

ECOCIDE AND COLONIALISM AS DRIVERS OF ENVIRONMENTAL DETERIORATION IN PALESTINE

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ABSTRACT

Environmental deterioration in Palestine is inextricably linked to prolonged colonial occupation, resulting in ecosystem destruction, pollution, biodiversity loss, and environmental injustice that restricts Palestinian access to vital natural resources. Given this complexity, this study aims to map the development of global research on this issue, identify trends, dominant themes, and analyze epistemic biases in the scientific literature. The methodology employs a combined bibliometric analysis and systematic literature review based on Scopus data. Results reveal a significant surge in publications and an epistemological shift toward framing the issue within environmental justice and settler colonialism. Content analysis confirms that the majority of the literature critically frames degradation as a consequence of structural violence (ecocide and toxic colonization). Crucially, this critical framing is substantiated even by Western-affiliated authors, whose research supports a decolonial perspective. This research significantly enriches academic discourse on ecocide and colonialism, providing a crucial basis for advocacy and policy recommendations to support the achievement of environmental justice and sustainable reconstruction in Palestine.

Keywords: *Palestine, Ecocide, Colonialism, Deterioration, Environmental Justice*

ABSTRAK

Degradasi lingkungan di Palestina tidak dapat dipisahkan dari pendudukan kolonial yang berkepanjangan. Situasi ini telah menyebabkan kerusakan ekosistem, polusi, hilangnya keanekaragaman hayati, dan ketidakadilan lingkungan. Pendudukan kolonial juga membatasi akses masyarakat Palestina terhadap sumber daya alam vital, memperburuk kerentanan mereka dalam hal kesehatan, kesejahteraan sosial, dan kondisi ekonomi. Studi ini bertujuan memetakan perkembangan penelitian global tentang kerusakan lingkungan di Palestina, mengidentifikasi tren, tema dominan, dan menganalisis bias epistemik dalam literatur ilmiah. Metode yang digunakan adalah analisis bibliometrik gabungan dengan tinjauan literatur sistematis berbasis data Scopus yang memetakan tren publikasi, jaringan kolaborasi, dan kluster tematik utama. Hasilnya menunjukkan lonjakan publikasi yang signifikan dan pergeseran fokus epistemologis ke kerangka keadilan lingkungan dan kolonialisme pemukim. Analisis konten mengkonfirmasi bahwa mayoritas literatur secara kritis membongkar

degradasi sebagai konsekuensi kekerasan struktural, bahkan oleh penulis dari afiliasi Barat, yang substansi risetnya mendukung pandangan dekolonial. Penelitian ini memiliki dampak penting dalam memperkaya diskursus akademik mengenai ekosida dan kolonialisme, serta menjadi dasar advokasi dan rekomendasi kebijakan untuk mendukung pencapaian keadilan lingkungan dan rekonstruksi berkelanjutan di Palestina. Penelitian ini diharapkan dapat memperkaya diskursus akademik tentang ekosida, kolonialisme, dan degradasi lingkungan di Palestina, serta menjadi dasar untuk mengembangkan strategi advokasi yang menekankan keadilan lingkungan dan rekonstruksi berkelanjutan.

Kata kunci: Palestina, Ekosida, Kolonialisme, Degradasi, Keadilan Lingkungan

1. INTRODUCTION

Israel's aggression against Palestine since October 7, 2023 has caused extensive damage and claimed many lives. According to data from the Palestinian Central Bureau of Statistics (PCBS), from the start of the aggression until October 13, 2025, there have been approximately 68,920 fatalities, 179,139 injuries, 2,000,000 displaced persons, 18,700 persons detained by the Israeli military, and 192,812 buildings damaged as a result of Israel's continuous invasion. This genocide has not only claimed many lives and caused material damage, but has also worsened the quality of the environment. Environmental impact is an inevitable consequence of any armed conflict. The rubble from Israeli airstrikes, ranging from bomb fragments to destroyed buildings, has piled up into millions of tons of debris that fills the streets of Gaza and pollutes the air with dust and hazardous chemicals that pose a serious threat to the health of residents throughout the affected area (Ahmed Khan & Bakhsh, 2024). Not only that, Israel's military occupation has also caused significant environmental degradation such as the destruction and exploitation of natural resources, soil contamination that exacerbates human suffering while also increasing vulnerability to climate change, global warming, and long-term ecological damage (Qandeel, 2025; Shaheen et al., 2024). Thus, Israel's aggression against Palestine has not only caused a humanitarian crisis, but also a major ecological crisis that threatens the sustainability of ecosystems in the Palestinian territories.

Long before the military aggression was launched, ecological damage in Palestine cannot be separated from the long history of colonialism practiced by Israel (Inzam, 2025). The news published by the Republika.id website entitled The Complete History of Israeli Occupation of Palestine explains that from the beginning, Zionists (adherents of Zionism) had planned the ethnic cleansing of Arabs in Palestine. This was marked by several events that occurred over a period of three centuries. First, in the 19th century, in 1897, Theodor Herzl, a leading figure in the Zionist movement and known as the "Father of the Jewish State," led the first Zionist Congress, which planned the establishment of a Jewish state in Palestine. This triggered a massive immigration and the purchase of Arab land, which then led to resistance and suspicion of the plan. Second, from the early 20th century to the post-World War II period, increased Jewish immigration to Palestine, British political support through the Balfour Declaration, and pro-Zionist colonial policies sparked conflict and the mass expulsion of Arabs, culminating in the establishment of the State of Israel in 1948 and the Nakba tragedy, which marked the beginning of the Palestinian people's long suffering. Third, since the end of the second Intifada in the 21st century, the Israeli-Palestinian conflict has continued through cycles of violence, ceasefire violations, and illegal settlement expansion, reaching its peak on October 7, 2023, when Operation Al-Aqsa Storm -Aqsa operation was launched by Hamas and was met with a brutal Israeli air strike on Gaza, causing tens of thousands of casualties and exacerbating the humanitarian crisis and environmental destruction in the Palestinian territories (Zamzami, 2024).

Based on this long history of colonialism, ecological damage in Palestine is actually a structural consequence of decades of occupation. Israel's occupation has been criticized by the United Nations (UN) and the International Court of Justice (ICJ) for violating international law by engaging in organized environmental exploitation (Kretzmer, 2025). Not

only that, Israel has repeatedly violated international humanitarian law, including military and humanitarian requirements, through actions such as the use of white phosphorus bombs and the blockade of humanitarian aid, which constitute some of the most severe human rights violations in history (Advitama et al., 2024). Various practices that restrict Palestinian access to vital resources such as clean water exacerbate deepening ecological inequalities (Muratoglu & Wassar, 2024). The ecological deterioration occurring in Palestine cannot be viewed merely as a consequence of armed conflict, but rather as a form of environmental colonialism that systematically erodes the sustainability of ecosystems and weakens the ecological sovereignty of the Palestinian people.

Studies on environmental degradation in Palestine have gained widespread attention from various disciplines. One study conducted by Braverman (2021) in his article entitled *Environmental Justice, Settler Colonialism, and More-than-human in the Occupied West Bank*, explains that environmental damage in the West Bank is not only the result of conflict, but also a tool of power in Israel's colonial project. Through a more-than-human geography approach, Braverman shows that natural elements such as water, soil, plants, and animals are part of the system of oppression as well as symbols of Palestinian ecological resistance. Meanwhile, Aasi (2021) in his article entitled *Pollution, Colonialité et Droit International de l'Environnement: Une étude de la situation palestinienne* examining environmental degradation from the perspective of international law and coloniality. He introduced the term "toxic colonization" to describe how Israel uses Palestinian territory as a dumping ground for hazardous waste and exploits natural resources. Both studies make important contributions to understanding the link between colonialism and environmental damage in Palestine, but they do not specifically examine how international scientific literature represents this issue, including the epistemic bias resulting from the dominance of Western paradigms in knowledge production. Therefore, this study attempts to fill this gap by mapping how environmental degradation in Palestine is examined in global publications and how this discourse can be directed to support environmental justice and sustainable ecological reconstruction for Palestine.

This research offers novelty by examining how international scientific literature represents environmental deterioration in Palestine through a bibliometric analysis approach. This study not only maps trends, dominant themes, and global publication networks, but also examines the epistemic bias that arises from the dominance of Western institutions and paradigms in knowledge production. This approach is important because environmental issues in Palestine are not only ecological in nature, but also constitute an arena of power and scientific discourse construction that has rarely been touched upon by previous studies.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

2.1 The Concept of Ecocide

Ecocide refers to deliberate actions taken with the awareness of causing large-scale and long-term damage to the environment (Checherskyi, 2025). This damage not only affects the environment but also destroys humans, animals, and plants due to armed conflict (Sziebig, 2024). Therefore, ecocide is considered the most serious crime in international law. Previous research entitled *Ecocide* by Kowalska (2023) states that this crime consists of at least the

following characteristics.

- a. These actions are extremely cruel, beyond the limits of humanity, and threaten world peace and security.
- b. Crimes committed with intent, in an organized and systematic manner, and on a large scale, resulting in death and other serious consequences.
- c. Crimes that require a large amount of money

This phenomenon shows that ecocide has a very strong political dimension. The environmental damage caused is not merely a side effect of conflict, but part of a strategy of domination to weaken a nation by destroying its sources of life. Control over water, land, air, and living space has become a new form of power that suppresses the existence of local communities. Thus, ecocide can be understood as a crime that attacks two aspects at once: nature and humanity.

Countries that have control over access to weapons, capital, and technology are able to cause large-scale environmental destruction without immediate consequences for themselves, while the communities that are victims must bear the ecological and social impacts for a very long time. Therefore, discussing ecocide is not enough within the framework of international law alone, but must also be seen as a matter of ethics, humanity, and global political economy. Ecocide ultimately shows that environmental destruction is not merely the result of negligence, but a reflection of a power system that views nature as an object of conquest. In this context, the discussion of ecocide becomes an important gateway to understanding how modern colonialism operates not only by controlling territories and people, but also by controlling and destroying the ecosystems that sustain their lives.

2.2 Colonialism and Environment

Colonialism is a system in which a dominant power controls a dependent region or people, characterized by invasion and forced occupation, whereby the colonizers take over a territory and then move their own people there to settle as colonists (Jhahharia, S., 2025). The colonial system had a significant impact on the countries or nations under its rule. The negative effects included the exploitation of natural resources, the triggering of conflicts and wars, and the development of anti-colonial sentiment among the colonized peoples (Young, 2015). However, colonialism also had a number of positive effects, albeit proportionally smaller than the negative effects, including the transfer of modern science and technology, and the development of infrastructure in the colonies (Seth, 2022). Based on previous research entitled *Settler Colonialism* by McCreary (2025) states that there are generally three types of colonialism, namely as follows.

- a. Settler colonialism is permanent colonization with the aim of replacing the indigenous population with the colonizing nation's population.
- b. Exploitative colonialism is colonization that aims only to take natural and human resources without any desire to seize the colonized territory.
- c. Internal colonialism is colonization dominated by political and economic influence within a country against its minority groups.

Meanwhile, the environment is defined as all biotic and abiotic elements and social factors that interact to form a life system that influences human material, spiritual, and living conditions, as explained by the Ministry of Environment and Urbanization, which covers all biological, geographical, and social activities, including interactions with other living things and inanimate elements (Çemrek, 2016). Thus, the relationship between colonialism and the environment shows that colonial powers not only subjugated people politically and economically, but also controlled and exploited nature, leaving behind a legacy of ecological inequality and long-lasting environmental damage.

2.3 Environmental Justice Theory

Environmental justice is defined as a shared framework and collective struggle for access to a safe, healthy, and pollution-free environment, while ensuring the availability of essential environmental resources for survival and social well-being. Achieving environmental justice is closely linked to structural and political issues, so environmental justice requires a transformative approach, namely the restructuring of social relations, institutional arrangements, and dominant economic models (Temper, 2019). Environmental justice therefore rejects views that separate ecological problems from the roots of social and economic inequality.

Historically, the term environmental justice emerged in the United States from the resistance of African-American communities associated with the civil rights movement, protesting the dumping of toxic waste and the placement of hazardous facilities in their neighborhoods. Subsequently, academics joined activists, concerned citizens, and religious leaders and communities to systematically document injustices (Temper, 2019). Since then, the movement has expanded transnationally, using empirical evidence to challenge traditional definitions of the environment and fight against ecological racism worldwide.

In the context of conflict and occupation, the environmental justice framework is expanded to examine the role of state and institutional violence in producing environmental injustice. Environmental justice is understood not simply as discrimination reflected in data on unequal treatment, but as forms of state and institutional violence that cause long-term physical, emotional, and spiritual harm, leading to suffering and premature death for affected communities. A thorough analysis of environmental justice must explore the history of oppression and interlocking systems such as racial capitalism, settler colonialism, and slavery, which underlie current environmental conflicts. This understanding emphasizes that environmentally unjust practices and policies are often designed to maintain privilege (environmental privilege) for dominant groups, supported by the violence of resource extraction and industrial pollution (Kojola & Pellow, 2021). Therefore, framing environmental injustice as a form of violence facilitates deeper engagement with histories of domination and systems that devalue life, both human and environmental.

2.4 Environmental Deterioration in Palestine

Environmental deterioration in Palestine is a serious and detailed consequence of the protracted conflict, significantly exacerbated by the recent military aggression on the Gaza

Strip during the period October 2023–January 2025. Military activity has caused profound environmental deterioration, including water contamination, soil erosion, and a decline in air quality. This damage not only endangers local ecosystems but also severely compromises vital natural resources, which in turn substantially hinders sustainable development efforts in the region (Gunawan, 2024; Hassoun, 2025). This environmental deterioration, along with the blockade and mass destruction of essential infrastructure, is at the root of an unprecedented socio-economic and humanitarian crisis.

The impacts of environmental deterioration are closely intertwined with social and economic collapse. Ecological damage exacerbates social impacts through high loss of life, displacement, and limited access to basic services, which collectively weaken social cohesion and community resilience. Economically, the destruction of infrastructure has hampered growth, driven up unemployment and poverty, and limited industrial opportunities and innovation. (Hassoun, 2025). These interconnected challenges therefore underscore the urgent need for implementation of sustainable infrastructure, responsible resource management, and strong international collaboration to rebuild resilience and ensure long-term sustainability in Palestine, particularly in Gaza.

2.5 Hypothesis

International scientific literature examining environmental deterioration in Palestine demonstrates a predominance of framings oriented toward environmental justice and settler colonialism, rather than a neutral frame focused solely on inter-state conflict, in an attempt to structurally and systematically represent the problem. Furthermore, an epistemic bias has been identified in global scientific publications, where, despite research on the Palestinian environment from Western universities and researchers, the results (substance) of their research are not 'neutral' or pro-Israel, but rather critical and supportive of the view that environmental deterioration in Palestine is a form of colonization (toxic colonialism) and systematic violence.

3. RESEARCH DESIGN

3.1 Conceptual Framework of the Methodologies

The systematic literature review approach provides a more comprehensive, efficient, and informative analysis compared to other methods (Abdullah, K.H. et al., 2023). Meanwhile, bibliometric analysis is used to narrow the scope of research and reveal current research patterns through mapping various scientific networks, making this method effective in detecting research gaps (Ramadan et al., 2022). These two approaches are combined in this study to assess trends and identify gaps in various studies that focus on developing a deep understanding of the research topic (Colicchia et al., 2019). Thus, this study aims to map the development of studies on environmental deterioration in Palestine, identify existing trends and research gaps, and analyze epistemic bias in academic publications, particularly the dominance of Western perspectives and the limited representation of Palestinian researchers and those from the Global South.

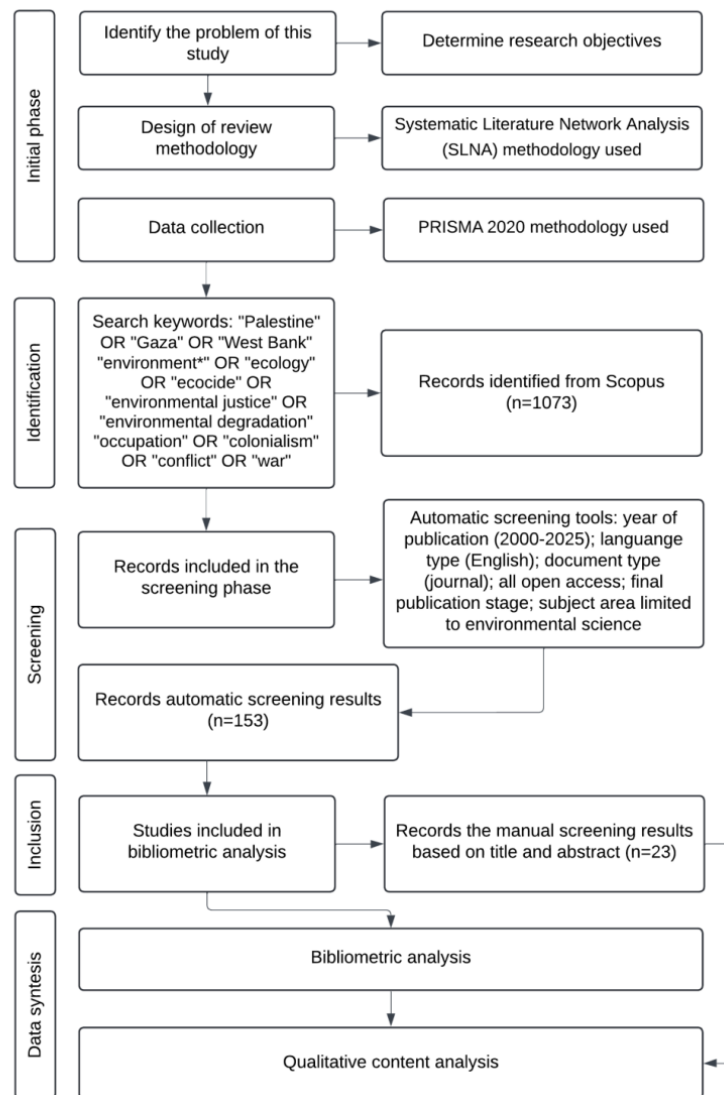


Figure 1. Conceptual framework

3.2 Data Collection

The data collection and selection process follows the PRISMA 2020 (Page et al., 2021) flow logic adapted to the bibliometric and qualitative content analysis framework. Data was obtained from the Scopus database, extracted on October 16, 2025. Scopus is widely known as one of the most reliable databases for bibliometric and content analysis because it is comprehensive and multidisciplinary. This platform provides powerful tools for bibliometric data extraction and analysis, making it very useful in identifying research trends, patterns of collaboration between authors, and thematic focuses in various disciplines (AlRyalat et al., 2019; Yonna Ananda et al., 2025). The search was conducted using the following keywords "Palestine" OR "Gaza" OR "West Bank" AND "environment" OR "ecology" OR "ecocide" OR "environmental justice" OR "environmental degradation" "occupation" OR "colonialism" OR "conflict" OR "war". This initial search yielded 1073 documents. Screening criteria were then applied, taking into account publication year, document type, language, source type, and publication stage. The publication range was

limited to 2000–2025, focusing on English-language journal articles in the field of environmental science. These screening criteria were used to ensure that only relevant, current, and reputable documents were analyzed, with a focus on English-language journal articles in the field of environmental sciences during the period 2000–2025 to obtain a state-of-the-art and academically standardized scientific overview. After the screening criteria process was carried out, 153 documents were obtained that matched the search keywords and were used as the basis for bibliometric analysis. From these, 23 documents were selected for qualitative analysis based on the documents with the most relevant and appropriate content for the research topic being studied. The Boolean query used in the search was as follows (*TITLE-ABS-KEY ("Palestine" OR "Gaza" OR "West Bank") AND TITLE-ABS-KEY ("environment*" OR "ecology" OR "ecocide" OR "environmental justice" OR "environmental degradation") AND ("occupation" OR "colonialism" OR "conflict" OR "war")) AND PUBYEAR > 1999 AND PUBYEAR < 2026 AND (LIMIT-TO (SUBJAREA , "ENVI")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (SRCTYPE , "j"))*). However, the use of the Scopus database and its English-language limitations potentially limit the scope of the analysis, as it excludes publications in other languages or sources outside Scopus that may contain local context and alternative perspectives. Therefore, the results of this study represent trends in internationally indexed English-language literature.

3.3 Data Analysis

3.3.1 Bibliometric Analysis

This study uses bibliometric analysis to identify key components in the literature, including authors, institutional affiliations, countries of origin, and number of citations, while exploring future research directions through comprehensive visualizations that illustrate the interrelationships between these elements (Piwowar-Sulej et al., 2021; Wali et al., 2022). In this study, bibliometric analysis was used as a statistical tool to identify current research patterns and discover opportunities and directions for development in the field under review (Bortoluzzi et al., 2021). Bibliometric mapping and visualization are performed using VOSviewer, software specifically developed for bibliometric analysis that allows researchers to effectively visualize and analyze relationships between elements in large data sets (El Bekkouri et al., 2024; Özyürek et al., 2024; Yabo et al., 2024). VOSviewer uses a visual similarity approach (VOS), which places keywords or nodes at distances that indicate the strength of their interrelationships. Shorter distances indicate stronger relationships between two keywords or nodes. As a result, in a VOS cluster map, keywords or nodes are arranged in such a way that they do not overlap, ensuring a clear visualization of the relational structure (Van Eck & Waltman, 2010). Thus, this method plays an important role in revealing patterns of collaboration, research dynamics, and the direction of scientific development in the future.

In this study, bibliometric visualization was performed using VOSviewer 1.6.20 with the full counting method to analyze collaboration patterns between countries and thematic linkages between author keywords. In the analysis of co-authorship countries, the minimum document threshold per country was set at 1 and the minimum citation threshold at 0,

resulting in 42 countries meeting the threshold, with 36 countries joining the largest interconnected network. Meanwhile, the analysis of co-occurrence of author keywords used a minimum threshold of 5 occurrences, resulting in 73 keywords, but after excluding “Palestine” and “Israel,” the largest network consisted of 64 keywords, indicating the main cluster of environmental research issues and trends in the Palestinian context.

3.3.2 Qualitative Content Analysis

Qualitative content analysis is a systematic research technique used to interpret and quantify textual data to reveal underlying themes, patterns, and potential biases. This approach can be divided into qualitative and quantitative methods, each of which has different research objectives. Qualitative content analysis emphasizes the interpretation of context and meaning in language, often using textual tracing to identify implied assumptions and stereotypes (Rucks-Ahidiana, 2024). In line with previous bibliometric studies (Piwowar-Sulej et al., 2021; Ranjbari et al., 2021), content analysis is used as a qualitative complement to bibliometric analysis.

4. RESULT AND DISCUSSION

4.1 Bibliometric Results

4.1.1 Descriptive Analysis of Research Developments

The number of scientific publications exploring environmental issues in Palestine increased significantly during the period 2000–2025, as shown in Figure 2. In the early period (2000–2007), the number of documents produced was still low, indicating limited academic attention to the ecological impact of the conflict and occupation experienced by Palestine. An upward trend began to emerge after 2008, coinciding with the escalation of military operations and the humanitarian crisis in Gaza, which drew attention to environmental degradation, water pollution, ecosystem damage, and inequitable access to resources. Publication peaked in 2021 (21 publications), reflecting the academic response to large-scale ecological infrastructure damage and the development of environmental justice and ecocide discourse within the framework of international law. Cumulatively (Figure 3) shows a pattern of increasing sharpness each year, reaching 153 documents in 2025, with an average of about 6 publications per year. This indicates an escalation of academic interest in this issue.

Based on publication sources, this issue has been raised in 88 Scopus-standard journals. The journals with the highest number of publications are *Environment and Planning E: Nature and Space* (13 articles; 8.5%), *International Journal of Environmental Research and Public Health* (12 articles; 7.8%), and *Sustainability (Switzerland)* (11 articles; 7.2%). The dominance of publications in these three journals confirms that the analysis of the ecological impact of conflict in Palestine is increasingly linked to the perspectives of critical geography, environmental health, and sustainability. Studies published in these journals highlight the relationship between the structure of colonialism, ecological degradation, exposure to pollutants, poor sanitation, and the vulnerability of civil society to prolonged environmental crises. According to the 2024 Scimago (SJR) rankings,

Environment and Planning E: Nature and Space and Sustainability (Switzerland) is in the Q1 category, while the International Journal of Environmental Research and Public Health is in the Q2 category. The dominance of Q1 journals indicates that this topic is not only developing quantitatively but also has strong academic appeal in high-impact publication forums, with an orientation towards issues of space, environment, and socio-ecological sustainability.

Overall, the combination of increasing publications and journal concentration shows an epistemological shift in global literature: environmental issues in Palestine are being reframed from mere ecological phenomena to issues of environmental justice based on structural conflict. The sharp increase in recent years reflects a growing academic urgency regarding the ecological consequences of long-term occupation, the need for evidence-based mitigation, and the relevance of international policy in environmental management and ecosystem restoration efforts in armed conflict zones.

Table 1. Descriptive statistics of publications and citations per year (2000 –2025)

Year	Document Production	Total Citations
2000	1	0
2001	2	52
2002	0	0
2003	2	35
2004	0	0
2005	2	26
2006	1	177
2007	0	0
2008	2	26
2009	7	151
2010	3	62
2011	8	222
2012	5	155
2013	3	46
2014	2	31
2015	6	99
2016	7	213
2017	6	123
2018	3	161
2019	6	142
2020	6	84
2021	21	377
2022	11	99
2023	15	115
2024	16	45
2025	18	20

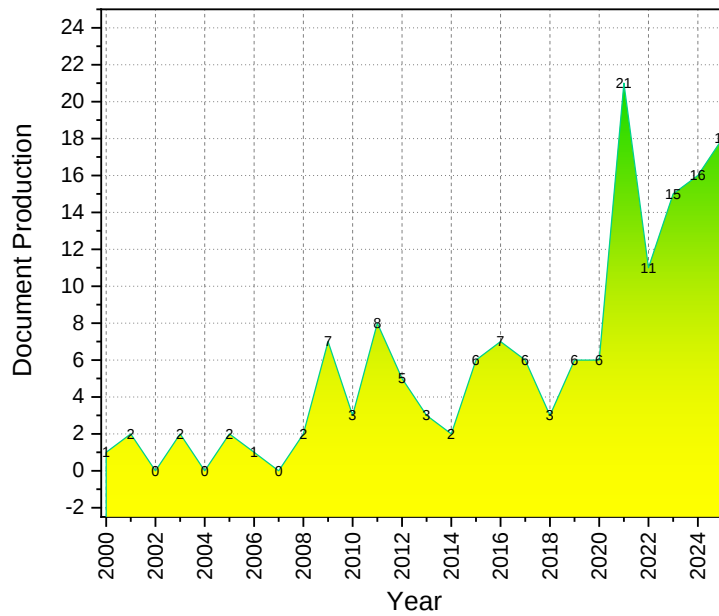


Figure 2. Annual document production trends (2000–2025)

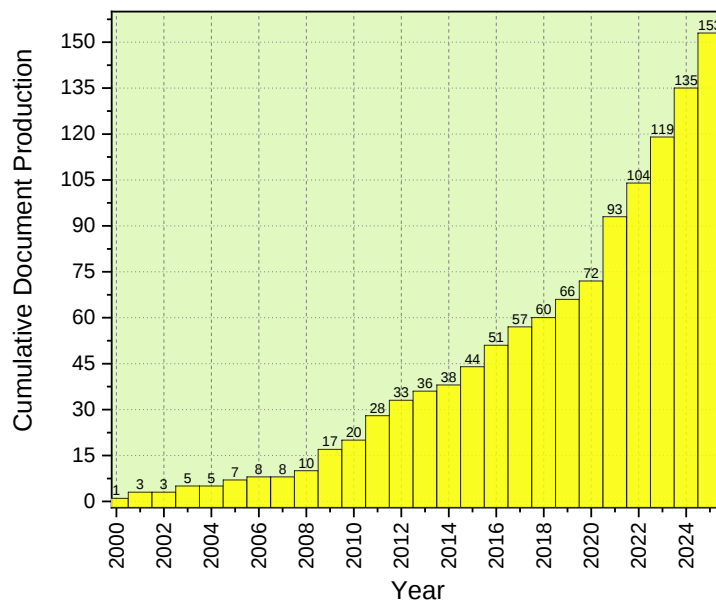


Figure 3. Cumulative development of document production (2000–2025)

4.1.2 Analysis of Country-Level Research Productivity and Collaboration Patterns

Figure 4 presents the top 15 countries (out of a total of 42 contributing countries) that have the greatest influence on Palestinian environmental issues, measured by scientific output volume and the number of citations of related documents. These countries dominate publications through consistent research contributions and relatively high output volumes compared to other countries in the dataset. This dominance reflects the level of global academic attention to environmental sustainability dynamics in the region. In general, publication productivity appears to be concentrated in countries with more established research capacities. This pattern indicates that factors such as the availability of research

funding, strong academic institutions, and stable research infrastructure play an important role in driving scientific output. On the other hand, some countries with lower publication volumes may limit their contributions due to limited resources or access to funding.

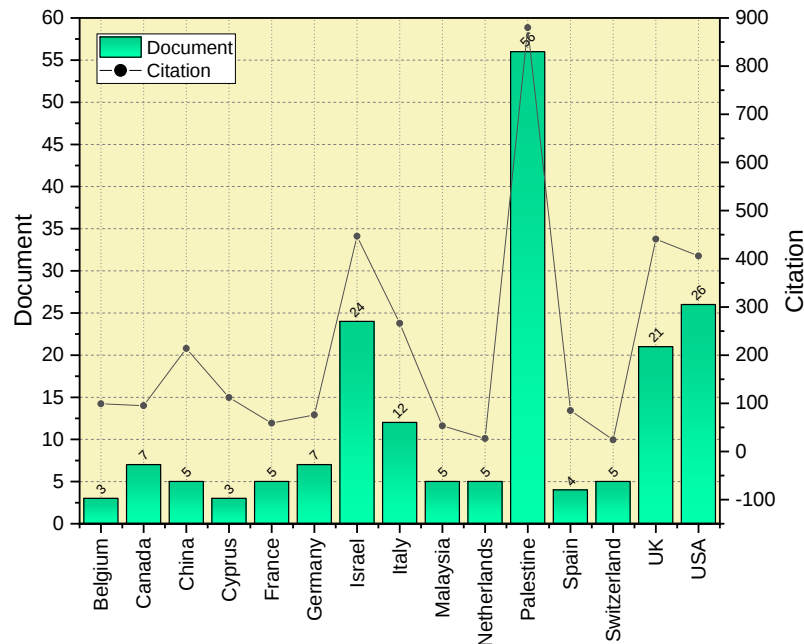


Figure 4. Country-level research productivity

The mapping of the collaboration network in Figure 5 reveals that Palestine and the UK act as central nodes with the highest connectivity, confirming their role in building the foundation of knowledge and the direction of global research on this issue. The UK acts as a broker connecting various clusters of European, USA, and Asian countries, while Palestine is strongly involved in regional collaboration with Middle Eastern and North African countries. Countries such as Italy, Germany, and the USA have strong interlinkages, demonstrating multidisciplinary contributions to the discourse on the environment, ecological justice, and the impact of conflict on ecosystems.

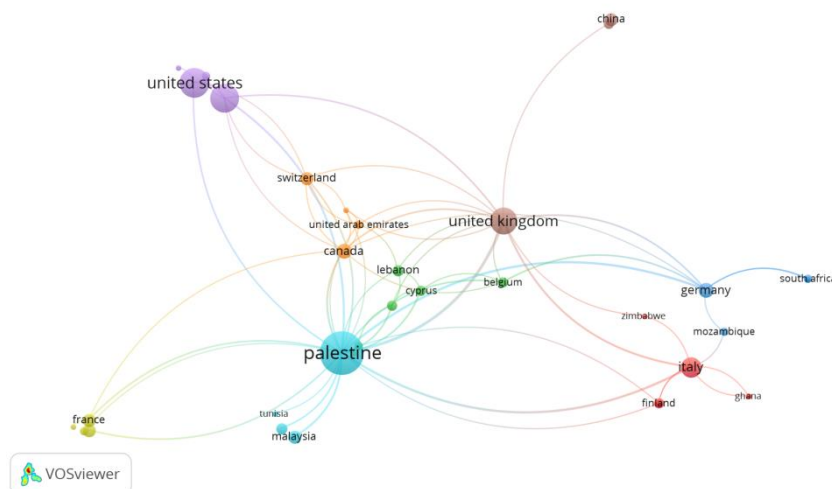


Figure 5. Collaboration network on Palestinian environmental research

4.1.3 Thematic Network Analysis of Author Keywords

Analysis of keyword co-occurrence networks generated using VOSviewer reveals complex thematic structures in publications related to environmental issues in Palestine. These networks indicate that research focuses on strategic topics such as *environment*, *Gaza Strip*, *West Bank*, *environmental justice*, and *water quality*, which are closely interconnected. The connectivity patterns that emerge reveal a high degree of interdisciplinarity between socio-political and ecological issues, with the dimensions of conflict, sustainability, and water resource management being the main focus of the research landscape. Based on the visualization in Figure 6(a) and the main themes in Table 1, cluster 1 describes the relationship between environmental degradation, community resilience, and geopolitical conditions, with the main issues being wastewater management and air pollution in conflict areas. Cluster 2 focuses on structural injustice and political ecology in resource control and environmental access in Palestine. Cluster 3 highlights the water crisis with a focus on processing efficiency, seawater intrusion, and reviewing the cost-effectiveness of water treatment technologies. Cluster 4 focuses on efforts to integrate sustainable development in a vulnerable socio-political context, including infrastructure policies and climate change adaptation. Cluster 5 shows that the Middle East is an important area for the study of cross-border resource governance and regional climate change, while Cluster 6 focuses on urban solid waste management. Cluster 7 emphasizes the dimensions of international law and environmental policy in conflict areas, while Cluster 8 focuses on the influence of neoliberalism on resource policy and environmental privatization. Cluster 9 highlights the environmental risk assessment of groundwater and marine pollution in the Gaza Strip, and finally, cluster 10 describes contemporary issues in electronic waste management in developing countries and urban areas with informal collection systems.

The terms West Bank, Gaza Strip, Palestine, Israel, and Middle East serve as geographical markers or key geopolitical nodes in the research network. These terms not only represent geographical locations, but also reflect the socio-political complexities that shape the direction and character of research in the region. The West Bank is often associated with studies on water management, sustainable development, and socio-ecological resilience. Meanwhile, the Gaza Strip is a focal point for research on pollution, water crises, and environmental risks resulting from blockades and infrastructure limitations. The term Palestine plays a greater role as an entity representing the struggle for environmental justice and rights to natural resources, while the use of the terms Israel and Israel-Palestine describes the cross-border and ecological political dimensions that connect aspects of conflict, security, and regional environmental governance. The term Middle East is used as a macro spatial framework. Overall, the use of these regional terms confirms that environmental studies in Palestine are multiscale and interdisciplinary, and are closely related to ecological, political, and humanitarian aspects.

Figure 6(b) shows an overlay visualization of environmental research developments in Palestine. In the early stages, these developments were dominated by global issues such as climate change and Middle East governance, then shifted towards more contextual themes such as water quality, waste management, and environmental justice. The latest themes highlight environmental justice and waste management, reflecting the growing attention to

(a)

Network visualization (a) showing research trends from 2014 to 2022. The network is dense with many connections, particularly around 'west bank', 'environment', and 'climate change'. The size of the nodes indicates the number of publications, and the color indicates the year of publication. The network is visualized using VOSviewer.

(b)

Network visualization (b) showing research trends from 2014 to 2022. The network is less dense than (a), with fewer connections between nodes. The nodes are still colored by year and sized by publication count. The network is visualized using VOSviewer.

Table 2. Main theme clusters of environmental research

Cluster	Main Theme	Keywords
1 (red)	Environmental Conflict and sustainability	air pollution, CO2, conflict resolution, gaza strip, mobility, security, separation wall, sustainability, wastewater treatment
2 (green)	Environmental Justice and Political Dimensions	developing countries, environmental justice, generation rate, hydro-hegemony, indigenous studies, medical waste, palestine/israel, settler colonialism

Published by the Palestine Research Center in collaboration with the University of Darussalam Gontor.

Table 2. (continued)

Cluster	Main Theme	Keywords
3 (dark blue)	Water Resource Management and Quality	cost-benefit analysis, desalination, management, stream restoration, wastewater, water, water quality, west bank
4 (chartreuse)	Sustainable Development and Political Ecology	agriculture, environment, infrastructure, political ecology, resilience, sustainable development, temporality
5 (purple)	Climate Change and Regional Governance	climate change, ecology, environmental degradation, governance, jordan river, middle east, water scarcity
6 (light blue)	Solid Waste Management and Urban Sustainability	composting, israel–palestine, municipal solid waste, nablus city, recycling, waste, waste management
7 (orange)	Legal and Geopolitical Aspects of Environmental Governance	conflict, international law, israel-palestine, mena, migration, scarcity, water governance
8 (brown)	Neoliberalism and Transnational Environmental Politics	israel/palestine, jerusalem, limpopo national park, mozambique, neoliberalism, securitization
9 (pink)	Risk and Water Pollution Studies	gaza, risk assessment, seawater intrusion
10 (pale orange)	Electronic Waste and Informal Sectors	e-waste, informal

4.2 Intellectual Structure of the Field

Based on the most influential articles, the highest number of citations (Table 3) indicates that five of them were written by first authors affiliated with institutions in Palestine, primarily Birzeit University and local institutions. This indicates that knowledge about space, infrastructure, and social conditions in Palestine is significantly produced by local actors, not just academic centers in the Global North. Meanwhile, contributions from the UK and the US tend to play a role in framing the narrative in the language of global theory, while Italy is more prominent in technical aspects and environmental analysis.

Overall, this configuration demonstrates a division of epistemic labor in which local Palestinian experiences serve as sources of data and contextual meaning, yet still interact with structures of international academic legitimacy. This means that the discourse is not entirely dominated by the West, but rather operates through a negotiation between local knowledge production and global recognition.

Table 3. Top 10 most cited articles

No	Title	Authors	Year	Source/Journal	Affiliation	Country First Affiliation	Cited by
1	Is my home my castle? Place attachment, risk perception, and religious faith	Billig, M.	2006	Environment and Behavior	Department of Architecture, Ariel University, Ariel, Israel	Israel	177
2	Assessment of groundwater salinity and quality in Gaza coastal aquifer, Gaza Strip, Palestine: An integrated statistical, geostatistical and hydrogeochemical approaches study	Abu-Alnaeem, M.F.; Yusoff, I.; Ng, T.F.; Alias, Y.; Raksmey, M.	2018	Science of the Total Environment	Department of Geology, Al-Azhar University of Gaza, Gaza, Palestine; Department of Geology, Universiti Malaya, Kuala Lumpur, Malaysia; Department of Chemistry, Universiti Malaya, Kuala Lumpur, Malaysia; Universiti Teknologi MARA, Shah Alam, Malaysia	Palestine	144
3	Squatting in camps: Building and insurgency in spaces of refuge	Sanyal, R.	2011	Urban Studies	Faculty of Social Sciences, The Open University, Milton Keynes, United Kingdom	United Kingdom	82
4	A study on the attitudes and behavioural influence of construction waste management in occupied Palestinian territory	Al-Sari', M.I.; Al-Khatib, I.A.; Avraamides, M.; Fatta-Kassinis, D.	2012	Waste Management and Research	Faculty of Graduate Studies, Birzeit University, Birzeit, Palestine; Institute of Environmental and Water Studies, Birzeit University, Birzeit, Palestine; Directorate-General for Climate Action, European Commission, Brussels, Belgium; Department of Civil and Environmental Engineering, University of Cyprus, Nicosia, Cyprus	Palestine	76

(continued on next page)

Table 3. (continued)

No	Title	Authors	Year	Source/Journal	Affiliation	Country First Affiliation	Cited by
5	Scenario of land use and land cover change in the Gaza Strip using remote sensing and GIS models	Abuelaish, B.; Camacho Olmedo, M.T.C.	2016	Arabian Journal of Geosciences	Department of GIS, Environment Quality Authority, Gaza, Palestine; Departamento de Análisis Geográfico Regional y Geografía Física, Universidad de Granada, Granada, Spain	Palestine	70
6	Assessment of groundwater quality in the buffer zone of Limpopo National Park, Gaza Province, Southern Mozambique	Barbieri, M.; Ricolfi, L.; Vitale, S.; Muteto, P.V.; Nigro, A.; Sappa, G.	2019	Environmental Science and Pollution Research	Department of Earth Sciences, Sapienza Università di Roma, Rome, Italy; Department of Environmental Biology, Sapienza Università di Roma, Rome, Italy; Universidade Eduardo Mondlane, Maputo, Mozambique; Department of Civil Building and Environmental Engineering, Sapienza Università di Roma, Rome, Italy	Italy	68
7	Debt space: Topologies, ecologies and Ramallah, Palestine	Harker, C.	2017	Environment and Planning D: Society and Space	Durham University, Durham, United Kingdom	United Kingdom	55
8	Assessment of health-care waste management in a humanitarian crisis: A case study of the Gaza Strip	Caniato, M.; Tudor, T.L.; Vaccari, M.	2016	Waste Management	Department of Civil Engineering, Università degli Studi di Brescia, Brescia, Italy; SITA Centre for Sustainable Wastes Management, University of Northampton, Northampton, United Kingdom	Italy	44

(continued on next page)

Table 3. (continued)

No	Title	Authors	Year	Source/Journal	Affiliation	Country First Affiliation	Cited by
9	Management of healthcare waste in circumstances of limited resources: A case study in the hospitals of Nablus city, Palestine	Al-Khatib, I.A.; Al-Qaroot, Y.S.; Ali-Shtayeh, M.S.	2009	Waste Management and Research	Institute of Environmental and Water Studies, Birzeit University, Birzeit, Palestine; Faculty of Allied Medical Sciences, Arab American University, Palestine, Jenin, Palestine; Faculty of Graduate Studies, An-Najah National University, Nablus, Palestine	Palestine	43
10	Tobacco use, exposure to secondhand smoke, and training on cessation counseling among nursing students: Cross-country data from the Global Health Professions Student Survey (GHPSS), 2005-2009	Warren, C.W.; Sinha, D.N.; Lee, J.; Lea, V.; Jones, N.R.	2009	International Journal of Environmental Research and Public Health	National Center for Chronic Disease Prevention and Health Promotion, Atlanta, United States; South-East Asia Regional Office, Organisation Mondiale de la Santé, Geneva, Switzerland; University of Wisconsin Carbone Cancer Center, Madison, United States	United States	42

4.3 Qualitative Content Analysis

4.3.1 Main Focus and Research Directions

A content analysis of the reviewed scientific articles shows that the majority of research focuses on the link between Israeli colonial occupation and ecological damage in the Palestinian territories. More than two-thirds of the articles identify armed conflict and settler colonialism as the primary determinants of environmental deterioration, while others highlight the water resource crisis, war-related pollution, and its impact on public health, all of which stem from ecological and structural pressures.

The use of the settler colonialism framework is particularly prominent. While the phrase "settler colonialism" itself is rarely used explicitly, the concept appears centrally in discussions of the environment. For example, several abstracts directly use academic terminology such as "settler colonial analysis" (Hughes et al., 2023) and "settler colonial project of territorial dispossession and elimination" (Braverman, 2021) to analyze Israel's green infrastructure or environmental injustices in the West Bank. Similarly, the concept of "settler ecologies" is explicitly used to highlight the ecological implications of the colonial project. This reinforces the claim that ecological damage is seen not simply as a side effect of conflict, but as a structural goal of a larger political project: the occupation and permanent appropriation of land.

There are three main focuses identified, including ecological damage due to war and military occupation which includes land degradation, air pollution, heavy metal contamination, and damage to biodiversity (Abu-alnaeem et al., 2018; Hassoun, 2025; Manduca et al., 2014); resource inequality and water injustice, this highlights Israel's dominance over groundwater access and the weakness of the international legal framework in guaranteeing the rights of Palestinian people to water resources (Dotan et al., 2017; Krakow, 2020; Lautze et al., 2005); ecological decolonization and environmental justice, this shows the Palestinian socio-ecological response through struggles on agrarian and agricultural issues, food resistance, and the idea of environmental sumud as a regenerative practice (Meneley, 2021). The findings across these articles indicate that the issue of ecocide in Palestine is not only understood as a consequence of military conflict, but also as a structural colonial process that normalizes the exploitation of ecological space.

The ecocide context in this research is reinforced by findings of "profound environmental degradation" (Hassoun, 2025) and "systematic destruction of agricultural, healthcare, and water infrastructure," (Hamamra et al., 2025), which some studies have even identified as "genocides of peoples and the environment." (Salem, 2019). Furthermore, the concept of toxic colonization is scientifically contextualized by evidence of persistent pollution. Several abstracts explicitly document heavy metal contamination (such as barium, arsenic, uranium) originating from weaponry, with studies demonstrating "persistence of heavy metal contamination in newborn hair" (Baraquoni et al., 2020) and "high levels of environmental contaminants... introduced by weaponry." (Manduca et al., 2020). This evidence confirms that the Palestinian population bears a long-term toxic burden as a direct consequence of the military policies and control of the occupation, validating the concept of toxic colonization and underscoring the structural and toxic nature of the ecological

domination that occurs. Therefore, ecocide in the Palestinian context is not only biophysical but also epistemic and political, operating through narratives, laws, and technologies that maintain colonial domination over environmental resources.

4.3.2 Geopolitical Representation

The cross-affiliation or cross-national studies, as shown in Figure 4, demonstrate significant geopolitical patterns of scholarship. Nearly half of the articles analyzed were from authors affiliated with Western countries, while the remainder came from Palestinian institutions or cross-national collaborations. Studies conducted by Western countries showed a strong tendency toward critical analysis and environmental justice. Studies from Western affiliates, in particular USA, UK, and Canada, explicitly uses a colonial framework in identifying the root causes by mentioning terms such as settler colonialism, ecocide, greenwashing, calling for ecological decolonization, and Western researchers generally focus on structural impacts.

Studies conducted by Palestinian authors, often collaborating with global affiliates, demonstrate a consistent and highly authentic critical narrative with a deeper emphasis on people's rights and resilience. Palestinian studies clearly highlight that Israel's occupation and military aggression constitute ecological and humanitarian crimes, resulting in widespread environmental damage, biodiversity degradation, and ecological racism. The narratives also focus on violations of Palestinian environmental rights, the failure of equitable water management, and the link between conflict and soil erosion and infrastructure damage. These environmental issues are not merely a consequence of the conflict, but also a tool of structural oppression that harms Palestinian society and the environment.

However, the content also suggests alternative interpretations, with some studies emphasizing non-colonial factors such as climate change and urbanization pressures as drivers of the crisis (e.g., diarrheal disease risk and aquifer salinization). For example, a study Hajat et al. (2022) modeled that a 2°C temperature rise could increase cases of heat-related diarrhea by more than 10%. These factors, which can be grouped as universal environmental challenges, do not negate the majority of findings but rather serve as additional pressures significantly exacerbated by the colonial structural context (blockades and resource controls) that are the primary focus of the literature. This integration of perspectives enhances the credibility of the analysis by demonstrating the complexities and interactions between factors recognized in the scientific literature.

5. CONCLUSION

This study charts the development of studies on environmental deterioration in Palestine through a systematic literature review and bibliometric analysis, confirming a significant surge in Scopus scholarly publications from 2000–2025, particularly after 2008. An epistemological shift is clearly identified, with environmental issues in Palestine increasingly being framed as environmental justice issues based on structural conflict, going beyond a purely ecological focus. Thematic analysis confirms the interdisciplinary nature of

these studies, highlighting dominant themes such as water quality, waste management, and socio-political dimensions in the Gaza Strip and the West Bank. In line with the hypothesis, content analysis indicates that the majority of the literature critically frames ecological deterioration as a consequence of colonial occupation and systematic violence (ecocide and toxic colonization), rather than simply a side effect of conflict. Although there are a significant number of authors affiliated with Western institutions in this study, the substance of their research tends to be critical and pro-environmental justice, supporting the view that environmental deterioration is a form of systematic colonialism, while authentic narratives from Palestinian researchers prioritize people's rights and ecological resilience. Therefore, this finding confirms that global scientific discourse structurally represents environmental problems in Palestine as justice issues rooted in colonialism. Overall, these findings underscore the urgency of integrating findings on ecocide and toxic colonialism into the international legal framework and sustainable reconstruction efforts, to ensure ecological justice and resource sovereignty for the Palestinian people.

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