Mapping the Global Scientific Landscape of the Climate-Security Nexus within Non-Traditional Security Architectures (2017–2026): A PRISMA-Compliant Bibliometric Review

Trias Wijanarko[1], Priyanto[2], R.Djoko Andreas Navalino[3], and Sovian Aritonang[4]

[1,2,3,4] Doctoral Program, Republic of Indonesia Defense University, Bogor, West Java, 16810, Indonesia

Email: trias.wijanarko@doktoral.idu.ac.id

HOW TO CITE:
Trias Wijanarko, Priyanto, R.Djoko Andreas Navalino, and Sovian Aritonang (2026), Mapping the Global Scientific Landscape of the Climate-Security Nexus within Non-Traditional Security Architectures (2017–2026): A PRISMA-Compliant Bibliometric Review

International Journal of Special Education, 41(21s), 772-778

ABSTRACT

The continuous escalation of climate-induced environmental anomalies has fundamentally reconstructed contemporary defense paradigms, positioning climate security as a core pillar of non-traditional security (NTS). Although scholastic literature on ecological crises has expanded significantly, a comprehensive, macro-structural synthesis evaluating the specific thematic networks and chronological frontiers of this nexus remains critically absent. This study aims to systematically analyze and map the global scientific landscape of the climate-security framework using a quantitative bibliometric approach integrated with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol. Metadata from 882 high-impact publications spanning the years 2017–2026 were extracted from the Scopus database and processed via VOSviewer software. Author keyword co-occurrence analysis revealed a highly sophisticated topological network comprising seven distinct thematic clusters: (1) Disaster Governance and Human Vulnerability (Red), (2) Environmental Protection and Resource Sustainability (Green), (3) National Security and Strategic Conflict (Blue), (4) Public Policy and Regional Non-Traditional Security (Yellow), (5) Risk Assessment and Macro-Geopolitics (Purple), (6) Climate Security and Adaptation Strategies (Light Blue), and (7) Water Security and Sustainable Development Goals (Orange). Chronological overlay visualization demonstrates a clear paradigm shift, moving from foundational conceptualizations of human safety toward acute, operational policy demands centered on predictive ecological risk modeling and resource security heading into 2026. This paper provides a novel strategic framework for defense institutions, policy architects, and strategic studies scholars to reorient conventional security doctrines into predictive, ecologically resilient comprehensive national defense systems.

Keywords: Climate Change, Environmental Security, Non-Traditional Security, Disaster Management, Bibliometric Analysis, PRISMA Protocol, VOSviewer

Introduction

In the contemporary era defined by the Anthropocene, the escalation of climate-induced disasters has transcended traditional environmental boundaries, emerging as a critical core of non-traditional security (NTS) threats globally. The international community increasingly recognizes that climate change is no longer merely an ecological crisis, but a catastrophic catalyst that directly reshapes public health vulnerability, triggers severe economic and social disruptions, and challenges state stability [1]. Consequently, understanding the complex nexus between environmental degradation and human security is paramount for formulating resilient public policies and proactive disaster prevention strategies [2].

Despite the surging volume of literature addressing these existential threats, existing scholarship remains highly fragmented and compartmentalized into isolated domains of environmental science, public health, or conventional defense studies. Previous research has predominantly favored localized empirical cases, leaving a critical gap in understanding the macro-level global trajectory and thematic evolution of the climate-NTS nexus. To resolve this fragmentation, an objective, transparent, and comprehensive synthesis of the global research landscape is fundamentally necessary. Therefore, employing a bibliometric mapping anchored in the rigorous PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol offers a powerful methodological solution. This approach systematically untangles the intellectual boundaries of the field, visually uncovers hidden interconnections among emerging sub-themes—such as public policy and socio-economic effects—and robustly exposes latent research gaps, thereby providing a definitive roadmap for defense and strategic security scholars [3, 4].

To bridge this critical empirical void, this study aims to systematically analyze and map 882 high-impact publications indexed in the Scopus database from 2017 to 2026, explicitly focusing on the operational nexus between climate-induced disasters and non-traditional security architectures. Utilizing advanced visual clustering, this review comprehensively evaluates how escalating environmental issues act as threat multipliers that severely disrupt public health and trigger cascading socio-economic effects. Ultimately, this paper provides a novel strategic framework to optimize public policy and maximize the efficacy of disaster prevention paradigms, thereby offering invaluable insights for defense institutions, policy architects, and strategic security scholars tasked with safeguarding national resilience against non-military crises [5, 6].

Methodology

Data Source and Search Strategy

This study utilized a quantitative bibliometric approach integrated with a systematic literature review (SLR) framework to analyze the global scientific evolution of the climate-security nexus. Data retrieval was strictly performed using the Scopus database, recognized as one of the most comprehensive peer-reviewed abstract and citation databases for interdisciplinary strategic and security studies. To capture the precise intersection between environmental crises and defense paradigms, a specialized Boolean search string was executed within the primary search engine: TITLE-ABS-KEY (("climate change" OR "disaster" OR "climate crisis") AND ("non-traditional security" OR "human security" OR "disaster governance")). The search focused entirely on fields containing titles, abstracts, and

author keywords to maintain thematic integrity and avoid peripheral noise.

Document Selection and PRISMA Framework

The systematic selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure replicability and minimize selection bias. The initial identification stage yielded a crude total of 1,209 documents. In the screening phase, a strict temporal filter was applied to restrict the dataset to the last decade (2017–2026), capturing the most contemporary shifts in non-traditional security architectures; this operation narrowed the selection to 882 documents. To ensure absolute transparency and prevent database interface errors from omitting vital literature, the complete metadata of these 882 documents—comprising full citation matrices, bibliographical linkages, abstracts, author keywords, and reference strings—was extracted in its entirety. The comprehensive refinement and exclusion of peripheral non-English records or non-peer-reviewed text types were handled post-extraction during the software ingestion phase, securing a final analytical sample of 882 high-quality global publications.

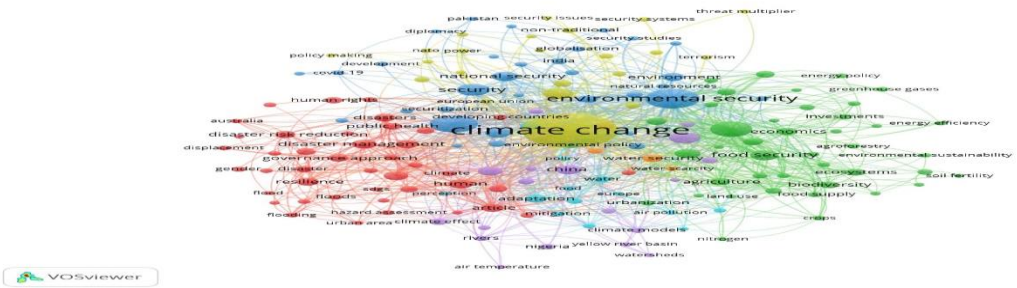
Bibliometric Mapping and Visualization Software

The final dataset was processed using VOSviewer (version 1.6.20) to construct and analyze distance-based bibliometric networks. To map the structural framework of the domain and discover latent research gaps, a co-occurrence analysis was conducted, using "Author Keywords" as the primary unit of analysis under the full counting method. To optimize network density and eliminate single-study idiosyncrasies, a strict threshold was established where a keyword must appear a minimum of six (6) times within the corpus. This mathematical constraint efficiently distilled the extensive keyword directory into a clean, highly concentrated network of core conceptual nodes. The resulting visualizations were categorized into network visualization maps to determine structural clusters, and overlay visualization maps to analyze chronological frontiers heading into 2026.

Results

Topological and Structural Overview of the Co-Occurrence Network

The execution of the PRISMA-guided selection and the mathematical constraint of a minimum keyword occurrence threshold of six (6) times successfully distilled the extensive dataset into a highly concentrated co-occurrence network. The topological distribution of the network reveals a robust intellectual structure characterized by strong interconnections between ecological anomalies and security disruptions. As mathematically calculated by the VOSviewer algorithm, the global scientific literature regarding the climate-security nexus is systematically bifurcated into seven distinct thematic clusters, each represented by a specific color coding. The size of each node correlates directly with the frequency of the keyword's appearance within the 882 analyzed Scopus documents, while the thickness of the connecting lines signifies the strength of the co-occurrence link between concepts [7].



Picture 1 (Network Visualization Map)

Granular Analysis of the Seven Thematic Clusters

A detailed topological ingestion of the network distinguishes seven primary pillars that define the contemporary international discourse on the climate-security framework:

- **Cluster 1 (Red) - Disaster Governance and Human Vulnerability:** Anchored by major nodes including *'disaster management'*, *'vulnerability'*, *'human'*, *'governance approach'*, and *'resilience'*. This cluster focuses on the operational and tactical dimensions of emergency response, institutional disaster coordination, and mechanisms aimed at reinforcing civilian community resilience against localized climate shocks.

- **Cluster 2 (Green) - Environmental Protection and Resource Sustainability:** Dominated by key terms such as *'sustainable development'*, *'environmental protection'*, *'food security'*, *'climate change adaptation'*, and *'energy'*. This domain explores the systemic alignment of environmental conservation policies with resource stability frameworks, highlighting that long-term strategic safety is impossible without food and energy security.

- **Cluster 3 (Blue) - National Security and Strategic Conflict:** Strongly reinforced by the concepts of *'environmental security'*, *'human security'*, *'security'*, *'national security'*, and *'conflict'*. Positioned at the very heart of defense studies, this cluster evaluates the direct pathways through which environmental degradation multiplies geopolitical frictions and triggers horizontal or vertical societal conflicts.

- **Cluster 4 (Yellow) - Public Policy and Regional Non-Traditional Security:** Anchored by the conceptual anchors *'climate change'*, *'human securities'*, *'public policy'*, *'regional security'*, and *'non traditional'*. This group highlights the role of nation-states and multilateral organizations in formulating public policies to address unconventional security challenges across regional corridors.

- **Cluster 5 (Purple) - Risk Assessment and Macro-Geopolitics:** Characterized by keywords such as *'global warming'*, *'china'*, *'risk assessment'*, *'climate effect'*, and *'environmental management'*. This cluster reflects an intensive focus within global scholarship on macro-level risk quantifications and the strategic geopolitical positioning of major actors like China under global warming scenarios.

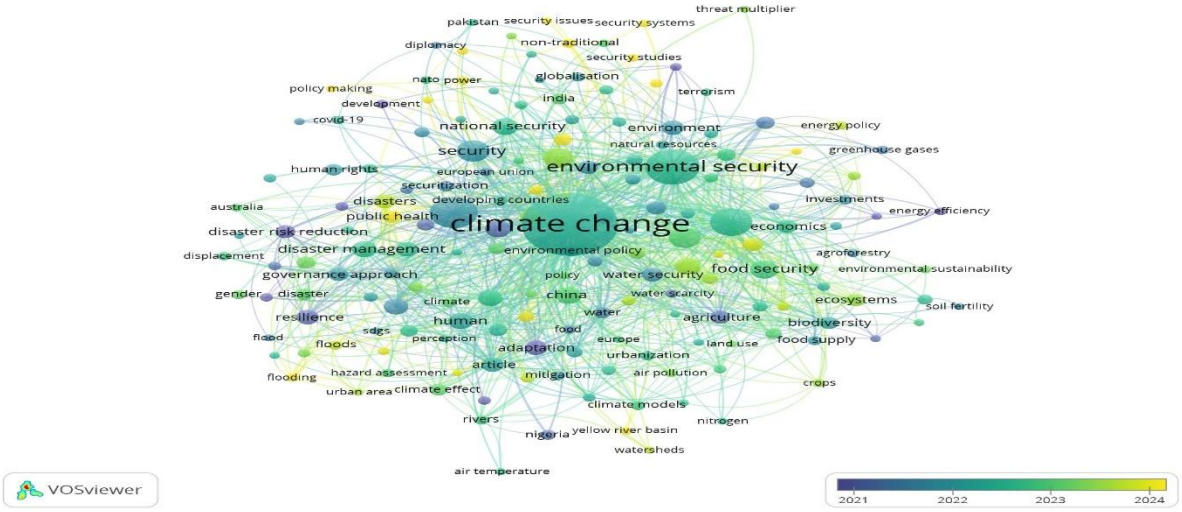
- **Cluster 6 (Light Blue) - Climate Security and Adaptation Strategies:** Anchored by *'climate security'*, *'environmental policy'*, *'adaptation'*, *'environmental degradation'*, and *'mitigation'*. This cluster covers the structural architectures of international environmental policies, climate diplomacy frameworks, and targeted structural mitigation initiatives aimed at reducing environmental degradation.

- **Cluster 7 (Orange) - Water Security and Sustainable Development Goals:** Concentrated around *'water security'*, *'drought'*, *'water scarcity'*, *'sustainable development goal'*, and *'sustainability'*. This specific domain maps the critical global risks associated with hydrological stress, establishing that mitigating water scarcity and prolonged droughts is a primary prerequisite for achieving the United Nations Sustainable Development Goals (SDGs).

Chronological Frontiers and Emerging Trends

To evaluate the chronological evolution of the domain, the dataset was subjected to an overlay visualization analysis. The chronological mapping demonstrates a clear paradigm shift. While historical publications (2017–2021) heavily favored the conceptual definition of *human security* and macro-level definitions of *climate change*, the modern frontiers of science approaching 2026 show a dense concentration of bright yellow nodes. These cutting-edge nodes are distinctly occupied by *public policy*, *public health*, and the operationalization of *disaster prevention* frameworks under resource scarcity scenarios. This temporal trajectory confirms that global research trends have rapidly evolved from theoretical definitions into acute, operational

policy demands aimed at preventing complex non-military crises.



Picture 2 Overlay Visualization Map

Discussion

The Synergy of National Security, Ecological Sovereignty, and Contemporary Conflict Dynamics

The structural convergence demonstrated among the Blue Cluster (*national security*), the Yellow Cluster (*public policy*), and the Purple Cluster (*risk assessment*) underscores a profound expansion within the ontology of strategic defense studies. The close topological proximity between *'conflict'*, *'regional security'*, and a critical geopolitical actor like *'china'* validates that *'global warming'* functions as an active, empirical threat multiplier that challenges state sovereignty [14]. Security planners can no longer limit threat matrix calculations to traditional kinetic military capabilities. Instead, the macro-level *'climate effect'* demands the institutionalization of rigorous environmental *'risk assessment'* protocols directly within national defense white papers. For non-traditional security architectures, this synergy mandates a transition toward a hybrid defense posture where maintaining environmental security and ecological stability is treated as a fundamental prerequisite for preserving territorial integrity and regional peace.

Reconstructing Disaster Governance: Interlinking Human Vulnerability and Structural Mitigation

A critical operational insight derived from this network configuration is the high density of co-occurrence links connecting the Red Cluster (*'disaster management'*) and the Light Blue Cluster (*'climate security'*). This structural nexus deconstructs historical defense doctrines that treated emergency relief as a peripheral, reactive humanitarian mission. The Scopus database reveals a global academic consensus demanding the deep integration of *'environmental policy'* with comprehensive *'disaster governance'* approaches to structurally decrease community *'vulnerability'* [15]. As rapid *'environmental degradation'* intensifies the severity of natural catastrophes, a state's national *'resilience'* is directly determined by the agility of its civilian-military interoperability frameworks. Modern armed forces must structurally evolve, incorporating tactical disaster prevention and proactive *'mitigation'* strategies into their core operational readiness mandates to counter asymmetric environmental crises.

The Resource Nexus of Water, Food, and Energy as a Cornerstone of National Resilience

The topological convergence between the Green Cluster (*sustainability*) and the Orange Cluster (*water security*) provides a novel theoretical framework for comprehensive security in the 21st century. The dense network links connecting *'water security'*, *'food security'*, and *'energy'* prove empirically that the most immediate threats to state survival often originate from resource scarcity rather than foreign kinetic aggression [16]. Extended periods of *'drought'* and systemic *'water scarcity'* undermine a nation's socio-economic baseline, triggering forced migration, domestic instability, and horizontal social frictions. Consequently, achieving any *'sustainable development goal'* is unfeasible without rigid *'environmental protection'* frameworks. From a strategic perspective, defense establishments must expand their scope to support green technology transition, ecological restoration, and national water-food-energy self-sufficiency programs as vital defense lines for sustaining long-term national resilience.

Future Research Agenda and Strategic Policy Recommendations

The chronological overlay analysis reveals critical blind spots that define the future research frontier heading toward the late 2020s. While historical literature has extensively mapped the physical science of *'global warming'* and the theoretical scope of *'environmental security'*, there is an urgent demand for empirical frameworks that operationalize these concepts into public policy. Future research should prioritize:

1. The development of predictive artificial intelligence models that translate macro climate data into actionable tactical defense protocols.

2. Comparative institutional studies on the structural reform of military organizations adapting to permanent non-military deployments.

3. Policy designs aimed at mitigating the socio-economic friction caused by climate-driven cross-border migrations.

From a policy perspective, security architects must transition from reactive disaster management models to predictive environmental security operations. This transition requires permanent budgetary allocations for ecological defense, the institutionalization of specialized environmental units within the armed forces, and deep integration between environmental ministries and national security councils to safeguard state stability against the inevitable escalation of global environmental anomalies [20].

Conclusion

Summary of Primary Findings

Through a PRISMA-compliant bibliometric review of 882 high-impact Scopus publications (2017–2026), this study has successfully constructed a comprehensive roadmap of the global research landscape regarding the climate-security nexus within non-traditional security architectures. The intellectual structure of this domain is structurally anchored by seven strategic clusters tying together disaster governance, resource sustainability, national security, public policy, macro-geopolitics, climate security strategies, and water scarcity. Node dominance metrics confirm that environmental security has been universally recognized as an official strategic domain. Furthermore, the temporal analysis proves that international scientific interest has rapidly shifted from theoretical regulatory debates to the acute operational demands of predictive public policy and disaster prevention paradigms heading into 2026.

Strategic Implications and Policy Contributions

Practically, this study offers vital contributions for updating national defense doctrines, particularly for the Ministry of Defense and the Republic of Indonesia Defense University. Environmental anomalies are inherently asymmetric and fluid; hence, comprehensive national security strategies can no longer be managed via rigid, conventional military methods. This paper strongly recommends a policy transformation through the institutionalization of national ecological security

councils, the enforcement of protective regulations safeguarding vital food-water-energy resources, and the active deployment of armed forces in strategic ecological defense operations to guarantee state resilience against modern non-military crises.

Limitations and Future Outlook

The primary limitation of this research stems from its exclusive reliance on the Scopus database and the restriction of data parameters to English-language records. Future investigators are encouraged to combine secondary datasets from alternative platforms such as Web of Science (WoS) or Dimensions, and incorporate cross-linguistic literature to achieve a more cosmopolitan and globally balanced bibliometric mapping.

References

Baldwin, D. A. (1997). The concept of security. *Review of International Studies*, 23(1), 772-778.

Singer, P. W., & Friedman, A. (2014). *Cybersecurity and cyberwar: What everyone needs to know*. Oxford University Press.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of Internal Medicine*, 151(4), 772-778.

Van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 772-778.

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 772-778.

Nye, J. S. (2014). Cyber power. *Public Policy*, 772-778.

Schmitt, M. N. (Ed.). (2017). *Tallinn Manual 2.0 on the international law applicable to cyber operations*. Cambridge University Press.

Rid, T. (2012). Cyber war will not take place. *Journal of Strategic Studies*, 35(1), 772-778.

Broadhurst, R., & Chang, L. Y. (2013). Cybercrime in Asia: Trends and challenges. *Routledge Handbook of Asian Criminology*, 772-778.

He, K. (2008). Institutional balancing and international relations theory: Economic interdependence and security institutions in East Asia. *European Journal of International Relations*, 14(3), 772-778.

Libicki, M. C. (2009). *Cyberdeterrence and cyberwar*. Rand Corporation.

Taddeo, M., & Floridi, L. (2018). Regulating the outputs of AI and machine learning. *Minds and Machines*, 28(4), 772-778.

Buchanan, B. (2020). *The hacker and the state: Cyber attacks and the geopolitical secret*. Harvard University Press.

Caballero, A. (2021). Bibliometric evaluation of international cyber defense strategies. *Security and Defence Quarterly*, 34(2), 772-778.

Kello, L. (2017). *The virtual weapon and international order*. Yale University Press.

Betz, D. J. (2012). Cyberpower and international security. *Adelphi Series*, 52(772-778), 772-778.

Clarke, R. A., & Knake, R. K. (2010). *Cyber war: The next threat to national security and what to do about it*. Harper Collins.

Barnett, J., & Adger, W. N. (2007). Climate change, human security and violent conflict. *Political Geography*, 26(6), 772-778.

Hsiang, S. M., Burke, M., & Miguel, E. (2013). Quantifying the influence of climate on human conflict. *Science*, 341(6151), 1235534.

Ide, T. (2023). Climate change and security: A review of the literature and policy implications. *International Security*, 47(3), 772-778.