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CLIMATE CHANGE AND WOMEN'S SRHR LAW: BIBLIOMETRIC MAPPING

MUDANÇA CLIMÁTICA E DIREITO SRHR DAS MULHERES: MAPEAMENTO

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Abstract
This study maps peer-reviewed research at the intersection of climate change (and climate-related hazards), women's sexual and reproductive health and rights (SRHR)/maternal health, and law–policy–rights–governance framing. Records were retrieved from Scopus and Web of Science and processed in R using bibliometric routines (Biblioshiny). After database-level filtering, dataset merging, and deduplication, a journal-aligned eligibility screening was applied to retain publications that jointly addressed climate-related exposure and women's SRHR/maternal health with an explicit governance or rights dimension. The final corpus (n = 400; 2002–2025) was analyzed through annual production trends, source and author productivity, country outputs and collaboration patterns, global citation performance, and conceptual structures based on indexed terms and keyword co-occurrence. Results indicate a sharp acceleration in annual production after 2018 and a dispersed publication landscape across journals and authors. Country production is concentrated in a small set of high-output countries, with international co-authorship links spanning multiple regions. Thematic patterns cluster around pregnancy/women-focused health descriptors, climate and vulnerability terms, and biomedical mechanisms. The discussion situates the field as being in a growth and diversification stage and outlines implications for environmental law and rights-based climate governance.

Keywords: Bibliometric Mapping. Climate Change. Environmental Law. Human Rights. Women**'s** SRHR.

Resumo
Este estudo mapeia a produção científica revisada por pares na interseção entre mudança climática (e perigos relacionados ao clima), saúde materna e saúde e direitos sexuais e reprodutivos (SRHR) das mulheres, com ênfase em enquadramentos de direito, políticas públicas, direitos e governança. Registros foram recuperados nas bases Scopus e Web of Science e tratados em R por rotinas bibliométricas (Biblioshiny). Após filtros em nível de base, combinação dos conjuntos e remoção de duplicatas, aplicou-se uma triagem de elegibilidade alinhada ao escopo do periódico, retendo apenas publicações que articulassem simultaneamente exposição climática e SRHR/saúde materna com dimensão explícita de governança ou direitos. O corpus final (n = 400; 2002–2025) foi analisado por tendências de produção anual, produtividade de fontes e autores, produção e colaboração por país, desempenho de citações globais e estruturas conceituais com base em termos indexados e coocorrência de palavras-chave. Os resultados indicam aceleração acentuada da produção após 2018 e dispersão temática e editorial entre periódicos e autores. A produção por país concentra-se em poucos países de alto volume, com vínculos de coautoria internacional em múltiplas regiões. Os padrões temáticos se organizam em torno de descritores de gravidez/saúde das mulheres, termos de clima e vulnerabilidade e mecanismos biomédicos. A discussão posiciona o campo em estágio de crescimento e diversificação e destaca implicações para o direito ambiental e a governança climática baseada em direitos.

Palavras-chave: *Direito Ambiental. Direitos Humanos. Mapeamento Bibliométrico. Mudança Climática. SRHR das Mulheres.*

1 INTRODUCTION

Climate change has become a defining challenge for sustainable development because it simultaneously intensifies environmental risks and reshapes the social conditions under which health can be protected and guaranteed. In this context, questions that appear "technical" or "clinical" quickly become questions of governance: how public authorities organize prevention and preparedness, how they allocate duties and resources across sectors, and how they ensure accountability when foreseeable harms materialize.

Women's sexual and reproductive health and rights (SRHR) and maternal health sit at a particularly sensitive intersection of these dynamics. SRHR outcomes depend on continuity of care, safe living and working environments, and timely access to information and services—conditions that can be disrupted by both acute climate-related events and longer-term climate stressors. These disruptions rarely affect populations evenly. Instead, the capacity to prevent harm and to access services is patterned by social inequalities, which means that climate-related impacts can deepen existing vulnerabilities and widen gaps in health and rights enjoyment.

For a journal centered on environmental law and sustainable development, the climate–SRHR interface is therefore not adequately addressed through biomedical framing alone. It raises normative and institutional questions about state obligations, policy design, regulatory choices, and the effectiveness of remedies. Yet scholarship on this interface is dispersed across multiple research communities and publication venues, often using different vocabularies for similar problems and different problem-definitions for related outcomes. This fragmentation makes it difficult to identify the field's dominant themes, its blind spots, and the extent to which legal, policy, rights-based, and justice-oriented approaches are shaping the conversation.

This article responds to that problem by providing a bibliometric mapping of peer-reviewed research at the intersection of climate change (and climate-related hazards), women's SRHR/maternal health, and a law–policy–rights–governance framing. Using Scopus and Web of Science records and a transparent, rule-based screening approach aligned with the journal's thematic priorities, we build a final corpus for analysis and examine how this literature has evolved over time, how it clusters conceptually, and how it is distributed across journals, countries, and institutional contexts. In doing so, the study aims to support more coherent agenda-setting for environmental law and sustainable

development scholarship that engages women's health as a governance and rights concern.

The article proceeds as follows. Section 2 reviews the normative and scholarly foundations of the climate-as-governance and human-rights problem, the climate–SRHR pathway literature, and the value of bibliometrics for mapping interdisciplinary fields. Section 3 details the data sources, inclusion and exclusion criteria, deduplication, and analytical procedures. Section 4 presents the bibliometric results, and Section 5 discusses their implications for legal and policy debates on climate action, accountability, and gender-responsive governance.

2 LITERATURE REVIEW

2.1 Climate change as a governance and human-rights issue (obligations, accountability, climate justice)

Climate change has long been framed in international environmental law as a governance challenge requiring coordinated duties of prevention, cooperation, and equity. The Rio Declaration consolidates core principles—such as precaution, prevention, participation, and access to justice—that are now routinely mobilized to evaluate whether public authorities are acting with due diligence in the face of foreseeable environmental harm (UN, 1992). The UNFCCC further grounds climate governance in "equity" and "common but differentiated responsibilities and respective capabilities", shaping debates on burden-sharing, adaptation finance, and the distributive dimensions of climate policy (UN, 1992). In parallel, the 2030 Agenda mainstreams climate action (SDG 13) alongside health (SDG 3) and gender equality (SDG 5), reinforcing the idea that climate governance must be assessed not only by emissions trajectories but also by social outcomes and inequalities (UN, 2015).

Within human-rights law, climate change is increasingly treated as a risk multiplier that interferes with the enjoyment of rights—especially for groups facing intersecting vulnerabilities. A key institutional signal is the Human Rights Council's recognition that integrating a gender-responsive approach into climate policies can increase the effectiveness of mitigation and adaptation (UNHRC, 2018). At the level of remedies and accountability, climate litigation has also moved into treaty-body practice.

In *Daniel Billy et al. v. Australia* (Torres Strait Islanders) (Lentner&Cenin, 2024), the UN Human Rights Committee examined climate harms through obligations under the ICCPR, emphasizing the need for timely and adequate protective measures where climate impacts threaten communities' lives, health, livelihoods, and culture (UNHRC, 2022). This jurisprudential development matters for "climate justice" arguments in legal scholarship because it links climate governance failures to concrete duties of protection, participation, and effective remedy—core components of accountability architectures. A recent example of doctrinal engagement with treaty-body pathways is Akindele's analysis of climate change as a human-rights issue in the UN Human Rights Committee context (Akindele, 2023).

2.2 Women's SRHR/maternal health under climate-related hazards (rights-based access, inequality, vulnerability)

The health evidence base increasingly documents how climate-related hazards—heatwaves, floods, droughts, storms, sea-level rise, and ecosystem disruptions—affect the social and environmental determinants of health and strain health systems. The WHO synthesizes these pathways and explicitly connects climate shocks to diminished health-system capacity and worsening inequities, with implications for universal health coverage and the human right to health (WHO, 2023). The IPCC's Sixth Assessment Synthesis Report likewise underscores the close linkages among climate, ecosystems, human well-being, and sustainable development, providing a high-authority basis for integrating health and equity considerations into climate governance (IPCC, 2023).

Within this broader climate–health nexus, women's sexual and reproductive health and rights (SRHR) and maternal health are shaped by both direct exposures and indirect constraints. Heat exposure during pregnancy has become one of the most consistently studied hazard pathways: a major systematic review and meta-analysis found that higher temperatures are associated with increased risks of preterm birth and stillbirth, and that effects can be larger among women facing socioeconomic disadvantage (Chersich et al., 2020). These relationships are not merely biomedical; they are mediated by housing quality, occupational conditions, access to cooling, water security, and the ability to obtain timely antenatal and emergency obstetric care—factors that map onto rights-based access and non-discrimination duties in health governance.

At the SRHR level, the field is notably uneven across regions, hazards, and outcomes. A recent scoping review focusing on low- and middle-income countries highlights both growth and fragmentation in climate–SRHR scholarship, pointing to gaps in how climate events are connected to SRHR outcomes and to policy-relevant interventions (Arunda et al., 2024). This fragmentation is consequential for law-and-policy work: without a clear map of what has been studied (and where the silences remain), it becomes difficult to set governance priorities—e.g., minimum service packages for climate emergencies, SRHR continuity plans, gender-responsive adaptation budgeting, or accountability indicators aligned with SDGs 3/5/13 (UN, 2015).

2.3 Why bibliometrics for mapping a fragmented law–health–climate field (need for systematic mapping)

Because climate change, SRHR/maternal health, and governance/human-rights scholarship are distributed across multiple disciplines (public health, environmental science, social science, law, and policy studies), traditional narrative reviews can struggle to capture the structure of the field—especially when terminology varies (e.g., "SRHR" vs. "maternal health", "climate hazards" vs. "extreme weather", "rights" vs. "justice" vs. "accountability"). Bibliometric approaches provide a complementary strategy: they quantify patterns of production, influence, and conceptual clustering through indicators such as citation networks, co-citation structures, bibliographic coupling, keyword co-occurrence, and collaboration maps (Zupic&Cater, 2015). Methodological guidance emphasizes that bibliometrics is particularly useful for "large volumes" of literature, enabling both performance analysis (who/where/what is most productive and influential) and science mapping (how themes and communities of knowledge evolve over time) (Donthu et al., 2021).

Operationally, the *bibliometrix* package (and its *Biblioshiny* interface) is widely used for implementing these workflows in a transparent and reproducible way (Aria&Cuccurullo, 2017). For a law–health–climate agenda, bibliometrics can do three things that are hard to achieve otherwise: (i) reveal whether governance and rights concepts form distinct clusters or are integrated into climate–SRHR research; (ii) identify bridging journals, countries, and institutions that connect legal/policy debates with empirical health evidence; and (iii) surface "blind spots" where climate–SRHR impacts

are discussed without corresponding legal/governance framing (or vice versa), which is directly relevant for publishing in a legal sustainability journal that expects normative and policy relevance. Taken together, this justifies bibliometrics as a rigorous mapping method for a field that is both conceptually heterogeneous and practically high-stakes for climate justice, accountability, and women's health. Against this backdrop, the present study undertakes a bibliometric analysis of peer-reviewed literature indexed in Scopus and Web of Science to delineate how research has evolved at the climate–women's health interface and to assess the prominence—and absences—of legal, policy, and rights-based approaches within that corpus.

3 METHODOLOGY

3.1 Research design

This study adopts a bibliometric science-mapping design to systematically describe and structure an interdisciplinary body of literature located at the intersection of climate change (and climate-related hazards), women's sexual and reproductive/maternal health, and law–policy–rights–governance scholarship. Bibliometric methods are appropriate for mapping fragmented fields because they combine (i) *performance analysis* (e.g., annual production, influential sources, countries, and authors) with (ii) *science mapping* (e.g., conceptual structures based on keyword co-occurrence and thematic evolution) (Zupic&Cater, 2015; Donthu et al., 2021). The analytical workflow was implemented in R using the *bibliometrix* package and its web interface *Biblioshiny*, which supports transparent and reproducible bibliometric procedures (Aria&Cuccurullo, 2017).

3.2 Data sources and database-level filters

Records were retrieved from Scopus and Web of Science (WoS**)** because they provide broad multidisciplinary coverage and exportable metadata suitable for bibliometric analyses (DONTHU et al., 2021). Searches were conducted using structured query strings applied to title/abstract/keywords fields (full search strings are reported in the Supplementary Material). To align the dataset with the journal's scope—

environmental law and sustainable development with a clear governance/rights dimension—database-level filters were applied prior to export: document types were restricted to articles and reviews, language was restricted to English, and results were limited to subject areas most likely to index climate–health–governance scholarship (Medicine, Social Sciences, Nursing, Environmental Science, Arts and Humanities, Multidisciplinary, Psychology, Health Professions, and Earth and Planetary Sciences).

3.3 Identification, deduplication, and eligibility screening

A total of 2,602 records were initially identified through database searches (Scopus: n = 2,331; WoS: n = 271). In Scopus, limiting results to articles and reviews and to the subject areas listed above reduced the yield to n = 1,865, and restricting to English reduced it further to n = 1,773. In WoS, restricting to articles and reviews reduced the yield to n = 261, applying the same subject-area categories reduced it to n = 222, and limiting to English resulted in n = 219. The two datasets were exported and merged in R (n = 1,992). Duplicate records were removed (n = 183), leaving 1,809 unique records for eligibility screening.

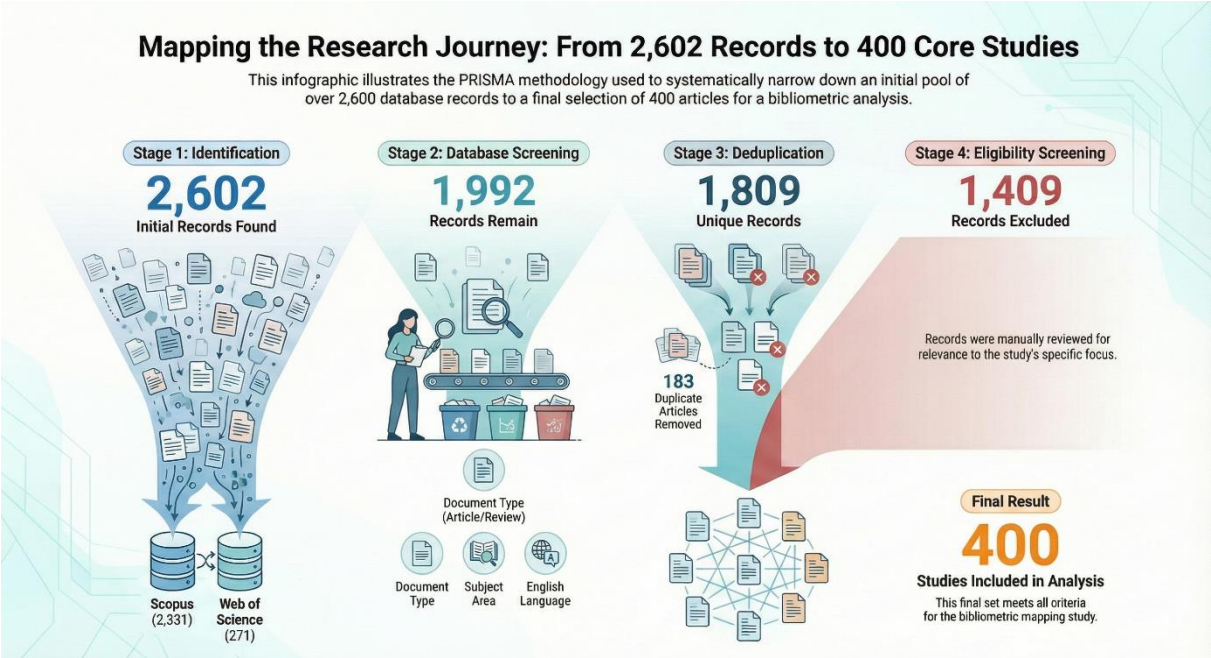
Eligibility screening was then conducted to retain only publications matching the study's intended intersection—climate change (or climate-related hazards) and women's sexual and reproductive/maternal health—while also maintaining thematic compatibility with the target journal's emphasis on law, policy, rights, and governance. Consequently, 1,409 records were excluded because they did not meet this journal-aligned scope: 1,361 records lacked climate relevance in the title/abstract/keywords (including 1,243 with no climate terms, 74 primarily focused on chemical/EDC exposure without climate framing, 43 addressing war/displacement without a climate linkage, and 1 meeting multiple exclusion reasons), and an additional 48 records mentioned climate and women's SRH/maternal health but did not include discernible law/policy/rights/governance framing, making them less suitable for a legal and sustainable-development journal. Following these exclusions, 400 records remained and were included in the final bibliometric analysis.

Study selection is reported in a PRISMA-like flow to document identification, filtering, deduplication, and eligibility decisions in a transparent manner (Page et al., 2021). Screening was conducted using a rule-based keyword protocol applied to titles,

abstracts, and keywords, followed by manual verification of borderline cases to reduce false exclusions and ensure conceptual alignment with the journal's thematic priorities (Figure 1).

Figure 1

PRISMA-like flow diagram showing database retrieval, filtering, deduplication, and eligibility screening for a bibliometric mapping study on climate change, women's sexual and reproductive/maternal health, and law/policy/rights framing.



3.4 Data preparation and metadata management

After merging Scopus and WoS exports, records were harmonized to a common bibliographic schema using *bibliometrix* conversion and merging routines (Aria&Cuccurullo,2017). Deduplication was performed using stable identifiers where available (e.g., DOI), complemented by bibliographic fields (e.g., title and year) to minimize residual duplicates. Because cited-reference fields (CR) were missing for most records in the final corpus, analyses requiring full reference lists (e.g., reference co-citation and historiographic citation network reconstruction) were not prioritized; instead, the study focuses on robust indicators available from core metadata and keywords.

3.5 Bibliometric indicators and analytical techniques

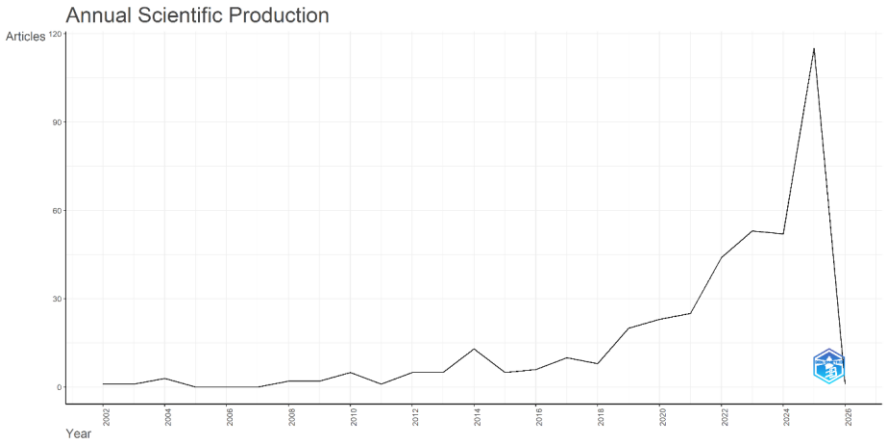
Consistent with established bibliometric guidance, we conducted performance and science-mapping analyses (Zupic& Cater, 2015; Donthu et al., 2021). Performance indicators included: annual scientific production; most relevant sources (journals); most productive and influential authors; institutional and country contributions; and citation-based measures available in the exported metadata. Science mapping emphasized conceptual and social structures that do not depend on complete reference lists: (i) keyword co-occurrence networks (Author Keywords and indexed keywords) to identify thematic clusters; (ii) thematic mapping to classify themes by centrality and density; (iii) thematic evolution to examine longitudinal shifts in dominant concepts; and (iv) collaboration networks (country and author co-authorship) to characterize the social structure of knowledge production. All analyses were executed in *Biblioshiny* to ensure reproducibility and to facilitate consistent parameterization across outputs (Aria&Cuccurullo, 2017).

4 FINDINGS / RESULTS

4.1 Annual scientific production

Figure 2

Annual scientific production



The final dataset (n = 400) spans publications indexed between 2002 and 2025. Figure 1 reports the annual scientific production across the study period. Output remains

very limited during the early years (2002–2011), with only sporadic publications per year. Production increases gradually through the mid-2010s and then accelerates after 2018. The upward trend becomes pronounced from 2021 onward, with a substantial rise in yearly output through 2022–2024. The series reaches its highest point in 2025, where annual production exceeds 100 publications. The final point shown at the end of the timeline is markedly lower and should be interpreted as incomplete coverage for the most recent indexing year rather than a decline in the underlying publication activity (Figure 2).

4.2 Average citations per year

Figure 3

Average citations per year.

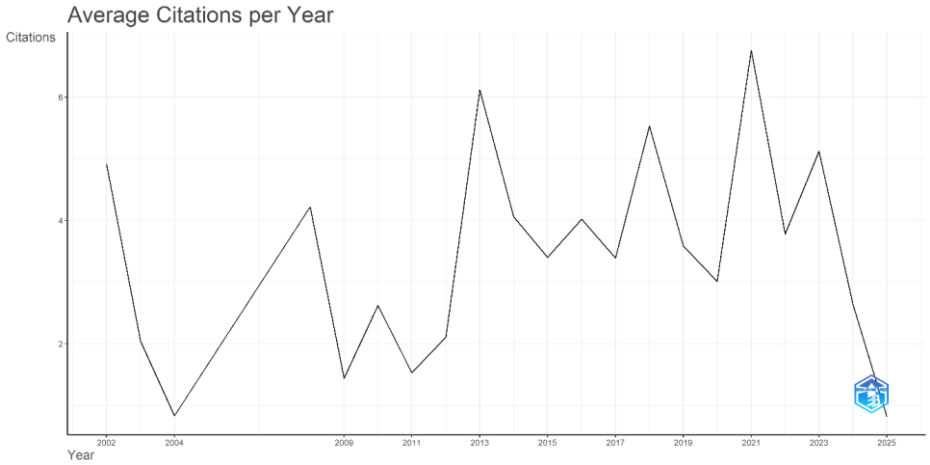


Figure 3 presents the average citations per year for publications in the final corpus (n = 400). The series shows substantial year-to-year variability across the observation window. Citation averages are comparatively lower in the mid-2000s, increase during the late 2000s, and reach a pronounced peak in 2013. From 2014 onward, the average citations per year remain generally between approximately 3 and 5, with notable local maxima around 2018 and the highest peak in 2021. After 2021, the values fluctuate again, with another increase around 2023, followed by lower averages in the most recent publication years shown in the figure.

4.3 Most relevant sources (journals)

Figure 4

Most relevant sources

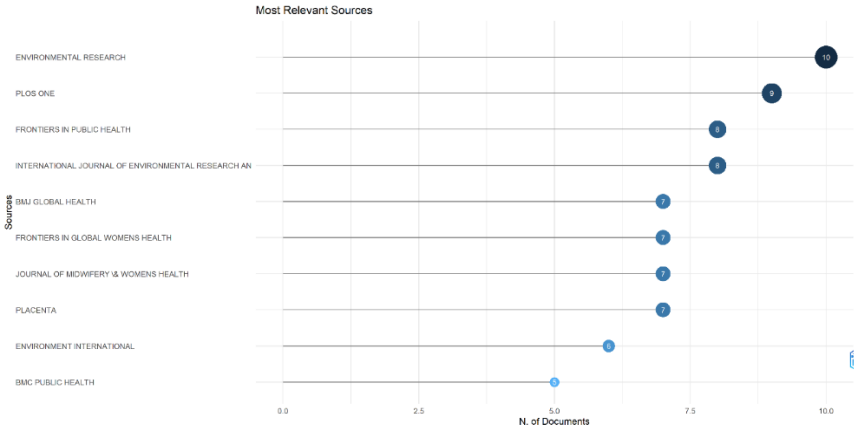


Figure 4 summarizes the most relevant sources in the final corpus by number of documents. The leading journal is Environmental Research (*n* = 10), followed by PLOS ONE (*n* = 9). Two outlets contribute *n* = 8 documents each: Frontiers in Public Health and the International Journal of Environmental Research and Public Health. A group of sources contribute *n* = 7 documents each (BMJ Global Health, Frontiers in Global Women's Health, Journal of Midwifery & Women's Health, and Placenta). The remaining sources in the top list are Environment International (*n* = 6) and BMC Public Health (*n* = 5). Overall, the top sources contribute small shares individually (e.g., the most prolific source accounts for 10 of 400 records), indicating that publications are distributed across multiple journals rather than concentrated in a single outlet.

4.4 Most relevant authors

Figure 5

Most relevant authors

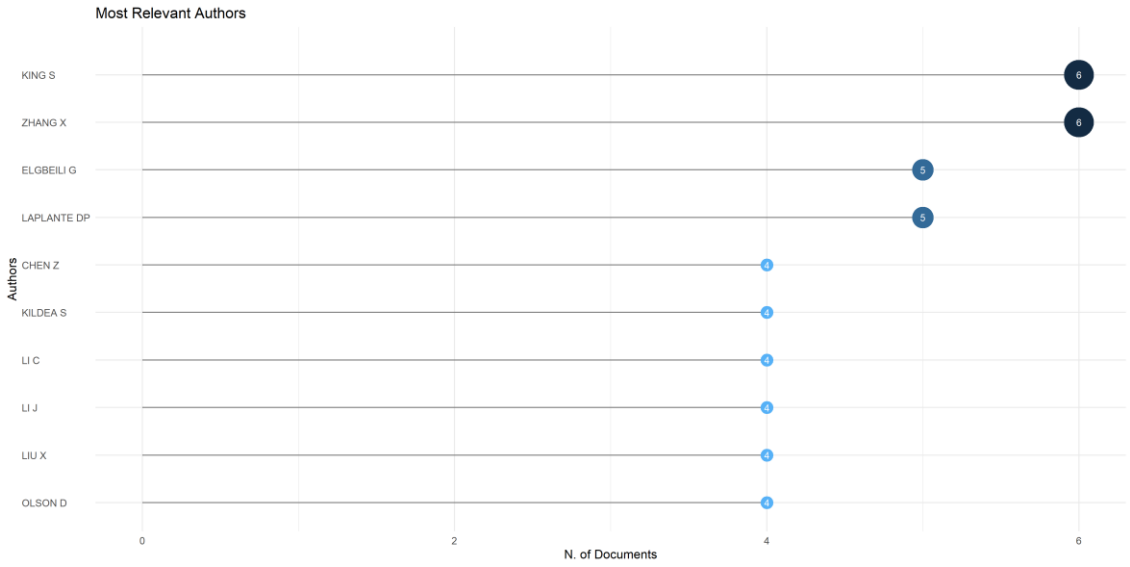


Figure 5 presents the most relevant authors in the final corpus by number of documents. Two authors lead the list with six publications each: King S (*n* = 6) and Zhang X (*n* = 6). The next highest contributors are Elgbeili G (*n* = 5) and Laplante D. P. (*n* = 5). A group of authors each contribute four publications: Chen Z, Kildea S, Li C, Li J, Liu X, and Olson D (each *n* = 4). As with the source distribution, author productivity at the top end remains relatively dispersed, with the most prolific individual authors contributing single-digit numbers of papers within the 400-record dataset.

4.5 Country scientific production

Figure 6

Country scientific production

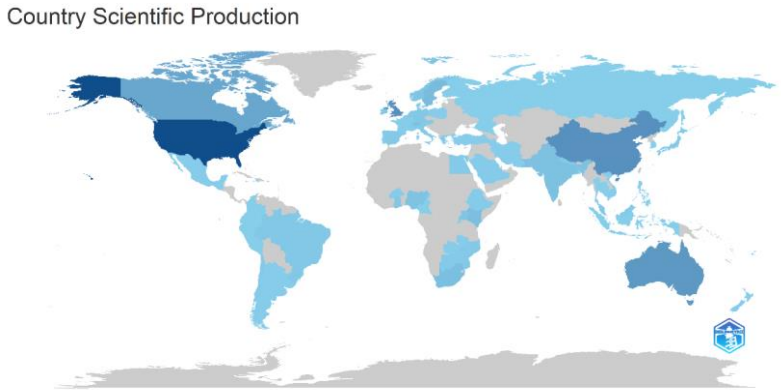


Figure 6 visualizes the geographic distribution of publications in the final corpus. The mapped output spans multiple regions, with contributions visible across North America, Europe, Asia, Oceania, and parts of Africa. The highest country-level production is attributed to the United States (n = 275), followed by the United Kingdom (n = 127) and China (n = 125). Australia ranks next (n = 109), with Canada also contributing a substantial number of records (n = 79). Additional countries appearing among the top contributors include Sweden (n = 37), Kenya (n = 30), Switzerland (n = 30), South Africa (n = 29), and Pakistan (n = 26).

4.6 Most globally cited documents

Figure 7

Most global cited documents

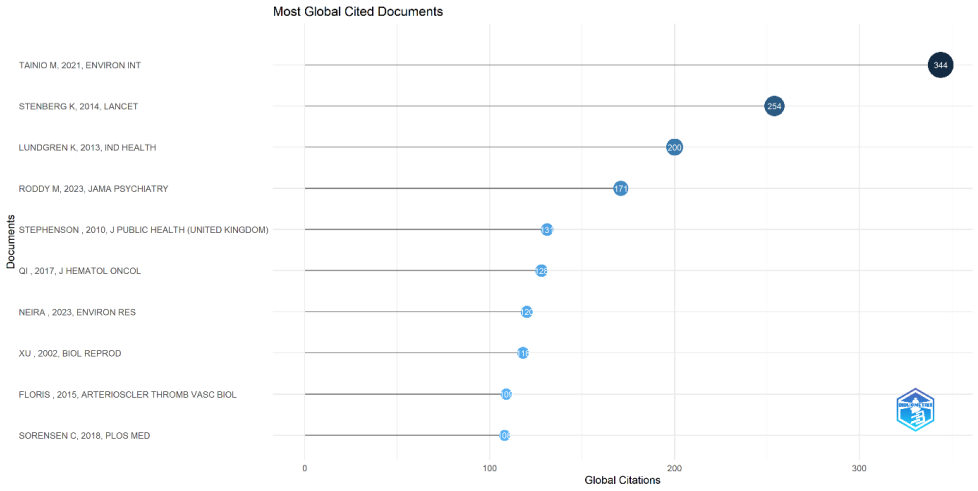


Figure 7 lists the most globally cited documents in the dataset (global citations). The highest-cited document is Tainio M (2021, Environment International) with 344 global citations. The next most cited are Stenberg K (2014, The Lancet) with 254 citations and Lundgren K (2013, Industrial Health) with 200 citations. More recent highly cited outputs include Roddy M (2023, JAMA Psychiatry) with 171 citations and Neira (2023, Environmental Research) with 120 citations. Additional documents in the top-cited set include Stephenson J (2010, Journal of Public Health [United Kingdom]) with 131 citations, Qi (2017, Journal of Hematology & Oncology) with 128 citations, Xu (2002, Biology of Reproduction) with 113 citations, Floris (2015, Arteriosclerosis, Thrombosis, and Vascular Biology) with 109 citations, and Sorensen C (2018, PLOS Medicine) with 108 citations.

4.7 Most relevant words (keywords plus / indexed keywords)

Figure 8

Most relevant words

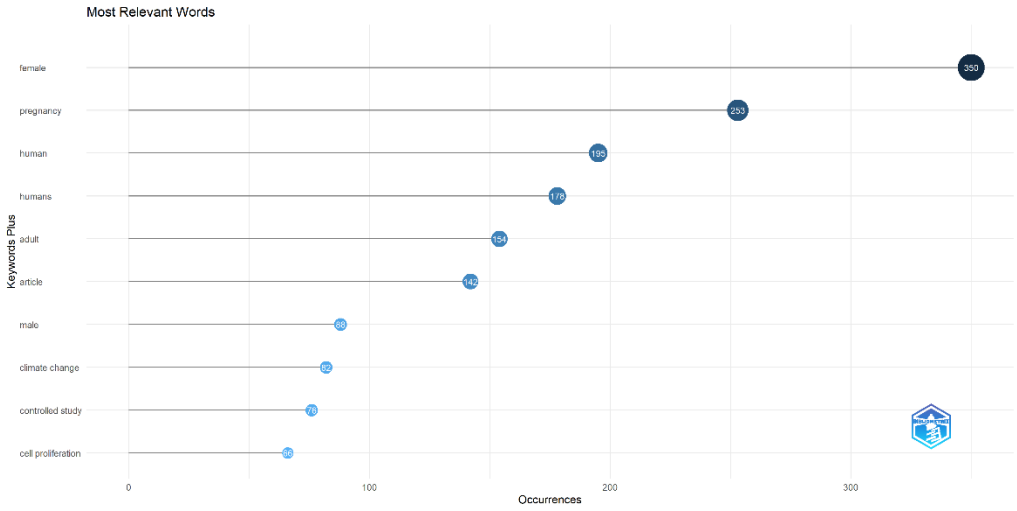


Figure 9

Word cloud

Figure 8 and Figure 9 reports the most frequent Keywords Plus (indexed keywords) in the dataset by number of occurrences. The most frequent term is “female” (*n* = 350), followed by “pregnancy” (*n* = 253). Additional high-frequency indexed terms include “human” (*n* = 195), “humans” (*n* = 178), “adult” (*n* = 154), and “article” (*n* = 142). Among the remaining terms in the top list are “male” (*n* = 88), “climate change” (*n* = 82), “controlled study” (*n* = 76), and “cell proliferation” (*n* = 66).

4.8 Trend topics

Figure 10

Trend topics

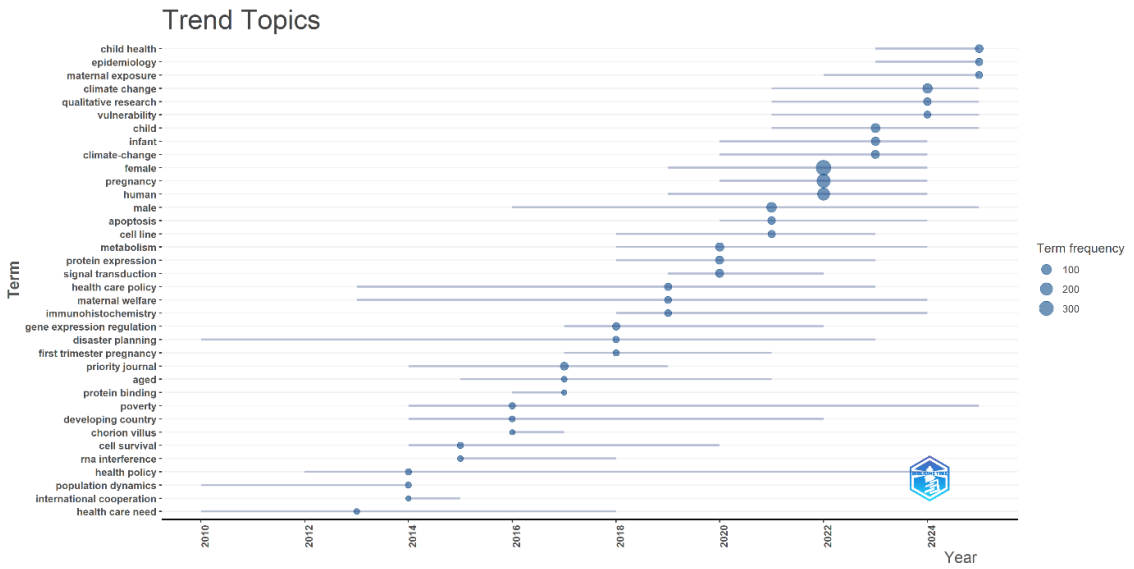


Figure 10 displays trend topics (term frequency by year) across the period shown in the plot (2010–2025). Early recurring terms include "health care need" (2013) and "health policy", "population dynamics", and "international cooperation" (2014), followed by "rna interference" and "cell survival" (2015) and terms such as "poverty", "developing country", and "chorion villus" (2016). In the subsequent period, terms including "gene expression regulation", "disaster planning", and "first trimester pregnancy" appear around 2018, while "health care policy", "maternal welfare", and "immunohistochemistry" are prominent around 2019. From 2020–2022, higher-frequency terms include "metabolism", "protein expression", "signal transduction" (around 2020), "male", "apoptosis", and "cell line" (around 2021), and the largest term-frequency peaks in the plot are observed for "female", "pregnancy", and "human" (around 2022). In the most recent years, climate-related labels become prominent in the trend plot, including both "climate change" and "climate-change", alongside "infant", "child", "vulnerability", and "qualitative research" (2022–2024), with "child health", "epidemiology", and "maternal exposure" appearing at the end of the time window (2025).

4.9 Keyword co-occurence network

Figure 11

Co-occurence network

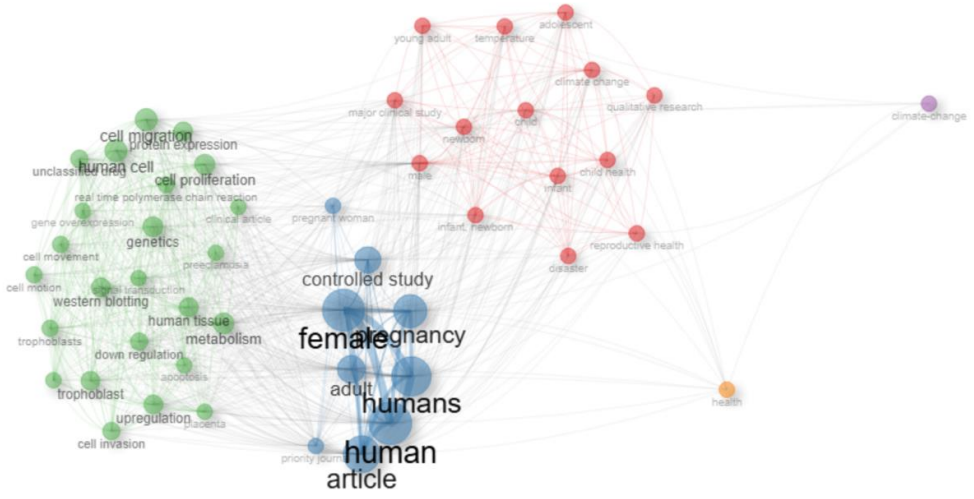


Figure 11 presents the keyword co-occurrence network for the final corpus. Node size reflects term frequency and edges represent co-occurrence links. The network shows multiple clusters. A central cluster is dominated by high-frequency indexing terms including “female”, “pregnancy”, “human/humans”, “adult”, “article”, and “controlled study”. A second cluster groups laboratory/biomedical terms such as “cell migration”, “cell proliferation”, “human cell”, “genetics”, “western blotting”, “human tissue”, “metabolism”, and “trophoblast/placenta”. A third cluster contains climate- and population-related terms, including “climate change”, “temperature”, “adolescent”, “young adult”, “child/child health”, “infant/newborn”, “qualitative research”, “reproductive health”, and “disaster”. The visualization also shows smaller, more peripheral nodes (e.g., “climate-change” and “health”) connected through fewer links compared with the central terms.

4.10 Country collaboration

Figure 12

Country collaboration map.

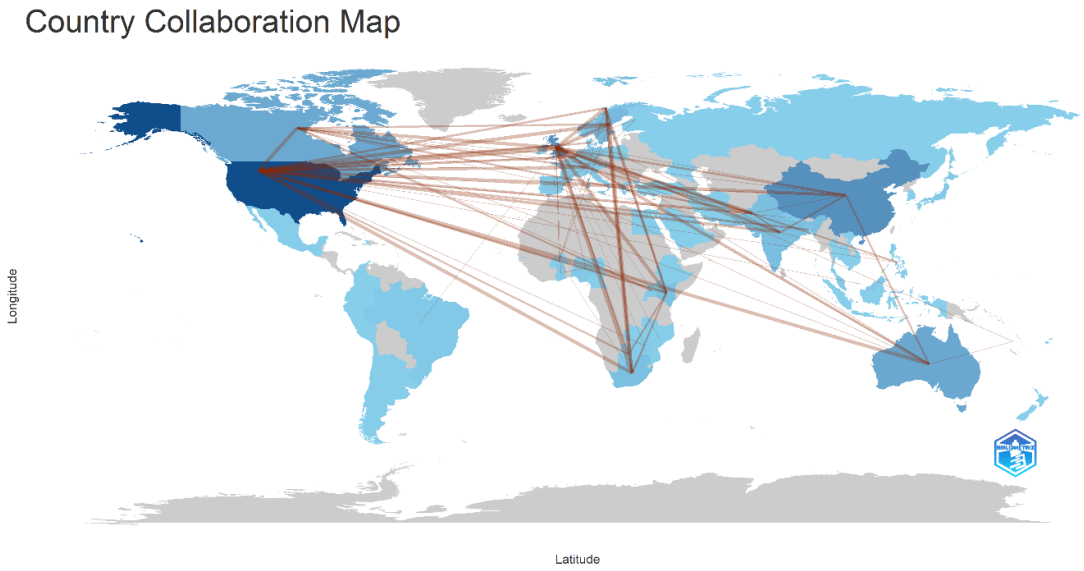


Figure 12 illustrates the international co-authorship network at the country level. The collaboration links span multiple regions, indicating cross-country research partnerships across North America, Europe, Asia, Oceania, and parts of Africa. In terms of the strongest collaboration pairs captured in the exported collaboration table, Australia appears as a central partner across multiple links. The most frequent co-authorship ties are Australia–Canada (*frequency* = 2), Australia–Fiji (*frequency* = 2), and Australia–Germany (*frequency* = 2). Additional collaborations shown include Australia–Belgium, Australia–Brazil, Australia–Cambodia, Australia–Denmark, Australia–Finland, Australia–Ghana, and Australia–India (each *frequency* = 1).

5 DISCUSSION AND CONLUSION

5.1 Discussion

The results portray a field that is expanding rapidly but remains structurally dispersed and conceptually uneven. First, the strong post-2018 growth in annual scientific production suggests that the climate–women's SRHR/maternal-health nexus has moved from sporadic, pioneer-style publication activity into an accelerated expansion phase. In

the terms proposed by Hernández-Torrano and Ibrayeva, research areas often develop from an initial exploratory stage (few outputs, weak specialization), into growth and diversification, and only later into consolidation around stable outlets, shared vocabularies, and identifiable "core" communities (Hernández-Torrano&Ibrayeva, 2020). The sharp rise in output in the early 2020s—together with the absence of a single dominant journal or a small set of highly dominant author hubs—fits best with a *growth/diversification* phase rather than a mature, consolidated stage. This is also consistent with the "distributed" journal pattern: even the most productive sources contribute only small shares of the final corpus, indicating that the conversation is being carried across multiple disciplinary venues rather than anchored in a stable core.

Second, the citation profile and the list of globally cited documents indicate that influence in this corpus is largely shaped by work appearing in mainstream health and environment outlets, rather than by legal journals. This matters for literature because it highlights a translation gap: the empirical health literature is growing and becoming more visible, but legal scholarship (rights, duties, remedies, accountability, governance architectures) is not yet equally prominent as an organizing axis. Normatively, however, the climate–SRHR interface is intrinsically governance-dependent. International environmental law and sustainable development frameworks require that climate action be evaluated not only by emissions or adaptation outputs, but also by distributive consequences, non-discrimination, and the availability and continuity of essential services (UN, 1992a; UN, 1992b; UN, 2015). In the human-rights domain, the turn toward climate accountability—illustrated by Human Rights Council resolutions and treaty-body practice—provides a legal vocabulary that can be operationalized for SRHR and maternal-health protection in climate contexts (UNHRC, 2018; UNHRC, 2022; Lentner&Cenin, 2024; Akindele, 2023). The bibliometric patterns therefore support a central implication for an environmental-law audience: empirical climate–SRHR evidence is expanding, but the governance and rights framing that would connect this evidence to obligations, standards of due diligence, and remedies remains comparatively underdeveloped and dispersed.

Third, the conceptual structure visible in the keyword patterns underscores why the field still looks "early" in its development. High-frequency indexed terms are dominated by demographic and biomedical descriptors, while climate-related labels appear but do not dominate the overall vocabulary. The co-occurrence structure is

especially telling: one cluster is organized around generic indexing terms (female/pregnancy/humans), another around laboratory and biomedical mechanisms, and a further cluster links climate-change terminology with life-stage and vulnerability descriptors (e.g., infant/child, temperature, disaster, qualitative research). This pattern suggests that the climate–SRHR interface is currently being built through (i) hazard–outcome epidemiology and clinical risk pathways, (ii) biomedical mechanisms, and (iii) a newer vulnerability-oriented strand where "climate change" is connected to population groups and qualitative framing. From a law–policy perspective, the opportunity is to move from *associational* knowledge (hazard exposure ↔ SRHR/maternal outcomes) toward *institutional* and *normative* knowledge: what governance arrangements reduce these risks; which duties attach to state actors and regulated entities; how adaptation planning should protect SRHR service continuity; and what accountability mechanisms apply when foreseeable harms are not prevented.

Fourth, the geographic distribution and collaboration patterns point to a second translation challenge. Production is concentrated in a small number of high-output countries, while collaboration ties appear present but thin (many links with low frequency). This combination can be read as a sign of a growing field that is internationally aware but not yet organized around stable, high-density global research consortia. For a sustainable-development framing, this matters because climate-related SRHR risks and service disruptions are often most severe in contexts with weaker infrastructure and higher exposure to compounding hazards. If the evidence base remains geographically uneven, the legal and policy inferences drawn from it may also risk becoming uneven—particularly regarding adaptation priorities, financing, and the design of rights-based minimum standards for SRHR continuity during climate-related disruptions.

Finally, the screening logic used to align the final corpus with the journal's scope is itself an interpretive finding. The large number of excluded records indicates that (a) substantial women's health/SRHR research does not explicitly engage climate framing, and (b) some climate-and-women's-health publications still do not articulate a law/policy/rights/governance lens. In other words, the bibliometric map supports the claim that the "law–health–climate" intersection remains partially siloed: empirical health research often proceeds without explicit governance/rights vocabulary, while legal and governance scholarship may address climate justice and accountability without sustained

engagement with SRHR and maternal-health evidence. For *Veredas*, this siloing is precisely where environmental law and sustainable development scholarship can add value—by integrating climate science, health evidence, and human-rights obligations into coherent governance arguments.

5.2 Limitations and directions for future research

Several limitations follow from the database and metadata constraints. Because cited-reference fields were missing for a large share of the corpus, co-citation and historiographic analyses were not prioritized, which limits inference about the intellectual "canon" and the historical lineage of ideas within this dataset (Aria&Cuccurullo, 2017). In addition, reliance on indexed keywords and database export fields means that conceptual structure is partly an artifact of indexing practices (e.g., generic biomedical descriptors appearing as dominant terms). The English-only restriction and the subject-area filtering also shape representativeness, privileging publication streams that are more visible in Scopus/WoS under those filters. Finally, the journal-alignment screening prioritizes explicit climate terms and explicit governance/rights language in title/abstract/keywords; this improves conceptual fit for an environmental-law outlet but may exclude work where climate relevance or governance implications are present mainly in full text rather than in metadata.

Future research can build on this map in four practical ways. (i) Deepen legal coding of governance content by adding structured qualitative coding for rights language (obligations, due diligence, accountability, remedy, participation, non-discrimination) and linking coded categories to SRHR outcome domains. (ii) Expand the legal evidence base by integrating specialized legal databases and systematically mapping climate litigation, treaty-body outputs, and domestic regulatory instruments that address SRHR-relevant climate harms. (iii) Strengthen equity-sensitive geographies by targeted searches and collaborations that increase visibility of high-exposure contexts, enabling more defensible sustainable-development and climate-justice conclusions. (iv) Improve bibliometric completeness by ensuring exports include cited-reference fields when possible, enabling co-citation and historiographic reconstruction to identify foundational works and intellectual turning points (DONTHU Et Al., 2021; ZUPIC&CATER, 2015).

5.3 Conclusion

This study mapped peer-reviewed literature at the intersection of climate change (and climate-related hazards), women's SRHR/maternal health, and law–policy–rights–governance framing using a journal-aligned screening approach and bibliometric science mapping. The findings indicate a rapidly expanding literature—especially since the late 2010s—yet one that remains dispersed across journals and author communities and whose dominant vocabularies are still heavily shaped by biomedical indexing. Interpreted through research-area development theory, the field appears to be in a growth/diversification stage rather than a consolidated, mature phase (Hernández-Torrano&Ibrayeva, 2020). For environmental law and sustainable development scholarship, the core implication is clear: as climate-related SRHR and maternal-health risks intensify, there is a pressing need to translate empirical hazard–health evidence into governance and rights frameworks that clarify duties, institutional design choices, and accountability pathways. Bridging that gap—by connecting SRHR continuity and equity concerns to climate obligations, gender-responsive adaptation, and human-rights remedies—represents a key agenda for future interdisciplinary research and for legal scholarship aimed at actionable climate justice.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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