sources, poor understanding of terrain analysis, among others, remains the challenge of terrain analysis in military operations. The study recommends the need for integrating artificial intelligence and leveraging the real-time data in terrain analysis in adapting to all dynamic changes in Chad's military operations.

KEYWORDS: Terrain analysis, Military operations, Geographic Information Systems, Chad.



INTRODUCTION

Military operations across the globe remain highly dynamic, dangerous and complex, and, of course, entail an acceptance of risks. But uncaredful military forces in some states globally have suffered more non-combat losses than combat losses from the enemies as a result of rapid change in physical environment, equipment failures, the speed and high frequency of operations and human factors arising from poor terrain analysis of the war space (Abiodun & Raheem, 2020). Where necessary, armed or security forces use terrain for positional advantage. They maneuver in terrain to bring firepower to the enemy and use firepower against the enemy to cover their movement.

In the 20th century, there were officers and military cough-outs that affirmed weather and terrain as factors affecting offensive and defensive military action more than any other physical factors (equipment, weapons, supplies) (Gerald, 2021). Therefore, the impact of terrain on past battles is studied in an effort to predict the importance of terrain in future western military engagements. However, the impact of terrain and terrain analysis on past combat outcomes has often not been studied adequately (Gerald, 2021), particularly the relative impact of terrain versus other factors such as communications, firepower and firepower accuracy, leadership, motivation, discipline, etc.

The form of engagement of western armies has changed to a degree since the end of the twentieth century from large-scale movement and engagement in natural surroundings to clashes with guerrillas in urban agricultural and often arid Moslem regions (Gerald, 2021), strategically aimed at limiting offensive guerrilla and terror capabilities in western countries. As technology has advanced exponentially (i.e., cyber warfare, UAV reconnaissance, precision targeting systems, satellite communications, etc.), there are decision-makers and western army commanders who maintain that the relative importance of terrain and military geosciences for present and future warfare has declined (Hoiston, 2012).

Nevertheless, even though technological developments have somewhat reduced the relative importance of terrain for combat outcomes, there is currently less emphasis on the importance of terrain, it is expected that terrain is often important in combat between guerrilla and conventional forces and soon may become even more important. Based on the above, this study, however, examines the crux of global terrain analysis, methods of conduct, strategic impacts, and challenges of terrain analysis in Chad's military operations against Boko Haram/ISWAP terrorists and other transnational security threats in the West African sub-region (Abdul, 2015).

Conceptual Clarifications

Military Terrain

The term *terrain* refers to the physical setting of the battles studied. Terrain underpins military engagement. In military terms, terrain is an area of ground whether large or small, whose physical features affect its suitability for military or security purposes (Doyle & Bennet, 2002). Terrain refers to the physical characteristics of the earth's surface, which includes natural features of a region, such as landforms and elevation, are driven by a number of factors, including climate and geology. In physical geography, terrain is the lay of the land. This is usually expressed in terms of the elevation, slope, and orientation of terrain features.



Moreover, there are six types of military terrain according to Sun Tzu's *Arts of War*, which include a. *Accessible ground*: here, both warring sides can freely move across this particular terrain. b. *Entangling ground*: This particular terrain is very hard to reoccupy after being abandoned. c. *Temporizing ground*: in this terrain, neither side will gain any benefit of war by making the first move here. d. *Narrow passes*: In case this terrain is occupied first, the occupiers have to garrison the terrain and then wait for their enemies. e. *Precipitous heights*: If a particular warring party is first to arrive, according to Doyle and Bennet (2002), it is expected to quickly occupy the sunny and raised spots and wait for the enemy to advance.

Also, *Open ground*: In this particular terrain, both warring sides have the freedom to move across the terrain. g. *Intersecting highways*: The key to three contiguous states is held on this ground. i. *Serious ground*: This actual terrain is reached when an army has penetrated deeply into a particular hostile state. j. *Difficult ground*: The terrain is very hard to traverse, as it is full of marshes, fens, rugged steeps, and mountain forests. k. *Hemmed-in ground*: here on this terrain, retreat is never possible or allowed because it is blocked on this terrain; and l. *Desperate ground*: There is no place of refuge on this actual terrain (Doyle & Bennet, 2002).

Terrain Analysis

Terrain analysis is the study of the geographical surface and its features. Its purpose is to evaluate the suitability of an area for various uses, supporting projects that range from engineering to urban planning (Doyle & Bennet, 2002). Terrain analysis consists of interpreting natural and man-made features of a geographic area, together with the influences of weather and climate, to determine their effects on military operations. It is also the process of evaluating and interpreting the natural and man-made features on the Earth's surface for purposes such as planning, military operations, and environmental studies, utilizing tools like digital elevation models and geographic information systems (GIS) for enhanced accuracy.

By understanding aspects like slope, elevation, and terrain roughness, you can predict water flow, assess suitability for construction or agriculture, and identify strategic locations. Terrain analysis aids in making informed decisions by providing comprehensive insights into the spatial patterns and physical characteristics of a specific area. The key elements of terrain analysis include the physical features of the land, climatic conditions, and human factors influencing terrain use.

Each component, therefore, plays a significant role in shaping tactical maneuvers:

The physical characteristics of terrain involve elevation, slope, and vegetation. These factors determine visibility, camouflage opportunities, and movement capabilities for both forces and vehicles. Understanding the elevation can also impact artillery range and air support effectiveness. *Climatic conditions*, such as weather patterns and seasonal changes, directly affect troop movement and operational readiness. Additionally, environmental factors like rivers and marshlands can impede or facilitate operations, making it vital for military planners to account for such elements (Africa Center for Strategic Studies, 2020).

Human factors consider existing infrastructure, population density, and cultural elements that may influence military strategies. By analyzing these key elements of terrain analysis, commanders can enhance their tactical decision-making and operational success in military engagements.



THEORETICAL FRAMEWORK

The paper adopted Carl von Clausewitz's Theory of Victory. The bane of the theory states that victory is the goal of combat, and strategy uses victory to attain the desired peace. Although he characterized victory as "the retirement of the enemy from the field of battle," more importantly, the moral force of victory is to bend the enemy's will to friendly designs (Gerald, 2021). This characterization leads to understanding the principles that underlie combat, such as hostility or enmity that should be subordinate to reason but often overwhelms rational calculation.

It is also clear that Clausewitz championed the modern conceptualization of combined arms warfare with his "two modes of fighting—close combat and fire combat." One is a "destructive act," the other a "decisive act." Close combat represents maneuver, and fire combat represents fires supporting maneuver.

As Gerard (2021) explains, fire combat is destructive but does not provide the certainty of victory. Close combat, or the ability to close with and destroy the enemy, makes it the decisive mode of combat: "the decision is that event which produces in one of the Generals a resolution to quit the field." Of interest to planners is Clausewitz's timeless wisdom that event-based criteria establishing conditions for decisive action are superior to operating according to a specified time. For anyone interested in strategy or tactics in winning, it is expected of all military formations to engage in terrain analysis before the troops advance for combat on the field in order to minimize losses.

Research Methodology

The study employed the qualitative descriptive design as it is actually meant to expand a richly detailed understanding of a particular topic, phenomenon or issue based on first-hand experience. Data for the study were sourced from both the primary (in-depth interview guide and administration of questionnaire) and secondary sources. The study examines the terrain analysis of dangerous war spaces and its impact on military operations in the Republic of Chad. Copies of the structured questionnaire were distributed to a total sample of 150 participants, while interviews were held with 6 key informant interviewees (KIIs) in the relevant agencies and experts on military operations in the country.

The study population included officers of the Chadian Armed Forces, living victims of war in Lac Province, repentant insurgents, community leaders, and security analysts/experts in selected areas in the country. The selected respondents were considered to be versed, knowledgeable and also mature enough to discuss the social phenomenon under investigation. The Republic of Chad was purposively selected due to her long years of military operations and battle with Boko Haram insurgency and other transnational security threats in the Lake Chad region.



Review of Related Literature

The Republic of Chad and Structure of Its Armed Forces

Chad, as the study area, is a vast landlocked country in the Central African Sub-Region, covering an area of 1,284,000 square km. It had a population of 12.2 million inhabitants in 2017, 44% of whom are below 14 years. Nearly 78% of the population lives in rural areas. Chad is endowed with diverse natural resources, including petroleum, uranium, gold, limestone, neutron, etc., as well as cultivable land (Andrew, 2023). Despite these abundant resources, Chad is still faced with poverty and food insecurity (Andrew, 2023). Close to half of the population (47%) lives below the poverty line. Chad, however, is ranked 186 out of 189 according to the UNDP 2017 Human Development Report, with a human development index of 0.404. This is below the sub-Saharan African average of 0.537. With regards to SDG Goal 6, which ensures access to water for all, Chad's access to drinking water is around 61%. This means that around half of the population doesn't have access to safe drinking water. The rate of access to hygiene is one of the lowest globally, around 18%. Infant mortality stands at 85 per 1,000 live births compared with an average of 56 for sub-Saharan African countries (Andrew, 2023).

The Chadian Armed Forces, or Forces Armées Nationales Tchadiennes (FANT), are made up of the National Army, Republican Guard, and other units. Their main role is to fight rebel groups in Chad (Andrew, 2023). The Forces include: *National Army*: Comprises the Ground Forces, Air Force, and Gendarmerie; *Republican Guard*: A unit of the Chadian Armed Forces; *Rapid Intervention Force*: A unit of the Chadian Armed Forces; *Police*: A unit of the Chadian Armed Forces; and *National and Nomadic Guard (GNNT)*: which is a unit of the Chadian Armed Forces. In terms of equipment deployment, the Chadian Armed Forces make use of small arms, anti-tank weapons, anti-aircraft weapons, artillery, tanks, tank destroyers, and armoured vehicles while in the areas of military operations, the Chadian Armed Forces are primarily active in the Lake Chad region, where they counter insurgencies and are also involved in nationwide security operations (International Crisis Group, 2020).

In the areas of support and military service, the Chadian Armed Forces are an important ally to French and U.S. forces in the fight against jihadi insurgencies in West Africa, while people usually volunteer for enlistment into the military service at the age of 18, and are considered fit for service at age 20. Women in Chad are required to serve one year of military or civic service at age 21. However, Chad has a significant role to play in regional security, with its army usually described as the most capable in the Sahel region (Pauline, 2019). The Chadian Forces remain an active member of the G5 Sahel and the Multinational Joint task Force. It was also the largest contributor to MINUSMA, the United Nations mission in Mali.



Table Showing Categories of Transnational Security Threats in the West African Sub-region

The table below illustrates the predominant transnational security threats in West Africa, according to The Guardian (2023), indicating threat patterns in terms of the international border zones, actors indulging in them, identified major transit routes, and some recipient states of the threats.

Predominant Transnational Security Threats	International Borders Traced to	Actors Involved	Transit Nations	Recipient Nations
Narcotics/Drugs Trafficking	Nigeria and Togo, Ghana, Cape Verde,	Narcotic/Drug dealers	Ghana/Togo/Benin/Nigeria	Spain, Portugal, UK, USA and South Africa
Advance Fee Fraud/Money Laundering	Sierra Leone, Nigeria, Ghana, and Côte d'Ivoire	Advanced Fee Fraud syndicates	Syndicates commute from the Western zone of West Africa (most especially from Senegal) across the eastern zones	Mostly Nigeria and other states
Human Trafficking	All across West Africa but mainly around Benin/Nigeria and Côte d'Ivoire/Burkina Faso	Traffickers who serve sometimes as middlemen, trade and business partners	Mainly Ghana and Sierra Leone	Other West African countries, and In North America, Europe, and the Middle East
Firearms Trafficking	Ghana/Togo/Benin/Nigeria, Sierra Leone/Liberia/Guinea, Côte d'Ivoire, Senegal	Rebels, local manufacturers of firearms and middlemen	Togo, Benin, Guinea Bissau and Gambia	Nigeria, Liberia, Sierra Leone, Guinea and Côte d'Ivoire
Child Soldiering, Mercenarism	Mano River states including Liberia/Sierra Leone/Guinea and Côte d'Ivoire	Rebel groups (including LURD, MODEL, RUF, CDF, New Forces (MPCI, MPIGO & MPJ))	Same countries depending on where conflict spills-over	Mano River States and Côte d'Ivoire
Smuggling of illegal goods	Côte d'Ivoire/Ghana/Togo/Benin and	Individuals, businessmen, warlords/civil	Ghana, Liberia, Sierra Leone and Côte d'Ivoire	Europe and North America



	Nigeria Liberia/Sierra Leone	and war combatants		
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Source: *The Guardian* (2023)

Proliferation and Smuggling of Small Arms and Light Weapons

Firearms trafficked across the sub-region are eventually used by rebel combatants and criminal gangs for either fighting civil wars, as in the case of Liberia, Sierra Leone and Côte d'Ivoire among others, or for armed robbery, including vehicle theft and trafficking, and for committing highway robberies of passengers moving from one ECOWAS state to the other (Abiodun, 2025).

Child Soldiering and Mercenaries

The states in the Mano River Basin area and Côte d'Ivoire have engaged in the use of mercenaries and recruited child soldiers for fighting civil wars. The mercenary groups are usually contracted by the government to beef up its security and defense capabilities, as was the case during the Sierra Leonean civil war. Both the government and rebel forces engaged in the civil war indulged in the act of recruiting or abducting young ones within the country or other neighboring states as child soldiers to fight wars (Lenshie, 2018). Also, in Liberia, about 10 percent of an estimated 60,000 combatants in the civil war that began in late 1989 were children.

Trafficking in Persons

Trafficking in persons is defined by the United Nations Office on Drugs and Crime (UNODC) at the recruitment, transportation, transfer, harbouring or receipt of a person by means of the threat or use of force or other forms of coercion, of abduction, fraud, deception, abuse of power, receiving of payments or benefits to achieve the consent of a person having control over another person for the purpose of exploitation (Abiodun and Nwannenaya, 2017). The scope of the human trafficking problem is widespread in West Africa. Child trafficking in particular spreads across eleven of the fifteen member states of the ECOWAS including Ghana, Togo, Benin, Burkina Faso, Nigeria, Niger, Cote D'Ivoire, Guinea, Sierra Leone, Gambia and Mali (Abiodun & Nwannenaya, 2017).

Marketing of Narcotics

The trade in drugs or narcotics is believed to be gaining ground in West Africa, with Ghana being considered as a major transit point in the subregion. In a recent case of drug trafficking, two Venezuelans were rounded up in Accra for allegedly possessing narcotic drugs valued at \$38 million. The 588 pieces of wrapped tablets suspected to be cocaine were found concealed in paper boxes with a gross weight of 580 kilograms (Abiodun & Nwannenaya, 2017).

Money Laundering and Internet Fraud

Criminals take advantage of the internet and telephone/fax facilities as a faster and cheaper means of communication to rob targeted or unsuspecting victims of huge sums of money or financial assets. Unlike other cross-border criminal acts, internet crime or fraudsters' activities



have no physical boundaries. The act entails sending a scam letter through an email or unsolicited fax message, either from Nigeria or any other country to any part of the world, offering a supposedly legal or legitimate business proposal in return for a huge financial reward. These types of crime pose technological challenges to law enforcement and security agencies all over the world (INTERPOL Report, 2023).

Overview of Boko Haram and ISWAP Terrorist Activities in Chad and Its Environs

The scale and threat of Boko Haram and ISWA's activities in Chad have fluctuated over the years. The January 2015 massacre of roughly 2,000 civilians at Baga Kawa, Nigeria (sometimes referred to only as Baga), an important trading hub and port on Lake Chad, prompted the mobilization of more than 1,000 Chadian soldiers into Nigeria to push Boko Haram out of its strongholds in Borno State, Nigeria (Andrew, 2023). The operation was a success, but the fallout was swift. Boko Haram quickly planned and executed multiple suicide attacks in N'Djamena during 2015, and its dispersed militants set up camps across the many islands on the lake, including those in Lac Province.

This initial period from 2015 to 2016 saw an influx in violence for communities in Chad along the Cameroonian and Nigerian borders. However, by the end of 2016, the security situation on the Chadian side of the lake began to improve due to the military's sustained presence and a containment strategy that discouraged encroachments on Chadian communities (Andrew, 2023). At this time, most Boko Haram activity took place elsewhere in the broader Lake Chad region. By late 2016, Boko Haram had split into two factions: one led by Abubakar Shekau and the other led by Abu Musab al-Barnawi, becoming ISWA. The two factions separated over differences in tactics and ideology. For instance, ISWA is not known to conduct female suicide bombings, while Shekau's Boko Haram is. Also, al-Barnawi has renounced attacks on Muslim civilians, while Shekau freely targets non-Boko Haram Muslim civilians, declaring them apostates (Abiodun and Raheem, 2020).

Over time, the influence of each grew over different geographic spaces. Shekau's faction established a stronghold in Sambisa Forest and the Mandara Mountains in northeastern Nigeria and parts of northern Cameroon. Meanwhile, al-Barnawi's faction maintained a presence along the Nigerian shores of Lake Chad and the Niger-Nigerian border. Moreover, a contingent of militants operating around Lake Chad led by Ibrahim Bakura, also known as Bakura Doron, concentrated its activities around the northern basin of Lake Chad (Andrew, 2023). This contingent actively raided communities in the borderlands of the lake, especially in Niger during the 2016-2017 timeframe.

By 2018, the Bakura-led faction of fighters had established itself under the leadership of Shekau and began to target military outposts in Nigeria and Cameroon. In Chad, their activities primarily took place in Kaiga-Kindjiria Sous-Préfecture, an area bordering Niger and Nigeria. Despite these raids, insecurity from Boko Haram and ISWA factions operating in Chad remained relatively contained for much of 2017 and throughout 2018 (Abiodun and Raheem, 2020). Over the course of 2019, however, the threat of insecurity posed by Boko Haram and ISWA in Chad steadily grew in Lac Province (see map). The strategic objectives of the increased attacks remain unclear, though some have speculated that they may be linked to leadership changes within ISWA, the steady growth of the Bakura-led faction of fighters that remains loyal to Shekau, or competition between the two groups.



Unearthing an Array of Attacks on Bohoma in the Republic of Chad

The rise in the number of attacks and fatalities in Chad in 2019 suggests that the March 23 attack on the military outpost at Bohoma fits a trend of Boko Haram and ISWA gaining ground and capabilities in Chad. During the attack at Bohoma, hundreds of militants stormed the military base on four sides from at least five boats fitted with outboard motors (Pauline, 2019). The surprise attack began just before dawn and continued until the Chadian soldiers were overrun around noon. Boko Haram militants then sacked the base, looting significant materiel and destroying the equipment they left behind, including roughly two dozen military vehicles. The attack is the most significant launched by Boko Haram outside of Nigeria in recent years.

Beyond Boko Haram's surprise tactics and sizable number of forces, the battle demonstrated that Boko Haram forces in the region have improved their intelligence, surveillance, and reconnaissance (ISR) capabilities. The Boko Haram militants were able to successfully ambush reinforcements while they were enroute to support those under attack at Bohoma. Militants may have also known that the troops at Bohoma had recently been relieved by soldiers with less familiarity with the area and experience combatting the insurgents (Andrew, 2023). Furthermore, the fact that hundreds of Boko Haram fighters could be mobilized without the Chadians detecting their movements suggests a failing on the part of Chadian ISR capabilities.

The attack on Bohoma raises other important questions, such as which group or groups were responsible for the attack. Who led and organized the assault? And what strategic purpose did it serve? It is hard to offer more than speculative responses to these questions (Andrew, 2023). The Boko Haram contingent operating on the northern shores of Lake Chad, supposedly led by Ibrahim Bakura, is believed to be responsible for the attack on Bohoma. A video of Shekau claiming the attack circulated on messaging services the following day. However, the Nigerian Ministry of Defense had previously claimed to have killed Bakura in a joint Niger-Nigeria operation that took place in their respective territories around the lake from March 10 to 16 (Andrew, 2023).

Should this lake faction of Boko Haram be responsible for the Bohoma attack, it would be particularly worrisome since ISWA is widely recognized as the stronger of the two forces operating across the Lake Chad region. Recent leadership tensions within ISWA may have unraveled some of its support, perhaps to Boko Haram's advantage. Yet, ISWA claimed to have ambushed the Nigerian military near the village of Goniri in Borno State, killing 100 soldiers and militiamen, on the same day as the attack on Bohoma. These events may signal that both groups are gaining support and capability in the wider region (Abiodun & Raheem, 2020).

Strategic Deployment of Terrain Analysis and Response of the Chadian Armed Forces During Operation Bohoma's Wrath

The integration of Chadian military technology significantly enhanced terrain analysis in her military operations, giving room for more accurate capability assessments and strategic planning. In the same vein, while some writers describe African military formations as unprofessional, backward, and lacking appropriate structure and global standards of civil-military relations, the Republic of Chad's army earnestly demands a reappraisal (Javi, Malek & Mokhtari, 2018). The country's military capability to entrench in international and regional deployments by gaining more experience via national conflicts and local warfare tactics—



employing nomad and warlord structures—greatly contributed to its success in the war against transnational security threats over the years (Olaniyan & Akinyele, 2017).

Moreover, Geographic Information Systems (GIS), the powerful tools that were deployed before advancing to the fields, enabled the Chadian military analysts to visualize and interpret geographical data in the war against all forms of transnational security threats. The GIS usually facilitated the analysis of terrain features, giving room for better-informed tactical maneuvers against the marauders. In addition, drones and Unmanned Aerial Vehicles (UAVs) were further deployed to augment the forces' terrain analysis (Javi, Malek & Mokhtari, 2018). These devices, put together, gathered very high-resolution imagery and real-time data, offering a detailed perspective on battlefield conditions for the forces. By deploying drones, the Chadian military forces could quickly assess enemies' positions and terrain obstacles, leading to more effective operational strategies. The strategies above assisted the former Chadian President Marshal Idris Derby to solidify more alliances and garner support from foreign states with the sole aim of waging war on terror in the West African sub-region (Andrew, 2023).

Moreover, the various emerging technologies, such as artificial intelligence support predictive modeling and data integration—the AI algorithms critically helped in the analysis of extensive datasets towards identifying the patterns and trends of terrain variations in the region. This capability enhanced decision-making processes, allowing for a dynamic approach to Chadian military tactics based on terrain analysis (Javi, Malek & Mokhtari, 2018). However, the strategic response from the Chadian Armed Forces and government came swiftly. Former President Déby, then, flew to Bohoma personally to witness the damage left behind on the battlefield. He thereafter stayed in Lac Province to announce a 3-day national mourning for the 92 fallen Chadian soldiers and subsequently launched a military operation called Operation colère de Boma on March 31, 2020 (Andrew, 2023).

The operation mobilized hundreds of soldiers, including a battalion that had originally been deployed to the Liptako-Gourma region in the central Sahel, where the borders of Mali, Niger, and Burkina Faso meet. Nonetheless, this strategic military operation took place across the Kaya and Foulï départements of Lac Province and across their borders into Niger and Nigeria. Both departments were placed under a state of emergency and declared war zones (Andrew, 2023). During the operation, Chadian armed forces systematically cleared the zones using a surge strategy through five sectors to eliminate the presence of militant Islamist fighters from the area.

The operation, which targeted both Boko Haram and ISWA forces and other forms of transnational security threats, was officially concluded on April 9, 2020 after Chadian Forces trailed the remaining militant contingents into Nigerian and Nigerien frontiers or territories, destroyed their bases, and carted away all the arms and ammunition left behind (Andrew, 2023). Though during the military operation, 53 Chadian security operatives were lost, two militant Islamist group command posts were totally destroyed. In addition, over a thousand insurgents and transnational criminals were killed, and 60 suspects were arrested as prisoners, after which their motorized boats had been destroyed and substantial arms caches were reclaimed during the strategic Chadian military operations.



FINDINGS AND DISCUSSIONS

Objective 1: Key Elements of Terrain Analysis in Military Operations in the Global System

There is no doubt that Commanders globally, usually analyze terrains by using the five military aspects of terrain with the acronym OAKOC, which means (O) *Observation and fields of fire*; (A) *Avenues of approach*; (K) *Key and decisive terrain*; (O) *Obstacles*; (C) *Cover and concealment* (Andrew, 2023). However, terrain analysis primarily encompasses several key elements that aid military strategists to better analyze and comprehend their battlefields. These elements include the physical features of the land, climatic conditions, and human factors influencing terrain use. Each component plays a significant role in shaping tactical maneuvers. The physical characteristics of terrain involve elevation, slope, and vegetation. These factors determine visibility, camouflage opportunities, and movement capabilities for both forces and vehicles. Understanding the elevation can also impact artillery range and air support effectiveness (Andrew, 2023).

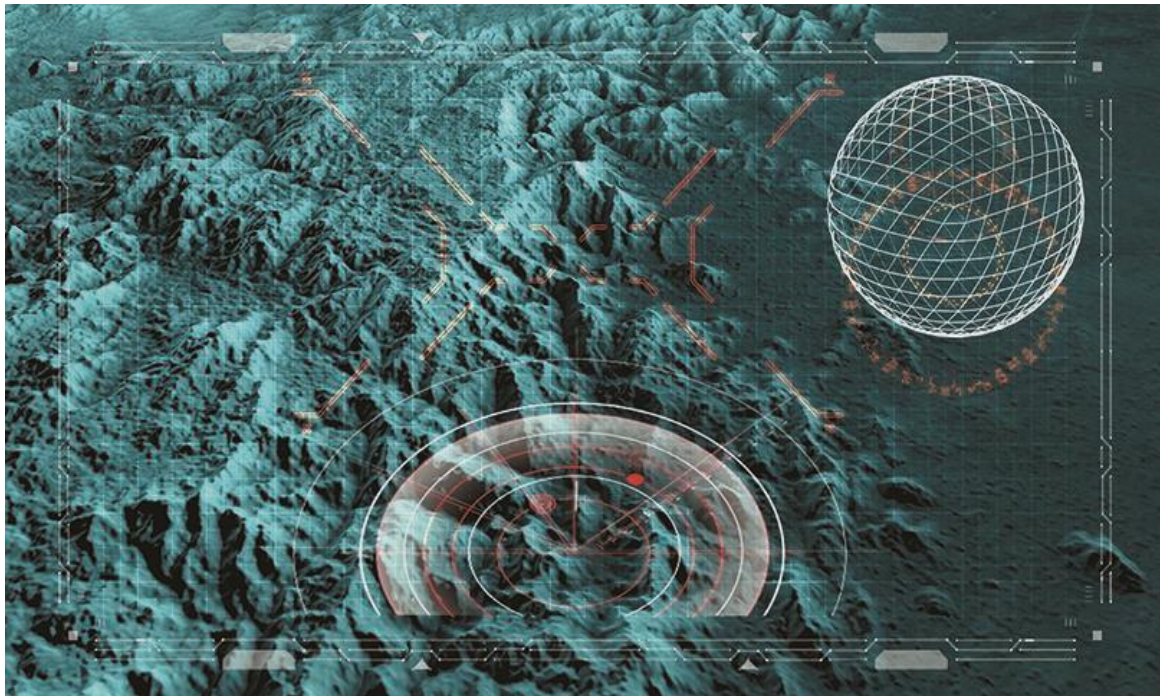
Also, the climatic conditions, such as weather patterns and seasonal changes, directly affect troop movement and operational readiness. Additionally, environmental factors like rivers and marshlands can impede or facilitate operations, making it vital for military planners to account for such elements. Lastly, the human factors consider existing infrastructure, population density, and cultural elements that may influence military strategies (Andrew, 2023). By analyzing these key elements of terrain analysis, commanders can enhance their tactical decision-making and operational success in military engagements.

Objective 2: Methods of Conducting Terrain Analysis in the Global System

The Chadian military forces were able to conduct terrain analysis using the methods illustrated below in their war against Boko Haram/ISWAP terrorists and other forms of transnational security threats in the West African sub-region (Field Survey, 2024):

- a. Through the **systematic examination** of the country's land features that enhanced quick decision-making in the state's military operations. Several methods were also employed to conduct terrain analysis effectively, ensuring that the state's military personnel understood the battlefields comprehensively.
- b. **Field surveys as** primary methods were also used by the country's military forces in gathering geospatial data, which swiftly enabled the military analysts to critically assess all the physical features on the fields directly. This hands-on approach, however, provided crucial insights into elevation, vegetation, and water bodies, all of which significantly influenced the nation's tactical maneuvers during operations (Field Survey, 2024).
- c. In conjunction with field surveys, **aerial reconnaissance utilizing aircraft and satellites also served as a vital method deployed**. These platforms adequately offered a broader view of terrain and enabled the capturing of some high-resolution images, thereby aiding in the identification of strategic locations and obstacles that may impact the country's military strategies against all forms of transnational security threats (Field Survey, 2024).

- d. **The Chadian military personnel also made use of data integration from the various possible sources.** By synthesizing information from the various intelligence inputs, including Geographic Information Systems (GIS), the Command teams were able to create the detailed maps that clearly depicted the terrains holistically. This multidimensional view was highly significant and essential for effective planning and execution of tactical maneuvers by the Chadian forces.



Terrain Analysis Techniques for Tactical Maneuvers by the Chadian Forces

The study reveals that terrain analysis techniques play a pivotal role in enhancing tactical maneuvers in military operations, though these techniques leverage some identified methodologies towards evaluating the physical landscape and impact on strategic decisions. Key among these techniques include mapping, modeling and simulation, which provide detailed visual representations of terrain features (Javi, Malek & Mokhtari, 2018):

Mapping involves creating topographical maps that highlight elevation changes, water bodies, and vegetation. This information is crucial for identifying advantageous positions for troops and understanding potential obstacles

Modeling, on the other hand, utilizes three-dimensional representations to illustrate how terrain affects movement and visibility, aiding commanders in planning effective maneuvers.

Simulation tools further augment terrain analysis by allowing military planners to visualize scenarios with real-time data inputs. By simulating different tactical outcomes, commanders can explore the implications of terrain on force deployment and reaction times (Javi, Malek, and Mokhtari, 2018). This predictive capability enhances operational effectiveness and minimizes surprises on the battlefield. Simulation tools serve as a decisive component in terrain analysis for military operations. They enable the visualization and manipulation of various environmental factors that affect tactical maneuvers. By employing these tools, military



planners can assess how terrain influences troop movement, visibility, and overall mission success (Javi, Malek & Mokhtari, 2018):

- a. Notable simulation software includes ***Terrain Visualization Software (TVS) and Command Post of the Future (CPOF)***, which allow commanders to simulate real-time operational scenarios. These tools integrate 3D terrain models, aiding in realistic assessments of various tactical situations across different landscapes.
- b. Ultimately, mastering these terrain analysis techniques enables informed tactical decisions, optimizing the alignment of forces with the complexities of the landscape. Recognizing these elements is essential for successful military operations in diverse environments.

Objective 3: Strategic Impacts of Terrain Analysis on the Chadian Military Operations Against Boko Haram and ISWAP Terrorists and Other Transnational Security Threats in West Africa

This study has revealed that terrain analysis involves a systematic process that evaluates the landscape in relation to military operations. In the context of military success in the Republic of Chad, effective terrain analysis has enabled Commanders to make informed decisions, enhancing the potential for the state's operational effectiveness in a number of ways, which include (Field Survey, 2025):

Terrain analysis has impacted the Chadian military operations by informing commanders about the battlefield's physical characteristics: Terrain analysis has fundamentally assisted the country's military operations by informing commanders about the battlefield's physical characteristics. It encompasses the study of geographical features, including hills, valleys, rivers, and urban landscapes, which influence troop movements, supply routes, and overall strategies (Field Survey, 2024).

It has enabled the Chadian military leaders to identify advantageous positions while recognizing potential vulnerabilities. A thorough terrain analysis by the forces has given room for the military leaders to identify advantageous positions while recognizing potential vulnerabilities. Understanding the terrain has actively aided in predicting the terrorists or enemies' movements and selecting defensive or offensive tactics based on the landscape's natural barriers or approaches (Field Survey, 2024).

Enhanced and awakened situational awareness for the nation's military formations: Incorporating terrain analysis into operational planning has greatly impacted the state's military operations by enhancing its situational awareness, which is vital for effective decision-making on the battlefield. This insight facilitates the optimization of resources, ensuring that troops are deployed strategically to maximize their effectiveness in variable landscapes.

Assisted the military forces in adapting to the dynamic nature of combat environments: Ultimately, terrain analysis directly correlates with operational success, as the insights gained have usually helped the Chadian military forces to adapt to the dynamic nature of combat environments. An informed approach to terrain can mean the difference between victory and defeat in military engagements (Field Survey, 2024).



Understanding the nuances of terrain has given room for the Chadian military in advantageous positioning of forces. This facilitates the identification of choke points, high ground, and cover options, which directly influence tactical maneuvers and engagement strategies. Furthermore, terrain analysis informs logistics and supply chain management. By considering the terrain's impact on movement and accessibility, military planners can optimize supply routes and resource allocation, ensuring sustained operations and increased readiness (Field Survey, 2024).

Incorporating terrain analysis into military strategy not only enhances situational awareness but also contributes to anticipating enemy movements. Ultimately, a comprehensive understanding of terrain plays a strategic role in ensuring military success on the battlefield. Terrain Analysis is a pivotal element in the strategic planning of military operations. Its influence extends beyond mere geographical assessment, shaping the very fabric of tactical maneuvers.

As technology advances, the integration of innovative tools and techniques into terrain analysis will continue to enhance decision-making capabilities. A comprehensive understanding of terrain ultimately plays a crucial role in ensuring military success on the battlefield. The terrain significantly influences tactical decision-making in military operations (Field Survey, 2024). Commanders must understand how various landforms, vegetation, and weather conditions affect movement, visibility, and engagement strategies, directly impacting operational success.

Objective 4: Notable Challenges Encountered by the Chadian Armed Forces in Terrain Analysis

- i. The study revealed the various challenges encountered by the Chadian military forces in their efforts to conduct strategic terrain analysis in the war against Boko Haram/ISWAP terrorists and other transnational security threats in West Africa (Field Survey, 2024):
- ii. Faced with significant challenges that military planners must navigate to ensure effective operations. One of the primary hurdles was the variability and complexity of terrain features, which could change dramatically due to natural occurrences, urban development, or human activities.
- iii. Another challenge was the integration of diverse data sources. Military operations required information from satellite imagery, historical maps, and real-time reconnaissance, each with different formats and scales; and coordinating these resources invariably resulted to some potential discrepancies in the Forces' terrain analysis process (Field Survey, 2024).
- iv. Human factors also played a crucial role – limited understanding or experience with terrain analysis also frequently resulted in misinterpretations, thereby potentially affecting the Forces' tactical decisions. In addition, training the personnel to effectively utilize terrain analysis tools posed a serious challenge in mitigating the potential risks on battlefields.
- v. Lastly, there was rapid pace of technological advancement which often presented a dual challenge. While new tools enhance terrain analysis, keeping military teams updated on the latest methods and technologies requires continuous investment and adaptation.



Addressing these challenges directly influenced the success of tactical maneuvers in the country's military operations (Field Survey, 2024).

RECOMMENDATIONS

For improvement in the future terrain analysis, the study recommended the need for:

- i. The integration of artificial intelligence applications in terrain analysis is transforming how military operations assess and navigate landscapes. AI algorithms can process vast datasets quickly, identifying patterns that may not be visible through traditional methods. This leads to more informed decision-making during tactical maneuvers.
- ii. Real-time data integration further enhances terrain analysis capabilities. By leveraging live data feeds from various sources, military units can update their understanding of the terrain continuously. This contributes to dynamic planning and immediate responsiveness to changes in the battlefield environment.
- iii. Real-time data integration further enhances terrain analysis capabilities. By leveraging live data feeds from various sources, military units can update their understanding of the terrain continuously. This contributes to dynamic planning and immediate responsiveness to changes in the battlefield environment.
- iv. The future trends in terrain analysis will significantly influence military strategies, improving the accuracy of operations and increasing the likelihood of success in complex terrains. Adapting to these changes will be crucial for maintaining strategic advantages in military endeavors.

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