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# Weak Signals Out to 2045 – Focus on the Middle East and North Africa including Sahel Region

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# ABSTRACT

## WEAK SIGNALS OUT TO 2045 – FOCUS ON THE MIDDLE EAST AND NORTH AFRICA INCLUDING SAHEL REGION

This paper investigates weak signals that may shape the future security landscape across the Middle East, North Africa, and the Sahel (MENA–Sahel) out to 2045. Recognizing the convergence of multi-domain risks and the limitations of traditional trend analysis, the study applies a Strategic Foresight Analysis (SFA) logic to identify early, low-visibility developments that remain under the radar of dominant narratives but may evolve into major drivers of security in North Atlantic Treaty Organization's (NATO) future operating environment. The analysis is exploratory and diagnostic rather than predictive, treating weak signals as directional signposts that warrant anticipatory attention rather than fixed forecasts. Methodologically, the research relies on horizon scanning of open-source materials from more than 300 institutions between January 2020 and June 2025, assembling a corpus of 5,200 items that include policy briefs, working papers, journal articles, reports, and transcripts of policy-relevant event videos. A structured multi-stage process, comprising document packaging, prompt-guided extraction, expert review, consolidation, and limited validation, was designed to ensure transparency, reproducibility, and traceability. Weak signals were organized under a STEEP-plus framework (Social/Human, Technological, Economic, Environmental, Political, plus Converging/Cross-Domain dynamics) and interpreted for their potential implications for NATO's partnerships, posture, and anticipatory planning. The focus on the MENA-Sahel arc builds on the premise that these interconnected regions form a single strategic setting of growing importance for Allied security. By elevating early indicators and linking them to policy-relevant considerations, the paper contributes to NATO Allied Command Transformation's commitment to broadening strategic awareness. The findings are publicly releasable under the Open Perspectives Exchange Network (OPEN) remit, offering insights for NATO planners, Allied stakeholders, and external partners alike.

*Keywords: MENA, Sahel, Strategic Foresight, Weak Signals, Horizon Scanning, AI*

# EXECUTIVE SUMMARY

This paper proceeds from the premise that conventional trend analysis is insufficient to capture early, low-visibility developments that may evolve into meaningful drivers or discontinuities. Accordingly, it applies horizon scanning to determine weak signals: ambiguous, fragmentary indicators of strategic change not yet dominant in policy narratives. The scope is explicitly exploratory and diagnostic, not predictive. Weak signals are treated as directional signposts, namely early warnings of possible change or openings for new opportunities, which warrant analytic attention and preparatory thinking rather than forecasts of fixed outcomes. The paper focuses on the Middle East, North Africa, and the Sahel (MENA-Sahel) and approaches the region as a single, interlinked strategic setting whose trajectories will shape Alliance security out to 2045.

The research reveals converging feedback loops across social, technological, economic, environmental, and political-security domains that compound regional fragility and complicate Allied engagement. Deteriorating social conditions manifest themselves through restive youth bulges, communal vigilantism merging with extremism, and urban humanitarian emergencies, particularly in the Sahel. These dynamics, combined with human capital erosion, refugee fatigue, and education gaps, are producing fragmented societal contexts with populations in constant flux.

Technological diffusion is fundamentally reshaping the threat environment across MENA-Sahel. Drone-first saturation tactics, cheap lethality, and increasingly crowded airspace characterize theatres where armed groups learn fast and adapt cheaply. The spread of commercial unmanned systems, motorcycle-fuelled insurgent mobility, and regulatory gaps in dual-use technologies blur boundaries between internal security and armed conflict. Meanwhile, bot networks, micro-influencer recruitment campaigns including gendered targeting, and exploitation of consumer-device metadata erode societal resilience while exposing Allied and partner operations to novel risks.

Economic dynamics worsen fragility through multiple vectors. Conflict-commodity booms, particularly gold in the Sahel, finance insurgents and establish parallel governance structures. Debt distress, violent rentierism, and deepening Chinese financial entanglement create conditions for strategic concessions that may restrict Allied access to critical infrastructure. Single-commodity dependence and energy transition pressures increase fiscal vulnerabilities, while trade route disruptions linked to Red Sea/Suez passages threaten economic stability. These economic stressors intersect with environmental pressures, manifested through climate-driven resource conflicts, degraded cropland, and water scarcity, which act as compound drivers that reshape conflict economies and migration corridors.

On the political-geopolitical front, the competition for ports, pipelines, and digital backbones by external powers is creating new veto players whose conditionality may reduce NATO leverage. These converging dynamics demand that Allied strategic planning, force protection, and partnership models adapt to mission settings dominated by highly localized actors, fragmented publics, and high-density urban contingencies while anticipating scenarios where fiscal stresses and social grievances trigger sudden policy pivots by key partners.

# INTRODUCTION: BACKGROUND, SCOPE, AND PURPOSE

NATO's contemporary strategic environment is characterized by high uncertainty, rapid change, and the convergence of multi-domain threats that increasingly blur regional and issue-based boundaries. In this context, the Middle East, North Africa, and the Sahel (MENA-Sahel) constitute a single, interlinked strategic setting whose trajectories will shape Allied security out to 2045. This paper proceeds from the premise that standard trend analysis alone is insufficient to capture early, low-visibility developments that may evolve into meaningful drivers or discontinuities. Horizon scanning for weak signals, first symptoms of strategic change that are still ambiguous, fragmentary, and not yet dominant in policy narratives, offers an evidence-informed complement to NATO's existing foresight functions. By employing this methodology through evidence-based research, this study seeks to help uncover the implications of the fast evolving security environment for future force design.

The geographic focus on the MENA-Sahel arc stems from two considerations. First, developments across these regions are expected to play an increasing role in shaping the future security environment facing the Alliance, with direct implications for collective defence, crisis management, cooperative security, and deterrence. Second, concentrating solely on headline "mega-trends" (e.g., demography) in a single regional setting risks creating blind spots. It may obscure early indicators of crises, or outlier events which can quickly alter NATO's operating conditions. A structured identification and interpretation of weak signals in cross-regional context aims to mitigate that risk by illuminating low-visibility dynamics whose policy salience could grow over the 2025–2045 horizon.

The paper aims to identify and interpret weak signals which may have plausible implications for Allied and partner security across MENA-Sahel. It seeks to explore policy-relevant implications of early cues for NATO. The scope of the paper is explicitly exploratory and diagnostic, rather than predictive. Weak signals are treated as directional signposts, warnings of possible change or openings for new opportunities, that warrant analytic attention and preparatory thinking, not as forecasts of fixed outcomes. The analysis privileges signals that (i) remain under-the-radar in dominant discourse; (ii) could plausibly scale or cascade; and (iii) bear on NATO's instruments of cooperation, assurance, and crisis-response in or around the southern neighbourhood. In terms of methodology, the study is anchored in a horizon-scanning corpus and a multi-stage data processing and analysis process.

The research applies horizon scanning to policy-relevant sources and research outputs. By focusing on weak signals, the paper complements existing trends research related to early-stage developments that may warrant watch-lists, stress-tests, or targeted analytic deep dives. As such, it brings forth the value of non-NATO perspectives and cross-sectoral insights, which may potentially help avoid analytical echo chambers and enrich understanding of complex regional developments.

The study neither prescribes policy nor offers definitive judgments about future trajectories. It

merely clarifies the issues area, by matching early indicators to plausible implications, which merit structured follow-up within NATO processes. It is in this context that the research might potentially have policy-relevant value. The weak signals identified here, if further validated over time, could inform future policy design, capability development, and capacity building programs with partners in the MENA-Sahel area. Therefore, the paper's primary audience is NATO planners and analysts engaged in futures research, innovation, and partnerships. Secondary audiences include policy communities in the Allied and partner nations, research institutes, and practitioners across humanitarian, development, and stabilization sectors.

The remainder of the paper is organized as follows: Section 3 (Methodology) details the scope and design rationale, the horizon-scanning strategy and corpus construction, the sub-regional packaging approach, the prompt-guided weak-signal extraction, the subsequent expert review and consolidation process, the prioritization criteria applied to candidate signals, and the limited post-synthesis validation step. Section 4 (Weak Signals in MENA-Sahel across STEEP-Plus Categories) presents the weak-signal narratives within a STEEP-plus structure, namely (4.1) Social/Human, (4.2) Technological, (4.3) Economic, (4.4) Environmental, (4.5) Political, and (4.6) Converging/Cross-Domain dynamics, organized by Sahel, Middle East, North Africa, and selected trans-regional linkages. This section remains strictly descriptive of early weak signals and does not reflect on outcomes. Section 5 (Implications of STEEP Dynamics NATO) seeks to provide high-level, non-prescriptive considerations for Allied planning and engagement. Section 6 (Implications and Recommendations for NATO) summarizes the paper's contribution to NATO's anticipatory posture and identifies priority areas for further analysis or monitoring, without revisiting or expanding the empirical content. Then, the Conclusion section wraps up the report. Finally, the References section provides a consolidated list of sources and hyperlinks.

# METHODOLOGY

This Strategic Foresight Analysis employed a systematic multi-stage approach to identify weak signals that could shape the future security landscape across the Middle East, North Africa, and the Sahel out to 2045. The research followed NATO SFA logic, emphasizing early, low-visibility developments not yet part of dominant narratives but which may evolve into meaningful drivers of the security environment. Here, our operationalization of the 'weak signals' follows the previous SFA reports and draws on what Godet (1994: 58) calls 'germ', i.e., "a factor of change hardly perceptible at present, but which will constitute a strong trend in the future." The timeframe covered policy-oriented publications from 1 January 2020 through 30 June 2025.

The research team constructed a comprehensive corpus through horizon scanning across approximately 300 institutions, including research centres, think-tanks, universities, and academic journals. Source materials were predominantly in English, with additional Arabic and Turkish content. This initial scanning identified 55,700 items, which were filtered based on publication year (≥2020), geographic relevance to the three regions, and minimum relevance to security-oriented transformation. The filtering process yielded a working corpus of 5,200 full-text documents comprising working papers, journal articles, policy briefs, special reports, commentary, videos, research papers, books, and case studies. Where applicable, video materials were captured as full transcripts via automatic speech recognition.

The documents were normalized to PDF format and organized into 20-document packages stratified by year within seven sub-regional categories nested under the three main regions. This packaging size was selected to maintain tractability for the language model while avoiding performance degradation. Each package was processed using ChatGPT O3 Pro with a single, constant prompt that defined weak signals (Annex 1).

The extraction prompt operationally defined a weak signal as an early, low-visibility, and often ambiguous sign of possible future disruption. The model was instructed to identify developments that met four key criteria. First, signals must be emerging and not yet part of dominant narratives in policy or academic discourse, distinguishing them from established trends already recognized by decision-makers. Second, they must be fragmented, contradictory, or non-obvious in their manifestation, requiring interpretation rather than straightforward extrapolation from existing data. Third, they must be potentially impactful for Alliance security, even when current implications remain unclear or the magnitude of future effects cannot yet be precisely estimated. Fourth, they must not yet be widely discussed in mainstream strategic planning conversations, ensuring focus on developments at the earliest stages of emergence. These four criteria served to distinguish weak signals from both well-documented developments and speculative scenarios lacking empirical anchors in the scanned materials.

Applying these criteria, we directed the model to search for early, low-visibility cues as they actually appear in the texts, scattered mentions across documents, single-source, and to privilege candidates with possible escalation, cross-regional diffusion, or cascading effects on NATO and partner operating environments. The model was

hard-constrained to the corpus (no web access) and, for every item elevated to a "signal," generated a standardized record: STEEP category (Social/Human, Technological, Economic, Environmental, Political/Geopolitical, or Converging), a 3–5-word title, a 4-5-sentence account of potential futures, a political-geography tag that explicitly captured either a single region (Middle East, North Africa, or Sahel) or a cross-regional span involving two or more of these regions, an APA-style citation, and the source file name. The same evaluative lens and output schema were applied to each 20-document package to preserve comparability while retaining sufficient latitude to capture heterogeneous weak signal forms in policy and academic writing.

This process yielded an initial table of 517 weak signals, which were then subjected to review, validation, filtering and consolidation by experts. Team members independently reviewed the master list to eliminate items that were already evident in dominant discourse, outside the geographic scope, or describing developments that had already materialized, and to merge semantically overlapping items into higher-order clusters. Following consolidation, the team conducted qualitative prioritization emphasizing potential impact, novelty, policy salience, and time horizon. The prioritized signals were then interpreted for operational and policy implications for NATO, with targeted post-synthesis validation to cross-check factual reference points and clarify mechanisms without altering the corpus or extraction constraints. All materials analyzed were legally accessible via institutional subscriptions or publicly available, and the exact extraction prompt was preserved to support replication.

## Figure 1: Methodological Steps

# WEAK SIGNALS IN MENA-SAHEL ACROSS STEEP-PLUS CATEGORIES

The research project produced several weak signals across the social/human, technological, economic, environmental, political and cross-domain dynamics, which are further clustered into the sub-regions.

**Table 1: Summary of Weak Signals across STEEP- Plus Categories**

| | Sahel | The Middle East | North Africa | Trans -regional |
|---|---|---|---|---|
| Social / Human Dynamics | Restive Youth Bulge | Human Capital Erosion | Urban Strain and Deepening Social Fault-lines | Cross-Regional Triangulation of Societal Risks |
| | Communal Vigilantism Coalesces with Extremism | Refugee Fatigue, Fragmentation and Militia Recruitment | Drone Acquisitions Reshaping Militarized Disputes | |
| | Urban Humanitarian Emergency | Education Gaps and Deepening Youth Vulnerability to Extremism | | |
| Technological Dynamics | Unregulated Commercial Unmanned-systems Proliferation | Drone-First Saturation Tactics | Drone Acquisitions Reshaping Militarized Disputes | Cross-Cutting Technology Threats |
| | Open-Source Data Exposure Risks | Insurgents' Low-Cost Access to Cyber Infrastructure | Tech Partnerships with Authoritarian Suppliers | |
| | Motorcycle-Fuelled Conflict Economy and Insurgent Mobility | Regulatory Gaps in Dual-Use Systems | Gendered Recruitment via Encrypted Channels | |
| Economic Dynamics | Conflict-commodity Boom Feeding Insurgent Finance | Violent Rentierism Eroding Formal Politics | Revenue Cliff due to Energy Transition | State Capture and Capacity Erosion as a Region-wide Trend |
| | Debt Distress and Crypto Youth | Chinese Financial Entanglement | Food Import Vulnerability Driving Instability | External Power Scramble Accelerating Regional Tensions |
| | Risks Stemming from Single-Commodity Dependence | Risks Stemming from Debt-Fuelled Megaprojects | | |

| | Sahel | The Middle East | North Africa | Trans -regional |
|---|---|---|---|---|
| Environmental Dynamics | Climate-Driven Resource Conflict | Conflict-Driven Environmental Pollution | Extreme Climate Events Overburdening State-capacity | Cross-Border Ecological Linkages Generating Geopolitical Implications |
| | Degraded Cropland and Climate Shocks Expanding the Scope of Conflicts | Politicized Environmental Grievances Undermining Domestic Stability | | |
| Political Dynamics | Post-French Sahel Realignment and Intensified Geopolitical Competition | Tech-Enabled Authoritarian Consolidation | Protracted Conflicts and Narrative Warfare Breeding Instability | Trans-Regional Mercenary Markets Undermining Deterrence and Crisis-Management |
| | Proliferation of Community Self-Defence Triggering Conflict Dynamics | Disinformation Erodes Cohesion | | Foreign Base Proliferation Deepening Regional Instability |
| | Erosion of Sovereignty under Cheap Lethality and Cross-Border Loyalties | | | Cross-Platform Disinformation Ecosystems Complicating Threat Environment |
| Converging / Cross -Domain Dynamics | Climate–Mobility Spiral Overwhelming Governance and Economics | Economic Woes and Legitimacy Erosion Triggering Geopolitical Realignment | Trade Rerouting and Fiscal Shocks Intersecting with Geopolitical Realignment | Fiscal Stress Inviting Strategic Concessions |
| | Triangulation of Militias, IED Corridors, Gold Rush | Disinformation Fueling Polarization | Climate Politics and Fiscal Stability Undermining Domestic Resilience | Blurred Lines between Internal Security and Armed Conflict |

## Social / Human Dynamics

### 4.1.1. Sahel

**Restive Youth Bulge:** The Sahel's demographic wave is on an upward trajectory precisely at a moment when state capacity is at its lowest. By 2045, more than half of the region's population will be under twenty five (Cincotta & Smith, 2021; O'Driscoll, 2020). Today that 'youth bulge' can be traced in the digital mobilization that delivered record first time voter registration during Nigeria's 2023 elections and in the surge of online protest networks from Dakar to Niamey (Ngwang 2023; Ojewale, Khalafallah & Oosterom, 2025). Yet the same cohort is also fuelling decentralized street agitation, as quickly excluded young can shake regimes that once relied on generational deference, which is hinting to the phenomenon of restive youth movements (International Crisis Group, 2021; Yabi & Holman, 2024). The convergence of youth bulges with the declining governance-state capacity to offer a better future and increasing digital mobilization could undermine social structures in the region.

**Communal Vigilantism Coalesces with Extremism:** Where state protection evaporates, communal mobilization to provide for self defence takes the stage. For instance, in Mali and Burkina Faso, local Fulani communities, routinely branded a 'suspect' bloc in counterterrorism discourse, have fashioned vigilante structures that increasingly blend with bandit economies and extremists (Human Rights Watch, 2021; Le Cour Grandmaison et al., 2023; Ejiofor, 2022). Branding an entire pastoral group as extremist is already proving a self-fulfilling prophecy, as the demonization of the Fulani as 'foreign terrorists' has driven recruitment and intelligence away from formal interlocutors (Ejiofor, 2022).

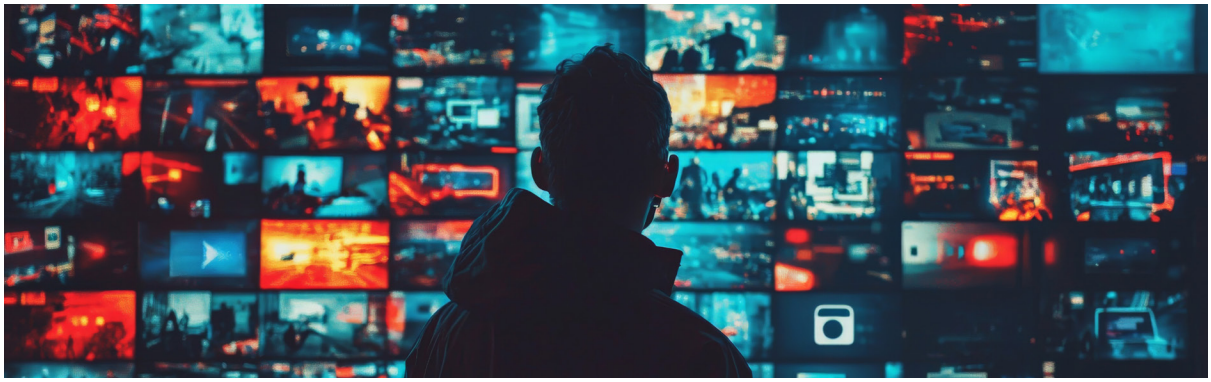
**Urban Humanitarian Emergency:** At the macro level there is a chronic humanitarian emergency underway. Since UNICEF's 2020 alert that 10.4 million Sahelian children faced acute malnutrition (UNICEF, 2020), the region has seen an increasing number of food insecure zones, which, coupled with other drivers, is breeding a humanitarian emergency (Mbowe & Diatta, 2023; Aguirre-Unceta, 2023). Acute food shocks intersect with rapid urbanization. Several cities on the Dakar–Niamey axis are flooded with rural migrants faster than governance or infrastructure can keep pace, generating what one analysis calls an 'unprecedented urban security frontier' (Africa Center for Strategic Studies, 2025). As a result of this process, urban flashpoints may come to substitute rural instability, as urban settlements are becoming potentially more convenient for recruitment of terrorist organizations.

### 4.1.2. The Middle East

**Human Capital Erosion:** Across the broader Middle East, demographic pressures are generating severe challenges. From Yemen to Lebanon, younger generations face shrinking labour markets and economic collapse, dynamics that not only drive refugee flows but also increase susceptibility to militia recruitment (Fraihat & Yaseen, 2020). In Lebanon, the protracted financial crisis has led to mass youth unemployment and emigration, weakening societal resilience and feeding into militia structures (Khalifé & Abou-Khalil, 2025). More broadly, the erosion of human capital through the departure of educated classes threatens long-term development prospects across the region (Heydemann, 2025).

**Refugee Fatigue, Fragmentation and Militia Recruitment:** Given the enormous waves of population movements across the region as a result of conflicts, societal cohesion is further strained by refugee fatigue within the host communities (DSP-ME, 2022; Abuhussein, 2023; Al Mokdad, 2025). In the post-conflict settings as well, repatriations and returns create new set of dilemmas (UNHCR, 2022; Norwegian Refugee Council, 2025; Travers, 2024; Diab & El-Zakka, 2025). As observed in the example of Iraq's Ninewa Plain, for instance, fragmentation among minorities is accompanied by divisions within the same ethnic or religious group, which is also putting further pressure on the existing power sharing frameworks (USIP & MERI, 2020; Clingendael, 2021; Iglesias, 2025). This is creating fertile ground for the recruitment of dispersed militias whose loyalties are fluid and often shaped by local incentives rather than ideology. In Yemen's southern governorates, for example, economic precarity and weak public services have encouraged some young men to join armed formations for income and protection (Jalal, 2024).

**Education Gaps and Deepening Youth Vulnerability to Extremism:** Lastly, the gaps in education accelerated by online schooling during COVID-19 are further consolidating structural inequalities. Marginalized groups that missed entire academic years are further penalized by socioeconomic vulnerabilities, which increases the lost generations' vulnerability to radicalization and recruitment (Meler, 2022; Shuayb & Hammoud, 2024). For example, in Lebanon, prolonged school closures combined with digital divides have left tens of thousands of refugees and low-income children permanently out of the education system. International observers warn that this dynamic heightens these vulnerable generation's their exposure to extremist recruitment (Shuayb & Hammoud, 2024; Stockhammer, 2025). Overall, diffuse, youth centric pressures are eroding already fragile domestic order across the broader Middle East.



### 4.1.3 North Africa

**Urban Strain and Deepening Social Fault-lines:** Urban centres across North Africa are beset with social tensions. In Egypt, rural populations abandoning heat-stressed and water-scarce farmlands increasingly migrate into Cairo and Alexandria, where overstretched districts struggle with limited infrastructure and basic services (Torba, 2020; Bani Samari, 2024). Meanwhile, Libya showcases a generation forged in conflict. The same youth cohort staffs militias, sustains smuggling networks, and simultaneously creates civic tech start-ups aimed at filling governance vacuums, a duality that complicates international efforts at disarmament or alternative post-conflict stabilization strategies (Lacher, 2024; Capasso & Elkorghli, 2024; Maggi, 2022). Elsewhere, identity politics remains an underlying issue across North Africa, with Arab Barometer survey data showing that economic downturns exacerbate societal fault lines and trust deficits (Arab Barometer, 2022; Makdissi, 2024; Robbins, 2023). In parallel, many countries face persistent backlash against women's rights, evidenced by rising femicides and harassment, a trend that undermines societal resilience and leaves communities more vulnerable to extremist narratives (Brechenmacher et al., 2024; Skalli, 2021; Edström et al., 2024).

Overall, physical and social mobility across North Africa continues at full speed, creating domestic and regional challenges: climate migrants overburden fragile urban services, youth seek to breach Mediterranean, or women fight to retain their rights. Any security engagement with the region has to assume that there are no static populations or homogeneous publics, and take into account the populations in flux.

### 4.1.4. Trans-regional

Several underlying trends connect the three sub regions together in terms of societal risks.

**Cross-Regional Triangulation of Societal Risks:** Firstly, there are rising social tensions in urban areas across the Sahel, Maghreb and Levant, due to the inflow of populations into cities that were designed for far smaller and older constituencies and that receive far less resources (Africa Center for Strategic Studies, 2025; OECD/SWAC, 2022). Secondly, the fast-evolving information ecosystem, where extremist narratives circulate within milliseconds across digital platforms, has emerged as a powerful driver of youth radicalization spanning the Sahel, Maghreb and Levant (Khebbaz, 2023; Bendebka, 2025; Sigillò, 2022). Thirdly, a widening cohort of 'stateless children' born in exile, growing up without papers, education or prospects, are increasingly identified as incubators for extremist recruitment and criminal predation across the Sahel, Maghreb and Levant (UNHCR, 2021; Glied, 2024). Last but not the least, climate-induced and conflict-related displacements are increasingly linking the Sahel to the Maghreb, with weather shocks driving migration intentions in West Africa (Bertoli, Docquier, Rapoport, & Ruyssen, 2020). These flows, fuelled by weak governance and persistent insecurity, ripple outward across the Mediterranean, reaching Europe and beyond, and increasingly define the contours of today's global migration landscape.

## 4.2. Technological Dynamics

### 4.2.1. Sahel

**Unregulated Commercial Unmanned-systems Proliferation:** A major area of concern is the rapid and uncontrolled spread of unmanned systems (Milnes & Lyammouri, 2025; Okpaleke, Nwosu, & Okoli, 2023; Coetzee & Putter, 2025). In the Sahel, commercial off-the-shelf drones have become the 'poor man's air force.' Prices for quad- and fixed-wing UAVs have declined sharply over the past decade, while open-source flight control code and Telegram tutorial channels now substitute for formal training (Monteh, 2025; Okpaleke, Nwosu, & Okoli, 2023). Terror groups already employ drones for reconnaissance and for deploying loitering munitions, which overwhelm lightly defended garrisons (Rassler & Veilleux-Lepage, 2025; Kurtz, 2025; Okpaleke, Nwosu, & Okoli, 2023). Private actors are following suit. For instance, mining consortia along the Niger–Burkina Faso border increasingly hire drone-equipped security firms, creating a commercial market for night vision optics and makeshift aerial imaging that operate outside any flight clearance regime (Edet et al., 2025; Ofori-Ayeh, 2022; Rogers & Goxho, 2023). One result is a crowded, poorly regulated airspace in which state, militia and corporate platforms intermingle with little coordination, a challenging environment for NATO forces to de-conflict.

**Open-Source Data Exposure Risks:** Sahelian extremist media cells replicate Levantine playbooks, live streaming drone footage to social media platforms to build narratives of state impotence and foreign abandonment (Rolbiecki, Van Ostaeyen, & Winter, 2020; Forest, 2023). Meanwhile, inadvertent metadata leaks can be weaponized by malign non-state actors. For instance, data-harvesting fitness apps and off-the-shelf logistics trackers have exposed military and UN convoy routes, underscoring the severity of the challenges (Twetman & Bergmanis-Korats, 2020; Ford, 2025; Neugroschel, 2021).

**Motorcycle-Fuelled Conflict Economy and Insurgent Mobility:** Furthermore, technology is transforming mobility in ways that reshape the battlespace. In Mali, Niger, and Burkina Faso, armed groups such as Jama'at Nasr al-Islam wal Muslimin (JNIM) and IS Sahel rely extensively on motorcycles to move across unmonitored frontiers, conduct attacks, and sustain logistics. Cheap Chinese brands provide high mobility at a fraction of the cost of pickups, making them indispensable for both fighters and civilian traders. Motorbikes are also integrated into smuggling networks that span from Benin and Togo to northern Mali, further embedding them in the conflict economy. As Beevor (2023) underlines, this dependence on motorcycles collapses the distinction between civilian transport and insurgent mobility, with direct implications for counter-insurgency operations.

### 4.2.2. Middle East

**Drone-First Saturation Tactics:** Non state actors' ability to garner tactical advantages from technological advances has been remarkable in the Middle East, setting further examples for the rest of the world. For instance, Houthi forces pioneered composite raids in which low-flying one-way drones first blind radars, clearing the path for cruise or ballistic missile salvos (Conflict Armament Research, 2021; Knights, 2024; Price, 2024). Hezbollah and Iraqi militias have been employing similar 'drone-first' saturation tactics (Veilleux-Lepage & Archambault, 2022; Carl, 2023; Rassler & Veilleux-Lepage, 2025). The operational lesson is clear. The layered air defence systems built against ballistic attacks must now handle dozens of unpredictable micro scale attack platforms.

**Insurgents' Low-Cost Access to Cyber Infrastructure:** An addition to kinetic proliferation of technological tools is a quietly maturing cyber warfare ecosystem. The Islamic Revolutionary Guard Corps (IRGC) have been running hacker programs for its proxies in Lebanon, Palestine, or Syria, teaching control, sabotage, and social media falsification techniques under plausible deniability (Work & Harknett, 2020; Levitt, 2021; Schweitzer & Shapira, 2025). Meanwhile, several recent examples illustrate how cheaply insurgents can now reach critical cyber infrastructure. Region-wide cyber readiness indices significantly lag behind the OECD average, leaving partner militaries dependent on ad hoc contractor support that cannot scale in crisis (Valiakhmetova & Tsukanov, 2022; Al Mokdad, 2025).

**Regulatory Gaps in Dual-Use Systems:** A third layer of risk stems from regulatory gaps in dual use technologies. While several MENA countries are launching Artificial Intelligence (AI) projects, only a small number of countries have meaningful data protection laws (Center for a New American

Security 2021). Commercial satellite imagery with 30 centimetre resolution is now openly marketed, allowing private actors or insurgents to track troop concentrations almost in real time (Lin Greenberg & Milonopoulos 2021). These trends suggest that, in the absence of harmonized export controls, adversaries may exploit permissive jurisdictions to assemble intelligence, surveillance, and reconnaissance (ISR) and AI tool chains that rival local state capacity.

### 4.2.3. North Africa

**Drone Acquisitions Reshaping Militarized Disputes:** As Algeria tests indigenously assembled unmanned combat aerial vehicles (UCAV) (Kasapoğlu, 2022), Morocco continues to procure drones from various suppliers including Türkiye and Israel (Al-Garni, 2022), while Tunisia is exploring loitering munitions such as Turkish-made Alpagu and has procured Anka-S UCAVs (Kinik & Çelik, 2021). All these developments may reduce air power gap between neighbours and change the nature of militarized disputes (Hvizda et al., 2025; van Hooft et al., 2022; Jones et al., 2023). Considering small procurement numbers, one might question strategic impact of this development. Nonetheless, it is important to note the accumulation of a latent capability, which may strike oil terminals or air defence installations far away.

**Tech Partnerships with Authoritarian Suppliers:** Moreover, tech partnerships with authoritarian suppliers add another vector. Chinese 'safe city' packages increasingly provide AI-enabled facial recognition and pattern of life analytics to major North African security forces (Jili, 2022; Lin, 2024; Abiade, 2025). In a future domestic legitimacy crisis, governments may resort to these tool kits before political compromise, raising the stakes for any external stabilization effort (Dauvergne, 2022; Gravett, 2023). Meanwhile, bilateral memoranda of understanding often bypass parliamentary oversight, which may entrench opaque surveillance architectures (Hicks, 2022), whereby data might be shared with Beijing, another source of concern (Peterson, 2022).

**Gendered Recruitment via Encrypted Channels:** Furthermore, militant Salafi recruiters increasingly target women through encrypted micro influencer channels, an angle long overlooked by male centric counter-terrorism campaigns (Nasraoui, 2021; Kapsokoli, 2023; Bloom, 2025). Some case studies document the use of narratives that frame migration to conflict zones as communal duty and promise social mobility otherwise blocked at home (Mncibi, 2021; Ranstorp et al., 2022). Parallel to the easy access to satellite ISR, North Africa is experiencing an information battlespace where several demographic segments are involved (Lohlker, 2024; Kapsokoli, 2024; ECDPM, 2023).

### 4.2.4. Trans-regional

**Cross-Cutting Technology Threats:** Several cross-cutting technological trends are reshaping security dynamics across the MENA subregions. First, the proliferation of consumer digital devices has created new vulnerabilities. For instance, location metadata from fitness trackers, delivery apps, and NGO logistics systems can be exploited by adversaries. A notable example is the inadvertent exposure of U.S. military base perimeters through Strava fitness app heat maps (Twetman & Bergmanis-Korats, 2020; Braw & Palazzolo, 2021). Second, the export of digital authoritarianism is accelerating, with regimes and non-state actors leveraging bot farms and troll services to manipulate public discourse and suppress dissent (Bradshaw et al., 2021). Finally, terrorist groups are diversifying their financing methods, increasingly experimenting with micro-donations via cryptocurrencies like Bitcoin or Monero to evade traditional methods to counter terrorism financing (Davis, 2020; Shetret, 2021).

## 4.3. Economic Dynamics

### 4.3.1. Sahel

**Conflict-commodity Boom Feeding Insurgent Finance:** A conflict-commodity boom is underway in the Sahelian economy. Gold mining has been intermingled with cross-border trading that bankrolls terrorist groups' arms purchases or provision of local 'governance' in areas where the state is absent. For instance, a single Darfurian smuggling circuit is arguably linking pits in northern Niger to buyers in southern Libya, funnelling proceeds back to fighters in Sudan and Burkina Faso (Tubiana, Warin, & Mangare, 2020). Since bullion is fungible and immune to sanctions or other financial measures, armed groups gain a resilient revenue stream despite the decline of traditional external donations (OECD, 2023).

**Debt Distress and Crypto Youth:** Moreover, a quieter fiscal time bomb needs to be watched carefully. More than 60 percent of West and Sahel African states now suffer from debt distress, due among others to Eurobond coupons that outstrip growth, or opaque bilateral loans (IMF, 2023; World Bank, 2023; Mustapha & Prizzon, 2023). Sudden financial shocks could force defence budget cuts, against the background of governments confronting ever more capable insurgents. Resulting austerity spirals may have obvious security ramifications for NATO partners. Meanwhile a 'crypto youth' phenomenon is emerging. Throughout Africa, millions of small crypto holders seek inflation hedges and remittance shortcuts, which put them into a grey zone ripe for exploitation or illicit finance, especially considering that regulations are lagging (Védié, 2022; WEF, 2022; Kharif, 2021).

**Risks Stemming from Single-Commodity Dependence:** Lastly, single-commodity dependence amplifies economic volatility. In the Sahel, a telling case is gum Arabic. Sudan, Chad, and Nigeria together account for over 95% of global exports, while most high-grade processing occurs in Europe and the United States, whereby producer countries capture only a fraction of the value chain (Djetoyom, 2024; CBI, 2022). More broadly, commodity dependence heightens exposure to price swings and terms-of-trade shocks, which can interact with debt vulnerabilities to destabilize already fragile states (UNCTAD, 2023).

### 4.3.2. The Middle East

**Violent Rentierism Eroding Formal Politics:** For one, conflict economics shapes much of the Middle Eastern landscape. In Syria and Lebanon, narcotics such as Captagon and shadow tax systems have integrated war profiteers into formal politics. This 'violent rentierism' entrenches actors who benefit from perpetual low-intensity conflict, complicating any external stabilization or conflict resolution effort (Daher & Mehchy, 2025; Baumann, 2021; Hameed, 2020).

**Chinese Financial Entanglement:** Secondly, a rapid deepening of Chinese financial entanglement is worth watching. Chinese companies are expanding their footprint in MENA through investments and trade, backed by loans that bind host governments to long-term repayment schedules (Stasevich, 2024; Erslev & Jiang, 2025). For sanctions-hit states such as Iran, barter deals and re-flagged tankers provide a lifeline that insulates Tehran from Western pressure, yet grants China leverage over Gulf chokepoints (Valadbaygi, 2024; Kauffman, 2022). The strategic risk for NATO is that critical port, cable landing, or energy infrastructure could potentially come under Chinese reach, narrowing allied access options (Bhattarai & Yousef, 2025).

**Risks Stemming from Debt-Fuelled Megaprojects:** Thirdly, headline-grabbing megaprojects and construction booms may mask mounting vulnerabilities and increase fragility. In Egypt, for instance, military-run firms dominate a debt-fuelled infrastructure spree whose job creation impact is short-lived and may leave behind mounting borrowing costs (Kinninmont, 2023). Combined with prolonged economic woes, these projects may erode domestic legitimacy or trigger risk-taking foreign policy entanglements (Yezid, 2021).

### 4.3.3. North Africa

**Revenue Cliff due to Energy Transition:** North African economies sit at the intersection of energy transition and fiscal fragility. Similar to the producers in the Gulf region, oil exporters such as Algeria and Libya require prices above current levels to balance budgets, while accelerated global decarbonization threatens a structural revenue cliff (Moses, 2023; El-Katiri, 2023). Analysts further warn that large hydrocarbon reserves could become 'stranded assets' as investors pivot to renewables (Weko et al., 2024). Meanwhile, the EU's forthcoming Carbon Border Adjustment Mechanism, which will tax carbon-intensive exports such as steel and fertilizer, may drastically curtail the producers' hard currency lifelines (Real Instituto Elcano, 2023).

**Food Import Vulnerability Driving Instability:** Moreover, food import vulnerability compounds the picture. For instance, wheat shipments account for up to 50 percent of caloric intake in some countries, leaving households exposed to external price or supply shocks (Mandour, 2021; Alborghetti, 2023; Rauschendorfer & Krivonos, 2022). As highlighted during the 2022 Ukraine war, this is a major driver of instability, especially in countries like Egypt, Tunisia, and Lebanon, where wheat import dependency exceeds 70% and contingency planning remains underdeveloped (FAO, 2022; 2023).

### 4.3.4. Trans-regional

In terms of the economic dynamics, two underlying trends may shape the future of Sahel, Levant and Maghreb.

**State Capture and Capacity Erosion as a Region-wide Trend:** Firstly, the erosion of state capacity and public resources through rent-seeking behaviour and state capture. Private actors have been gaining quasi-sovereign rights, accelerating capital extraction or allocation of public goods at the expense of citizen welfare. In this process, formal authorities may be too weakened to deliver basic services (World Bank, 2021; Khatib, 2021; Williams, 2023). Meanwhile, trade-route rerouting risks triggering other economic woes including the undermining of megaproject-based models. For instance, if Arctic shipping routes were to partially displace Suez traffic, Egypt could lose transit revenues while servicing mounting megaproject debt, with shocks that could ripple into MENA sovereign markets (UNCTAD, 2024; International Monetary Fund, 2025; Middlebury Institute of International Studies, 2024).

**External Power Scramble Accelerating Regional Tensions:** A second undercurrent is an external power resource scramble that increasingly pits Gulf, Chinese and Russian investors against one another for stakes in ports, pipelines, or digital backbones (African Center for Strategic Studies, 2025; Atlantic Council, 2023; European Parliament, 2023). The UAE is now Africa's largest single investor in some recent years, surpassing China by announced greenfield capital/commitments, and carving out influence from Khartoum to Nouakchott (EY, 2024; fDi Intelligence, 2024; Financial Times, 2024). China, and to a degree Russia, are expanding in higher-risk environments that many Western businesses avoid, including mining and security-linked concessions (CSIS, 2023; Reuters, 2024). Such ground presence can crystallize into footholds near Allied operating areas, notably along the Mediterranean/Red Sea littorals (e.g., Chinese-operated Haifa Bayport; prospective Russian facility at Port Sudan) (Reuters, 2021; European Parliament, 2023; Reuters, 2024). The region's economic chessboard is fragmenting into overlapping zones of external influence, which should inform NATO force posture and partnership.

## 4.4. Environmental Dynamics

### 4.4.1. Sahel

**Climate-Driven Resource Conflict:** Firstly, environmental degradation accelerates resource competition at drastic levels. A combination of drought, cropland loss and organized violence creates a toxic conflict cocktail around Lake Chad and elsewhere in the Sahel (World Bank, 2021; Refugees International, 2023). For instance, Boko Haram and ISWAP (IS West Africa Province) terrorists tax or seize outputs from artisanal farms already crippled by failed harvests, while farmers arm themselves in reaction, which is widening the militia market and making climate stress a direct accelerator of insurgency (Delanga & Fidèle/ISS, 2025; Amadou & Foucher/SWP, 2022; Pulitzer Center, 2024). Resource competition is similarly visible in surging farmer-herder clashes across Nigeria's Middle Belt and into Niger. In some years, fatalities have rivalled those from militants' violence and remain elevated (ACLED, 2023; Africa Center for Strategic Studies, 2021; IFPRI, 2025).

**Degraded Cropland and Climate Shocks Expanding the Scope of Conflicts:** The challenges are aggravated by degradation of agricultural land on the one hand and climate anomalies on the other. Across Sub-Saharan Africa, roughly two-thirds of cropland is already degraded, with some estimates as high as 80%, which is flattening yield growth and inflating food import bills (UNCCD, 2022; FAO, 2024). Without rapid regenerative practices, soil loss could push millions off the land within a decade (UNCCD, 2022). Likewise, climate anomalies have revived desert locust swarms, threatening rain-fed agriculture and precipitating famine and displacement cascades (FAO, 2022; Liu, Zhang, & He, 2024). Meanwhile, deforestation in the Congo Basin weakens atmospheric moisture transport toward the Sahel, raising risks for rainfall variability (Africa Center for Strategic Studies, 2024; te Wierik

et al., 2022). These trends indicate that ecological change may not only aggravate existing conflicts but generate new theatres of instability, stretching already thin security forces and humanitarian infrastructure (IPCC, 2022).

### 4.4.2. The Middle East

**Conflict-Driven Environmental Pollution:** Environmental pollution as a direct result of conflicts is on the rise. In Syria, makeshift refineries operated by non-state actors contaminate soil and aquifers, damaging farmland and undermining recovery (Gaafar, 2021; PAX, 2020). Meanwhile, clandestine ship-to-ship oil transfers used by sanctioned exporters to evade oversight increase spill risks that can harm marine ecosystems and even force the closure of desalination intakes supplying millions (U.S. Department of the Treasury/OFAC, 2024; UNDP, 2023). Nuclear programs developing amid heightened conflict create the risk of radioactive pollution, which present an asymmetric threat magnified by dense littoral populations and uneven or limited chemical, biological, radiological, and nuclear threats (CBRN) preparedness in parts of the region (Lisowski, 2021; Farhat et al., 2023).

**Politicized Environmental Grievances Undermining Domestic Stability:** Moreover, environmental grievances are increasingly politicized. In Yemen, public backlash over the circulation of banned agricultural pesticides in 2024 forced de facto authorities to address the issue, illustrating how environmental harms are becoming politically salient (Sana'a Center, 2024). In Iran, water-stress-related protests such as the Khuzestan mobilization have prompted forceful crackdowns, embedding environmental risk in contentious politics (International Crisis Group, 2023). Furthermore, some state 'solutions' risk creating new hazards because of their energy intensity. Saudi Arabia's pursuit of civilian nuclear energy, with potential desalination applications, raises non-proliferation debates and underscores coastal ecosystem risks from large-scale desalination (World Nuclear Association, 2024; PIR Center, 2021; FAO & AOAD, 2023). Finally, a broader 'climate damage' narrative circulates on regional social media during dust-storm seasons or other adverse periods, where influencers and activists frame storms or pollution as governance failures, an ambient driver of digital-first contention (Chatham House, 2023; Arab Reform Initiative, 2024).

### 4.4.3. North Africa

**Extreme Climate Events Overburdening State-capacity:** North Africa faces intersecting risks from water scarcity, heat extremes and marine ecosystem stress (WMO, 2024). Morocco and Egypt are now below 1,000 m³ of renewable water per capita, a scarcity threshold associated with high socio-economic risk (World Bank, 2025; UNICEF, 2022). Algiers has resorted to water-rationing, which is an early signal of how urban water crises can trigger disorder. Tunisia has imposed quota systems and night-time cuts amid multi-year drought (Global Water Intelligence, 2021; Reuters, 2023, 2024). Meanwhile, wildfire seasons across the Mediterranean/North Africa have intensified, disrupting daily life and demanding large-scale emergency mobilization (Copernicus/EFFIS, 2024). Off the Atlantic littoral, Senegal's key small-pelagic stocks (notably sardinella) are severely overexploited with sharp declines in landings, reflecting the combined pressures of overfishing and ocean warming (FAO/CECAF, 2024; FAO EAF-Nansen, 2024).

In short, climate shocks now stretch from coast to coast, with heat extremes and marine heatwaves compounding drought/flood risks (WMO, 2025). Against the backdrop of an early global fossil-fuel demand peak projected this decade, North Africa's rentier-economy model faces mounting strain, amplifying stresses on already fragile environmental governance (IEA, 2024; IMF, 2024). Coupled with state-capacity erosion, extreme weather and environmental risks increasingly translate into geopolitical pressure on EU borders, via climate-sensitive displacement and onward movements, as reflected in migration flows through North Africa and in Libya's climate-migration dynamics (IOM, 2025; IOM, 2024).

### 4.4.4. Trans-regional

**Cross-Border Ecological Linkages Generating Geopolitical Implications:** In the Sahel–MENA arc, environmental dynamics act as compound drivers that reshape conflict economies, migration corridors and even great-power competition. Climate hazards interacting with weak governance create feedback loops that conventional security lenses often miss (IPCC, 2022). Ecological risks ignore borders and are tightly inter-connected. For example, Congo Basin deforestation can weaken moisture transport toward West Africa and the Nile Basin, while large-scale climate modes such as El Niño-Southern Oscillation (ENSO) modulate rainfall anomalies across West Africa and parts of the Eastern Mediterranean (Africa Center for Strategic Studies, 2024; IPCC, 2021a). Region-wide water scarcity further intensifies competition for 'virtual water' via cereal imports, elevating the strategic importance of shipping lanes, a reality underscored by Red Sea/Suez disruptions and EU naval protection of merchant shipping (Le Mouël et al., 2023; Council of the EU, 2024).

## 4.5. Political Dynamics

### 4.5.1. Sahel

**Post-French Sahel Realignment and Intensified Geopolitical Competition:** Throughout the Sahel, political authority is being reshaped by regional geopolitical shifts. Military juntas in Mali, Burkina Faso, and Niger have adopted an explicitly post-French posture, turning to a patchwork of alternative patrons, with Moscow the most visible as Russian proxy forces embed with ruling regimes (Robertson, 2024; CTC/West Point, 2024). In many cases, Wagner-linked contingents have yielded few measurable security gains while drawing allegations of atrocities, deepening regime dependence (Human Rights Watch, 2024; Robertson, 2024). Meanwhile, external competition has intensified: China, Türkiye, and Gulf states have expanded their roles via financing, security cooperation, and (notably via Türkiye) drone sales, turning the central Sahel into a competitive market for external security services (Casola, 2022; Atlantic Council, 2025).

**Proliferation of Community Self-Defence Triggering Conflict Dynamics:** At the community level, foreign involvement intersects with a crisis

of local legitimacy. Communities facing terrorist predation or banditry increasingly seek protection from local groups that provide limited security and rudimentary justice. The proliferation of self-defence formations is reshaping conflict dynamics well beyond a classic insurgency-army confrontation (International Crisis Group, 2023; Global Initiative, 2024). Disinformation further complicates the environment, whereby coordinated campaigns on Facebook and Telegram amplify anti-Western narratives and target multilateral missions, eroding residual support for external stabilization efforts (Africa Center for Strategic Studies, 2024; International Peace Institute, 2022).

**Erosion of Sovereignty under Cheap Lethality and Cross-Border Loyalties:** Meanwhile, cheap and lethal technologies are accelerating the spread of conflict and eroding political authority. Sudan's Rapid Support Forces have drawn on cross-border kinship and trading networks to recruit in neighbouring states. Especially across Chad and into the Central African Republic, this dynamic is creating durable transboundary loyalties (Rift Valley Institute, 2023; UN Security Council, 2024). At the same time, improvised explosive device (IED) components and commercial explosives circulate across West Africa, raising the baseline lethality of armed actors throughout the Sahel (Small Arms Survey, 2023; UN General Assembly, 2024). Taken together, these dynamics point to a political marketplace in which sovereignty is traded for survival, as armed groups and foreign brokers shape rules of engagement more than formal institutions.

### 4.5.2. The Middle East

**Tech-Enabled Authoritarian Consolidation:** One distinctive feature of regional politics is technology-enabled authoritarian consolidation. Interestingly, pandemic emergency powers normalized broad surveillance authorities and coercive enforcement in many states (Kubinec, 2022; Freedom House, 2023). COVID-era contact-tracing infrastructures in parts of the Gulf were highly invasive and accessible to authorities, and in parallel several countries advanced AI-enabled/predictive-policing programs (Amnesty International, 2020; INTERPOL, 2022). Below the state level, information operations, including coordinated inauthentic networks and bot armies, exploit domestic fault lines across Arabic social media, undermining social cohesion and, by extension, the resilience of partners on which NATO relies (Stanford Internet Observatory, 2021; Atlantic Council/DFRLab, 2024).

**Disinformation Erodes Cohesion:** Meanwhile, beneath the state level, information operations target social cohesion. Coordinated networks and bot armies exploit domestic fault lines across Arabic social media spaces, sustaining disinformation at scale (Stanford Internet Observatory, 2021; Atlantic Council/DFRLab, 2024). Such divisions erode resilience in states on which NATO relies for access, basing, and overflight, which lends further credence to NATO's assessment of disinformation as a threat to Allied and partner security (NATO, 2022).

### 4.5.3. North Africa

**Protracted Conflicts and Narrative Warfare Breeding Instability:** North Africa's political landscape is shaped by protracted conflicts, competition over resources, and narrative warfare (International Crisis Group, 2021; Africa Center for Strategic Studies, 2024). Among youth, frustration with stalled or failed peace processes, most visibly around Western Sahara, interacts with adverse demographic and governance trends, raising risks of renewed mobilization (International Crisis Group, 2021; UNDP, 2022). Egypt, Algeria, and Tunisia face widening gaps between public expectations and state capacity, while water stress has become overtly politicized, with protest cycles that can spill over into broader instability (OECD, 2024; Malka/CSIS, 2023; see also AP on Algeria's 2024 water-riots).

### 4.5.4. Trans-regional

**Trans-Regional Mercenary Markets Undermining Deterrence and Crisis-Management:** Across the broader MENA, North Africa, and the Sahel, a trans-regional market for mercenary and militia services has deepened. In several cases, security provision is exchanged for mining concessions or political alignment, as documented for Wagner-linked networks in Central African Republic (CAR) and Sudan (UK Parliament Foreign Affairs Committee, 2023; U.S. Department of the Treasury, 2023, 2024). Such networks lower the entry costs of armed intervention and blur the line between state and non-state violence, posing challenges to traditional deterrence and crisis-management frameworks (RAND, 2023; NATO, 2024).

**Foreign Base Proliferation Deepening Regional Instability:** Moreover, the proliferation of outside powers' bases merits close monitoring from the Horn of Africa to Syria and North Africa. Djibouti now hosts multiple foreign bases, which is also the case in Somalia. While Russia is seeking a facility in Sudan, in Libya, it has expanded its footprint and pursued basing arrangements (EUISS 2024; CSIS 2023; PISM 2024). Host governments often leverage this competition for rents and regime security, whereby base leases and related concessions are a significant income stream, as Djibouti's public-finance discussions and rent data illustrate (IMF 2024; JICA 2023). The perception of a U.S. drawdown encourages hedging, inviting new entrants who treat basing rights as a gateway to strategic relevance (Kaye 2022; Thépaut 2022).

**Cross-Platform Disinformation Ecosystems Complicating Threat Environment:** Furthermore, disinformation is a common challenge across the Sahel-MENA arc. Coordinated networks and bot armies circulate anti-Western and anti-mainstream narratives across both francophone African Facebook spaces and Arabic-language Telegram ecosystems (Africa Center for Strategic Studies, 2024; Atlantic Council/DFRLab, 2023). These streams intersect with climate-grievance hashtags and anti-refugee conspiracies, amplifying polarization and risk (ARIJ, 2025; The Tahrir Institute for Middle East Policy, 2024). The result is a layered threat environment in which cyber, information, and kinetic vectors reinforce one another across subregions, platforms, and conflict cycles (NATO, 2024).

## 4.6. Converging / Cross Domain Dynamics

Under the 'converging dynamics' lens, the team looked at the pressures that cut across the STEEP categories and incorporate multiple drivers, ranging from climate to technology, finance, or demography, which generate compound risk systems. They combine the variables already discussed, but look at them in a new light to see how their amalgamation may create qualitatively new triggers of instability.

### 4.6.1. Sahel

**Climate–Mobility Spiral Overwhelming Governance and Economics:** The compound risks are the most visible in the Sahel's climate-mobility spiral. Multi-year droughts and yield shocks push households to move as a first adaptation strategy, with West Africa projected to see major internal climate-migration hotspots by 2030-2050, including in and around the Lake Chad region (World Bank, 2021; IOM, 2024). The resulting displacement places additional strain on governance and fiscal resilience, raising longer-term fragility risks (IOM, 2024).

**Triangulation of Militias, IED Corridors, Gold Rush:** Security vacuums often give way to self-defence militias and intensified farmer-herder clashes that insurgents exploit, expanding violence beyond a classic state-insurgent dyad (International Crisis Group, 2023; Africa Center for Strategic Studies, 2021). These same zones have also become corridors for Improvised Explosive Devices (IED) know-how and components, as well as illicit drug flows, elevating baseline lethality and financing armed actors (Small Arms Survey, 2023; UNODC, 2024). Meanwhile, a gold-mining rush, both formal and artisanal, continues across the central Sahel, entangling security, livelihoods and transnational trafficking (OECD, 2022; UNODC, 2023). These dynamics underscore the need to integrate hydro-climate programs, urban-planning support and explosive-forensics/CBRN training within a single security-cooperation toolkit.

### 4.6.2. The Middle East

**Economic Woes and Legitimacy Erosion Triggering Geopolitical Realignment:** A major undercurrent is the cascading of socio-economic disillusionment into geopolitical realignment. Across several countries, labour market weaknesses, inflation/food-price shocks, fiscal tightening, and water-resource stress have undermined social cohesion and contributed to outward mobility (World Bank, 2023; IMF, 2024; International Crisis Group, 2023). As domestic legitimacy erodes, regimes hedge via new external alignments, while some develop civil nuclear programs as part of techno-strategic bargains (Kaye, 2022; World Nuclear Association, 2024; World Nuclear Association, 2025). High debt burdens and financing gaps increase exposure to 'debt-relief diplomacy', ranging from China's rescue lending to Gulf state' financial packages and strategic investments such as the UAE's $35 billion Ras El-Hekma deal in Egypt (AidData, 2023; Reuters, 2024; IISS, 2023).

**Disinformation Fuelling Polarization:** The widening spectre of information warfare further confounds these trends. Disinformation campaigns, particularly narratives blaming the West for socio-economic problems or regional tensions, circulate widely in Arabic online spheres, reinforcing economic grievances and polarization (Janadze, 2022; Atlantic Council/DFRLab, 2024). Overall, the region is moving through a feedback loop in which socio-economic stress, ecological pressures, weak governance, and debt burdens erode state capacity, while external actors advance techno-strategic bargains and alignments that can undercut NATO leverage (World Bank, 2023; IMF, 2024; Kaye, 2022).

### 4.6.3. North Africa

**Trade Rerouting and Fiscal Shocks Intersecting with Geopolitical Realignment:** One major cross-cutting trend is the intersection of mega-infrastructure projects and shifting trade routes, which can undermine fiscal stability especially when revenue flows are affected. The Red Sea/ Suez disruptions already show how quickly foreign-currency flows can collapse (UNCTAD, 2024; AP, 2025). Large desert solar farms, while potentially adding revenue, could alter regional precipitation patterns and water balances, with studies showing mixed outcomes depending on scale and siting (Lu, 2021; Wei et al., 2024). Looking ahead, continued Arctic sea-ice loss could expand Northern Sea Route windows and offer shorter Asia-Europe passages, posing long-term competitive pressure on Suez, though current operational and geopolitical constraints limit near-term uptake (Brown University, 2022; Middlebury Institute, 2024; Gunnarsson, 2024).

**Climate Politics and Fiscal Stability Undermining Domestic Resilience:** The politics surrounding climate change compounds uncertainty about fiscal stability. While national capital increasingly channels into green-finance instruments and highly publicized eco-cities, drought-stricken inland communities may see limited tangible benefits, raising the risk of future tensions (World Bank, 2022; Sharp, 2022; Malka/ CSIS, 2023). NATO engagement should therefore factor fiscal stress and social grievance into planning and partnerships, consistent with the Alliance's climate-security framework (NATO, 2021; NATO, 2024).

### 4.6.4. Trans regional

Several vectors connect these sub regions into a single strategic setting.

**Fiscal Stress Inviting Strategic Concessions:** Firstly, fiscal stress and climate-finance shortfalls may trigger future defaults, forcing some governments to barter basing rights or other strategic concessions in exchange for relief. Recent evidence shows that China has acted as a 'lender of last resort,' providing large rescue loans to distressed states, while Gulf bailout and investment diplomacy is also reshaping access arrangements. Egypt's Ras El-Hekma deal with the UAE and negotiations over Russia's planned base at Port Sudan illustrate how financial distress can translate into strategic concessions (AidData, 2023; Reuters, 2024; CSIS, 2023; EUISS, 2024). These fiscal vulnerabilities intersect with external alignments, complicating partners' ability to respond to Allied needs and encouraging hedging behaviour.

**Blurred Lines between Internal Security and Armed Conflict:** Secondly, the normalization and proliferation of drones, missiles, and other arms platforms by both state and non-state actors continues to blur the line between 'internal security' and 'armed conflict,' complicating the Alliance's rules of engagement. The Middle East and North Africa together account for roughly a quarter of global arms imports in recent years (SIPRI, 2025; UN PoE Yemen, 2024; Conflict Armament Research, 2024–2025). Last but not the least, the scramble for resources and critical infrastructure access through control of ports, pipelines, digital backbones creates new veto players that may directly affect NATO mobility and force posture (CSIS, 2024).

# IMPLICATIONS OF STEEP DYNAMICS

The foregoing research into the weak signals in the Middle East, North Africa, and the Sahel regions offers important insights for the Alliance's future strategic adaptability when considered alongside the vision and priorities set forth in NATO 2030. Based on the main trends on the STEEP axes analysed in greater depth earlier, the implications of these weak signals for NATO could be recapitulated as follows.

## 5.1. The Implications of Social / Human Dynamics

Societal risks have been triangulated across MENA-Sahel. Their effects ripple outward across the Mediterranean, reaching Europe and beyond, and increasingly define the contours of today's security environment. Several demography, mobility, identity or information related variables are shaping social-human dynamics in such a way that the underlying operating environment is highly threat-laden.

Atomized societal contexts resulting from a number of forces such as restive youth or communal vigilantism complicate NATO's traditional partner centric assistance model. Stabilization efforts that ignore these hyper local actors risk empowering predatory proxies or cementing grievance cycles at the local level.

As a result of the widening spectre of urban humanitarian emergencies, urban flashpoints may come to surpass rural insurgencies. This will force NATO planners to anticipate urban extraction scenarios in congested population centres as promptly as desert convoy protection, and train for mitigating harm to civilians.

Physical and social mobility continues at full speed, creating domestic and regional challenges. Any security engagement with the region has to assume that there are no static populations or homogeneous publics, and take into account the populations in flux.

A host of demographic pressures, such as the erosion of human capital through outward migration, societal fragmentation, refugee fatigue and vulnerability to militia recruitment, education gap or youth vulnerability to extremism are undermining the already fragile domestic order across the MENA-Sahel. As much as NATO engages largely with official channels, it has to watch carefully these subterranean demographic trends, and, where appropriate, develop proper engagement strategies. As NATO teams may have to be deployed to fragmented settings, they need to rethink vetting, disarmament, demobilization, and reintegration (DDR) interfaces, or force-protection postures in their missions.

Since other dynamics are directly related to this baseline, every threat vector from militant innovation to great power competition cannot be discussed without taking into account these societal-human drivers. At any rate, NATO will have to be attentive to societal resilience, deeper civil-military coordination on humanitarian support, and contingencies arising from mobilization across maritime and land borders.

## 5.2. The Implications of Technological Dynamics

As a result of rapid and uncontrolled spread of unmanned systems, a crowded, poorly

regulated airspace is emerging, in which state, militia and corporate platforms intermingle with little coordination. This is creating a challenging operational environment for NATO forces where they will have to find de-conflicting arrangements with a myriad actors. Mission planning will have be accompanied with enhanced de-conflicting protocols or counter-UAS (unmanned aircraft systems) preparedness.

Normalization and proliferation of drones, missiles, and other arms platforms continue to blur the line between 'internal security' and 'armed conflict,' complicating the Alliance's rules of engagement.

Open-source data exposure risks can be weaponized by malign state and non-state actors. At the very least, such leakages may be used against NATO assets around the region to create an image of incompetence. Multinational NATO units may need to adapt standardized rules on open-source apps to ensure operations and safety of units. Likewise, they will have to have protocols for the situations where they come close contact with partner or UN convoys.

Technology is transforming mobility in ways that reshape the battlespace, reducing the distinction between civilian transport and insurgent mobility. For instance, motorcycles are employed as cheap alternatives to conduct attacks or sustain logistics, which has direct bearing on counter-insurgency operations. NATO's protocols on rules of engagement or ISR tasking in both hostile settings and mixed civilian-insurgent traffic environments need to be revisited in view of these difficulties.

Technological advances are enabling drone-first saturation tactics, offering tactical advantages to non state actors. The layered air defense systems built against ballistic attacks need rethinking to handle dozens of unpredictable micro scale attack platforms.

Low-cost access to cyber infrastructure or regulatory gaps in dual-use systems, such as commercial satellite images, can be exploited by malign actors in situations where local state capacity is already weakened. For NATO, these converging trajectories turn the MENA into 'live laboratories' where inexpensive autonomous platforms, cyber operations and commercial ISR interact faster than traditional acquisition cycles. Engaging with local allies through conventional programs such as air defence training alone will be insufficient, and more work is needed to ensure partner networks are digitally stronger and data governance and protection is ensured. Moreover, cyber defence capabilities of NATO missions in such partner countries have to be bolstered against low-cost intrusions or disinformation.

Tech partnerships with authoritarian suppliers may create vulnerabilities for exploitation by adversaries or alter the behaviour of certain regional countries in a more risk-taking direction. NATO needs to watch closely the geopolitical dimensions of the technology partnerships in the broader region.

The spread of encrypted micro influencer recruitment channels targeting women needs to be watched. This may necessitate counter-radicalization campaigns to be more gender sensitive.

Terrorist groups are resorting to micro-donations via cryptocurrencies to evade traditional surveillance and monitoring. Counter-terrorism financing activities must watch the changes brought by technology carefully.

## 5.3. The Implications of Economic Dynamics

The erosion of state capacity and public resources through rent-seeking behaviour and state capture is a region-wide phenomenon. NATO should be prepared to a scenario where the local partners it is engaging are shrinking in terms of economic capacity.

Distressed by debt burden, credit-fuelled mega projects, dependence on single-commodities, trade-route rerouting, or violent rentierism, many already fragile states may fall prey to financial shocks, which could trigger austerity spirals. This may have obvious security ramifications for NATO partners, forcing defence budget cuts. Conversely, they could also trigger risk-taking foreign policy entanglements, creating further geopolitical flash points.

Energy transition paradoxically may be another trigger of fiscal fragility in hydrocarbon producers. Accelerated global decarbonization may threaten a structural revenue cliff hence fiscal stress, which is further aggravated by the EU's forthcoming Carbon Border Adjustment Mechanism. NATO

needs to be more attentive to the intersection of energy transition with security and economics, and anticipate new instabilities.

Conflict-commodity boom is feeding insurgent or terrorist finance, with gold mining intermingled with cross-border trading. This suggests that many internal conflicts will be hard to quell in the short term. NATO must be prepared to face scenarios where the non-state actors might be financially more resilient than its state partners. Moreover, counter-terrorism financing operations have to take into account the new trends in illicit financing.

External powers' scramble for resources in the region, particularly Chinese financial and economic engagement, is deepening. This is creating strategic risks for NATO that critical port, cable landing, or energy infrastructure could potentially come under reach of adversaries. Such ground presence can crystallize into footholds near Allied operating areas, notably along the Mediterranean/Red Sea littorals. Since the emergence of zones of external influence will narrow Allied access options, NATO force posture and partnerships should carefully monitor these trends pre-emptively.

## 5.4. The Implications of Environmental Dynamics

The spectre of resource conflicts driven by environmental and climate related factors will likely expand. They will not only aggravate existing conflicts, but also generate new theatres of instability, stretching already thin security forces and humanitarian infrastructure. NATO may have to respond to greater number of humanitarian assistance and disaster response requests. NATO missions need to be prepared for complications in access, convoy movement, or community engagement in these fragile settings.

Environmental pollution as a direct result of conflicts is on the rise, ranging from oil spilling to radioactive pollution. Considering the uneven/limited CBRN preparedness in parts of the region, NATO should make the capacity building in this realm part of its engagement with the regional partners.

Environmental dynamics act as compound drivers that reshape conflict economies, migration corridors and even great-power competition. Climate hazards interacting with weak governance create feedback loops that conventional security lenses often miss. Grievances resulting from environmental factors are increasingly politicized, while water scarcity, heat extremes or marine ecosystem stress undermine the already fragile state capacity. This is increasingly translating into geopolitical pressure on the Southern Flank, via climate-sensitive displacement and onward movements. NATO should include environmental security into its dialogue with the regional partners, going to the root causes and adopting a more comprehensive perspective.

Degraded cropland, locust swarms, water scarcity, or soil loss can generate new instability theatres and displacement, stretching local security and humanitarian systems. NATO may need to factor higher Humanitarian Aid / Disaster Response requests and sustainment friction into planning. The rules of engagement for missions, or equipment or training of forces may need to be revisited.

## 5.5. The Implications of Political Dynamics

Regional geopolitical shifts are reshuffling political authority, with the spread of military juntas or coup leaders seeking new external patrons for financing and security cooperation. Intensified external competition risks further entanglements. NATO needs to watch more closely political trends, through foresight and risk analysis, and be prepared to manage the challenges arising from strategic realignments of certain regional countries.

The hedging behaviour by regional countries, particularly in view of the discussions pertaining to U.S. drawdown, will accelerate the proliferation of external powers' military bases, which is already underway for other reasons. As NATO monitors those broader geopolitical alignments, it should also be prepared to face scenarios where units in NATO missions act in an environment populated by military units from other countries. This calls for rethinking creative de-conflicting arrangements adaptable to the local contingencies.

A crisis of political authority and domestic legitimacy, expansion of self-defence formations, or empowerment of cross-border loyalties are reshaping conflict dynamics, complicating external stabilization efforts. NATO missions may have to operate in settings dominated by armed local

actors and coordinated disinformation that targets multilateral missions. NATO should invest in new ways of engagement in its missions in post-conflict settings, including robust community mapping, careful vetting of interlocutors, and proactive strategic communications.

The spread of cheap and lethal technologies are further deepening cycle of violence. NATO training or advisory engagement with partners should anticipate higher explosive ordnance disposal (EOD) or drone threat, and pay closer attention to convoy security, and border-security demands.

Vulnerabilities to information operations through coordinated networks or bot armies are eroding societal resilience in many countries where NATO or Allied militaries may rely for access, basing, and overflight. The result is a layered threat environment in which cyber, information, and kinetic vectors reinforce one another across subregions, platforms, and conflict cycles. NATO needs to maintain its treatment of disinformation as a threat to Allied and partner security.

Protracted conflicts, frustration with failed peace processes, competition over resources, or narrative warfare, are creating fertile ground for a renewal of social mobilization and protest cycles, which can spill over into broader instability. NATO missions should be prepared to respond to such upheavals, and the units should increase their riot control capacity both in terms of equipment and training.

A trans-regional market for mercenary and militia services will continue to expand, lowering the entry costs of armed intervention and blurring the line between state and non-state violence. NATO needs to watch the challenges presented by this dynamic to its traditional deterrence and crisis-management frameworks. In challenging theatres, it may have to maintain control over key corridors, engage in de-conflicting arrangements with myriad non-state actors, or negotiate with host governments.

## 5.6. The Implications of Converging / Cross Domain Dynamics

As in the case of Sahel, a climate-mobility spiral is creating displacement, which exerts additional strain on governance and fiscal resilience of states, raising longer-term fragility risks. NATO forces should invest in more humanitarian assistance and disaster response capacities to respond to emerging hotspots in urban settings.

A triangulation of militias, IED corridors, or gold rush complicate the operational environment. They underscore the need to integrate hydro-climate programs, urban-planning support and explosive-forensics or CBRN training within a single security-cooperation toolkit.

Socio-economic disillusionments, accelerated by erosion of domestic legitimacy and environmental drivers, are cascading into geopolitical realignments. Regimes hedge via new external alignments. While some develop civil nuclear programs as part of techno-strategic bargains, high debt burdens and financing gaps increase others' exposure to 'debt-relief diplomacy.' The scramble for resources and critical infrastructure access through control of ports, pipelines, digital backbones creates new veto players. Those third parties may be more assertive in putting tighter conditionality on NATO access, basing, mobility or force posture.

Overall, the region is moving through a feedback loop in which socio-economic stress, ecological pressures, weak governance, and debt burdens erode state capacity, while external actors advance techno-strategic bargains and alignments that can undercut NATO leverage. NATO engagement should therefore factor fiscal stress and social grievance into planning and partnerships, consistent with the Alliance's climate-security framework.

The fiscal pressures from, among others, trade rerouting may have wider implications for maritime security. Disruptions in Red Sea and Suez or the volatility stemming from megaproject based development models create vulnerabilities that erode certain key actors' domestic stability, further undermining maritime security. NATO strategic planning should watch closely the developments related to alternative sea lines of communication (SLOC) in conjunction with the economic and fiscal fragility of key partners.

# IMPLICATIONS AND RECOMMENDATIONS FOR NATO

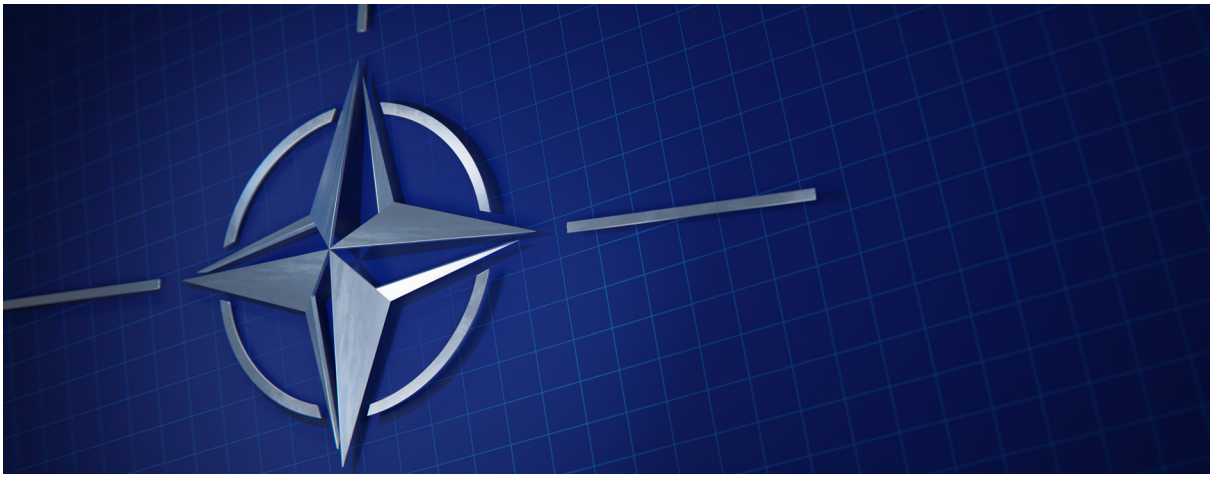
This paper set out to identify weak signals across the MENA-Sahel arc that, while still fragmentary or under the radar of dominant narratives, may evolve into meaningful drivers of NATO's future operating environment. The study complemented trend work with horizon scanning, treating weak signals as directional signposts rather than predictions, and sought to translate them into policy-relevant considerations for Allied planning. The geographic focus reflected the premise that the Middle East, North Africa, and the Sahel form a single, interlinked strategic setting whose trajectories will shape Allied security out to 2045. The analysis is exploratory, designed to enrich NATO's anticipatory posture and inform follow-on watch-lists, stress-tests, and analytic deep dives.

## 6.1. Key Results for NATO

Several cross-cutting findings emerged from the research, which were studied in greater length in the previous sections. Out of these various trends, a few of them are worth recapitulating here.

**a. Overlapping feedback loops complicating Allied engagement:** First, the dynamics in these regions are converging into social, economic, technological, environmental, and political feedback loops that compound fragility and complicate Allied engagement. Fiscal stress, climate-finance shortfalls, and debt exposure are already giving way to the emergence of strategic concessions that can constrain Allied access, basing, and mobility. Moreover, the normalization and diffusion of drones, missiles, and other platforms further blur boundaries between internal security and armed conflict, with implications for rules of engagement and crisis management. These shifts coincide with a scramble for ports, pipelines, and digital backbones. NATO must be prepared to act in environments where there are third parties that are acting as veto players, undermining the Alliance's leverage.

**b. Erosion of social/human foundations altering the operating environment:** Second, the social/human baseline across the MENA-



Sahel arc is deteriorating in ways that significantly alter the operating environment. A restive youth bulge, communal vigilantism that coalesces with extremism, and an urban humanitarian emergency in the Sahel, together with human capital erosion, refugee fatigue, and education gaps elsewhere, are producing fragmented societal contexts and constant flow of populations. Stabilization models that assume static populations or rely solely on official channels risk empowering predatory intermediaries and cementing grievance cycles at the local level. NATO planning, force protection, and DDR interfaces must adapt to mission settings dominated by hyper-local actors, fragmented publics, and contingencies in high-density urban settings.

**c. Diffusion of technology reshaping threat environment:** Third, technological diffusion is reshaping threat environment across domains. Drone-first saturation tactics, cheap lethality, and crowded airspace are now routine features in theatres where armed groups learn fast and adapt easily. Meanwhile, a widened information battlespace, spanning bot networks, micro-influencer recruitment campaigns (including gendered targeting), and the exploitation of consumer-device metadata, erodes societal resilience. Allied and partner operations need to prepare for challenging settings where they are exposed to ever transforming risks stemming from rapid technological advances.

**d. Economic fragility and external leverage threatening Allied force posture and partnerships:** Fourth, economic dynamics amplify fragility and invite external leverage. In the Sahel, conflict-commodity booms, especially gold, finance insurgents and embed informal governance. Debt distress and "crypto youth" patterns widen policy grey zones, while dependence on single-commodity heightens exposure to price shocks. Across the Middle East, violent rentierism integrates war profiteers into formal politics, while deepening Chinese financial entanglement and debt-fuelled megaprojects raise the odds of future concessions that affect Allied access to critical infrastructure. In North Africa and other hydrocarbon producers, an energy-transition 'revenue cliff,' Carbon Border Adjustment Mechanism-related export headwinds, and food-import vulnerability present cumulative fiscal risks that can evolve into wide political instability in key countries. NATO should factor the fragmented economic chessboard caused by state capture or external powers' scramble for ports, pipelines, and digital backbones into decisions pertaining to Allied force posture and partnerships in the region.

**e. Expansion of environmental pressures generating new operational requirements:** Fifth, environmental stress has become a compound driver of insecurity from the Sahel to the Mediterranean littorals. Climate-driven resource conflicts around Lake Chad, degraded cropland and revived locust swarms, conflict-generated pollution, and cascading water scarcity together stretch humanitarian systems and undermine governance. These pressures also have maritime and geo-economic consequences. Climate-sensitive displacement elevates pressure on EU borders, and region-wide water and food insecurity increase the strategic salience of shipping lanes already affected by Red Sea/Suez disruptions. In addition, Arctic sea-ice loss could alter SLOC economics over the long term, with fiscal impact on Suez-dependent states. NATO should anticipate higher Humanitarian Assistance / Disaster Response demand, and incorporate environmental security into dialogues with partners and capacity-building, including CBRN preparedness where appropriate.

**f. Reconfiguration of geopolitical alignments restraining Allied access options and operational environment:** Sixth, political realignments and hedging behaviour are reshaping authority structures and Allied access options in key regional countries. The proliferation of external bases, the diffusion of mercenary markets, and the empowerment of community self-defence formations complicate de-confliction and strain traditional deterrence / crisis-management frameworks. In contested theatres, NATO should anticipate situations where Allied units may operate alongside foreign forces and local armed actors, requiring creative, context-specific de-confliction arrangements and resilient strategic communications against orchestrated disinformation operations.

## 6.2. Operational Consequences for NATO

Taken together, these findings point to a strategic operating environment characterized by a myriad of dynamics including but not limited to population mobility and urban fragility, proliferation of

cheap lethality, digitally accelerated contention, fiscal strains that can translate into strategic concessions, and ecological risks that ignore borders. The implications of these developments for NATO's anticipatory posture are clear. Based on the extensive analysis in Section 5, these consequences for NATO can be summarized in the Table below.

**Table 2. Consequences of STEEP Drivers for NATO**

| Social / Human Dynamics | Technological Dynamics | Economic Dynamics | Environmental Dynamics | Political Dynamics |
|---|---|---|---|---|
| Rethink the traditional state-partner centric assistance model | Redesign air defense systems to handle dozens of unpredictable micro-scale attacks by drones. | Factor fiscal considerations into planning and partnerships decisions, watching closely adverse effects of mega projects. | Be prepared to respond to greater number of humanitarian assistance and disaster response requests. | Watch closely the challenges arising from strategic realignments of certain regional countries. |
| Be prepared to respond to urban flashpoints, and calibrate instruments to congested urban settings. | Envision de-conflicting arrangements with a myriad actors, due to over-crowded airspace. | Monitor shrinking of partners' economic capacity, which may trigger defense budget cuts. | Anticipate complications in access, convoy movement, or community engagement in fragile settings. | Be prepared to face situations where units in NATO missions act in an environment populated by military units from other countries. |
| Rethink vetting, DDR interfaces, or force-protection postures in missions in fragmented social settings. | Adapt standardized rules on open-source apps to ensure operations and safety of multinational units. | Anticipate risk-taking foreign policy entanglements driven by domestic economic woes, creating further geopolitical flash points. | Make capacity building in the realm of CBRN preparedness part of engagement with regional partners. | Anticipate contested operational environments as a result of a triangulation of militias, IED corridors, or gold rush. |
| Anticipate urban extraction scenarios in congested population centres. | Revisit protocols on rules of engagement or ISR tasking in both hostile settings and mixed civilian-insurgent traffic environments. | Pay attention to the intersection of energy transition with security and economics. | Integrate hydro-climate programs, urban-planning support and explosive-forensics/CBRN training within a single security-cooperation toolkit. | Invest in new ways of engagement in missions, including robust community mapping, careful vetting of interlocutors, and proactive strategic communications. |
| Anticipate continued migratory pressures triggered by social/human disillusionments. | Ensure resilience of data governance and cyber defense capabilities of partner networks against low-cost intrusions or disinformation. | Watch conflict-commodity boom and perpetuation of conflicts. | Factor higher Humanitarian Aid / Disaster Response requests and sustainment friction into planning. | Pay closer attention to convoy security, and border-security demands in training or advisory engagement with partners. |
| Anticipate cascading of social/ human dynamics into geopolitical realignments. | Watch closely the geopolitical dimensions of the technology partnerships in the broader region against vulnerabilities for exploitation by adversaries. | Anticipate non-state actors financially more resilient than state partners. | Include environmental security into dialogue with the regional partners, going to the root causes and adopting a more comprehensive perspective. | Continue to treat disinformation as a threat to Allied and partner security. |
| | Monitor micro-donations via cryptocurrencies in counter-terrorism financing activities. | Watch closely the developments related to alternative SLOCs and polar rerouting, in conjunction with economic and fiscal fragility. | | Monitor carefully external powers' scramble for resources and bases in the region, in planning and decisions on force posture and partnerships. |

In conclusion, a number of the operational consequences are worth highlighting. First, planning and partnerships should systematically factor fiscal stress and social grievances. Among others, this may include monitoring debt dynamics, exposures caused by energy-transition, and vulnerabilities brought by food-imports, which may trigger abrupt policy pivots by partners, especially those that are located as gatekeepers along critical passages.

Second, Alliance instruments should be calibrated for congested urban contingencies, such as urban extraction, convoy protection through complex IED corridors, or enhanced humanitarian assistance / disaster response capacity for densely populated settings.

Third, force-design choices should incorporate cross-domain interaction. This may include integration of hydro-climate programming and urban-planning support with explosive forensics and CBRN training under a single security-cooperation toolkit, or focusing on counter-UAS, EOD, and border-security tasks in the capacity development programs for partner forces.

Fourth, the diffusion of technology will continue unabated, complicating operational environments. Among others, the implication for NATO is two-fold: refine ISR and counter-UAS approaches that are responsive to urban density and mixed civil-military airspace, and bolster mission protection against data leakage and information operations that can delegitimize multilateral forces.

Last but not the least, access, basing, and mobility policies should be stress-tested against scenarios in which new veto players, state or non-state, constrain Allied presence, while in the maritime domain alternative SLOCs and their second-order fiscal impacts on key partners need to be watched closely.

## 6.3. Areas of Further Inquiry

Finally, these findings point to a number of potential avenues of future research.

**a. Linkages between fiscal challenges and security:** For one, it may be worthwhile to explore the linkages between fiscal challenges and security, especially pressures exerted by climate-financing, or sovereign debt stress, and how the prospective 'debt relief diplomacy' might be tied to basing or infrastructure access.

**b. Evolution of trans-regional militia markets:** Secondly, the evolution of trans-regional mercenary/militia markets and their effects on escalation control, civilian protection, and de-confliction present another line of research.

**c. Urban humanitarian emergencies and resilience:** Thirdly, the trajectories of urban humanitarian emergencies, including migration corridors and city-level resilience relevant to Allied crisis-response, warrant further scrutiny.

**d. Cross-cutting technological risks:** Fourthly, another promising area of research may look at cross-cutting technological risks, from drone saturation to micro-donation crypto financing and metadata exposure.

**e. Environmental security as an operational variable:** Last but not the least, there is room for further inquiry into environmental security as an operational variable, from conflict-related pollution and CBRN vulnerabilities to SLOC-sensitive food and water dependencies.

Advancing research into these areas will contribute to the Alliance's efforts to sustain a 360-degree approach to security, and act proactively and consistently across its southern neighbourhood.

# CONCLUSION

This report presented the findings of a research project employing strategic foresight analysis. The main purpose of this research project was to uncover weak signals and how they may potentially impact Allied and partner security across the Middle East, North Africa, and the Sahel, which have been treated as a single, interlinked strategic setting. The scope of the research has been mainly exploratory and diagnostic, rather than predictive. Hence, it adopted evidence-based methodology to help uncover the implications of the fast-evolving security environment for the Alliance's engagement with the contingencies in Southern neighborhood. By employing horizon-scanning, and multi-stage data collection, processing and analysis, the research sought to identify weak signals, which are operationalized as those trends that (i) remain under-the-radar in dominant discourse; (ii) could plausibly scale or cascade; and (iii) bear on NATO's instruments of cooperation, assurance, and crisis-response in or around the southern neighbourhood.

The research pointed at several weak signals across the social/human, technological, economic, environmental, political and cross-domain dynamics (STEEP), which could shape the future security landscape across the Middle East, North Africa, and the Sahel. While some of these early signals are already having an impact on the regional security environment, others may gain more visibility over time and emerge as major drivers of NATO's future operating environment. Therefore, the report also identified several policy-relevant implications of these weak signals for NATO, which yielded cross-cutting findings.

The analysis underscored the necessity to avoid a compartmentalized approach. Many weak signals coalesced multiple STEEP categories simultaneously, while several dynamics transcended the geographic boundaries of individual sub-regions. The complexity and interdependence of the MENA-Sahel arc, with its interlocking feedback loops across demographic, economic, societal, environmental, or political domains, cannot be captured through oversimplification and confinement into discrete categories. Therefore, the research integrated cross-domain and trans-regional categories to the SFA analysis. Taken together, the findings point to a strategic operating environment characterized by a myriad of dynamics including but not limited to population mobility and urban fragility, proliferation of cheap lethality, digitally accelerated contention, fiscal strains that can translate into strategic concessions, and ecological risks that ignore borders.

The implications of these STEEP dynamics for NATO are multifaceted and demand a more integrated approach to security planning. Across the social and human domain, the Alliance must reckon with operating environments that are no longer defined by stable populations, but rather by fragmented publics, restive youth groups, and communities in flux, as a result of displacement, refugee fatigue, or eroded human capital. Technological diffusion has fundamentally altered the threat calculus, as crowded airspaces populated by state, militia, and commercial platforms, combined with cheap lethality and digitally enabled recruitment, present challenges that conventional training and advisory programs might prove ill-equipped to address. Economic fragility across the region, whether stemming from debt distress, violent rentierism, or the paradoxes of energy transition, renders partner states

vulnerable to external leverage and sudden policy pivots that may constrain Allied access and scuttle cooperation. Environmental pressures compound these vulnerabilities by generating new waves of displacements, stretching humanitarian response capacities, and interacting with weak governance. These process are likely to produce feedback loops that traditional security frameworks tend to overlook. Political dynamics, characterized by geopolitical hedging, the expansion of mercenary markets, or the proliferation of external military footprints, further complicate the operational landscape by introducing multiple actors with competing interests and by eroding the predictability of partner behaviour.

When translated into policy-relevant considerations, these findings suggest that NATO's engagement with the MENA-Sahel arc requires adaptation across several dimensions. The convergence of fiscal stress, social grievance, or ecological risks into overlapping feedback loops means that planning assumptions must be stress-tested against scenarios where partners face abrupt revenue shocks, infrastructure concessions to external powers, or domestic legitimacy crises that alter their strategic orientation. Force design and capability development should reflect the reality of congested urban environments, where extraction scenarios, IED corridors, and humanitarian emergencies may occur simultaneously, and where the distinction between combatant and civilian, or between internal security operation and armed conflict, is increasingly blurred. Cross-domain integration, linking hydro-climate programming with explosive forensics, urban planning support with CBRN preparedness, or counter-UAS measures with strategic communications is becoming an operational necessity. Furthermore, the diffusion of technology, from drone saturation tactics to cryptocurrency-enabled financing and metadata exploitation, demands that the Alliance refine its intelligence, surveillance, and reconnaissance postures while simultaneously bolstering mission protection against information operations designed to delegitimize multilateral presence. Finally, access, basing, and mobility policies must account for the emergence of new veto players, whether state or non-state, that can constrain Allied presence or complicate de-confliction in contested theatres.

Ultimately, this report does not claim to predict the future; rather, it seeks to sharpen the Alliance's vision towards the Southern neighbourhood by drawing attention to developments that, while still nascent or fragmented, may acquire strategic weight over the coming two decades. The MENA-Sahel arc is not a static periphery but a dynamic arena where the trajectories of demographic change, technological proliferation, economic restructuring, environmental stress, and political realignment intersect in ways that impact Allied interests. By treating weak signals as directional signposts rather than forecasts, and by integrating cross-domain and trans-regional perspectives into strategic foresight, NATO can position itself to respond with greater agility when the unexpected materializes. The value of such anticipatory work lies not in the certainty of its projections but in its capacity to expand the range of contingencies for which the Alliance is prepared, thereby contributing to a more resilient and forward-leaning posture across its Southern neighbourhood.

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# ANNEX 1 – PROMPT

"🎯 **Objective:**
This task supports a NATO strategic foresight analysis aimed at identifying **weak signals** that may shape the future security landscape in the **Middle East**, **North Africa**, and the **Sahel** regions. Based on NATO's Strategic Foresight Analysis (SFA) methodology, the goal is to detect subtle, early-stage, or underexplored developments that may evolve into major drivers of change. Read Project documents about our Project in general

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📌 **What Is a Weak Signal?**
A **weak signal** is an early, low-visibility, and often ambiguous sign of possible future disruption. These are:

- **Emerging** and **not yet part of dominant narratives**
- **Fragmented**, **contradictory**, or **non-obvious**
- **Potentially impactful**, though current implications may be unclear
- **Not yet widely discussed** in policy or academic discourse

Weak signals help anticipate unexpected developments and challenge conventional foresight assumptions.

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🛠️ **Method and Instructions:**

Each time I will give you documents (a merged pdf file that includes many documents).

Your tasks:

1. **Carefully read all documents. No web search.**
2. **Identify weak signals** using the definition above.
3. Classify each signal using the **STEEP framework**:
    - **Social / Human:** Migration, identity, unrest, demographics, etc.
    - **Technological:** AI, cyber capabilities, surveillance, tech innovations, etc.
    - **Economic:** Informal economies, remittances, resource pressures, etc.
    - **Environmental:** Climate risks, desertification, ecological shifts, etc.
    - **Political / Geopolitical:** Fragile governance, external influence, alliances, coups, etc.
4. For **each valid weak signal**, provide the following information:

- **STEEP category**
- **Weak Signal Title**: A short (3–5 word) summary of the signal
- **Explanation**: A 4–5 sentence description of the weak signal, its source, and possible future impact
- **Region**: Specific country or sub-region (e.g., Libya, Sahel, Levant, Algeria)
- **APA Citation:** reference of the document that you have detected the weak signal.
- **Name of the File:** name of the file that you detected the weak signal.

5. **DO NOT fabricate** content.
   - If you do not detect any weak signals from a study, skip it.
   - Focus on **real insights that you can detect from documents** only.
   - I am not giving a minimum or maximum number of weak signals. Find real and relevant ones as many as you can without fabrication.

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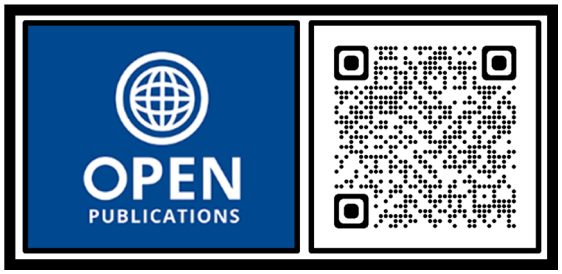
📊 **Output Table Format:**
Return results in a table with the following structure:

| STEEP Category | Weak Signal Title (a few words) | Explanation (5-7 sentences) | Political geography | ◦ APA Citation | Name of the file |
|---|---|---|---|---|---|




Weak Signals Out to 2045 –
Focus on the Middle East and North Africa including Sahel Region
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