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A BIBLIOMETRIC REVIEW OF RESEARCH ON INTERNATIONAL COOPERATION BETWEEN VIETNAM AND THE INTERNATIONAL ATOMIC ENERGY AGENCY (IAEA)

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ABSTRACT

This paper applies bibliometric analysis, following the PRISMA 2020 protocol, to map the scholarly literature on international cooperation involving the International Atomic Energy Agency (IAEA) and, separately, the literature on Vietnam's international cooperation more broadly, in order to identify the extent to which the bilateral relationship between the two has been examined as an independent object of study. Data were drawn from Scopus, restricted to the Social Sciences and Multidisciplinary subject areas, using two mandatory keyword groups combined with a fixed set of international-cooperation terms. After screening, the dataset comprised 280 documents on IAEA-related international cooperation and 2,615 documents on Vietnam's international cooperation, of which only three documents addressed both subjects simultaneously. Performance analysis was carried out with Biblioshiny and science mapping with VOSviewer. The results show that publications on Vietnam's international cooperation substantially outnumber and grow faster than those on IAEA cooperation, and that keyword co-occurrence networks for the two bodies of literature are almost entirely disjoint: Vietnam-related research clusters around climate change, higher education, and sustainable development, while IAEA-related research clusters around safeguards, sanctions, non-proliferation, and nuclear security, with nuclear energy virtually absent from Vietnam's central keyword clusters. Content analysis of the three overlapping documents, supplemented by one additional technical study located through targeted search, shows that existing work referencing both Vietnam and the IAEA consists of technical or legal reports on specific cooperation projects rather than analyses of the cooperative relationship itself. These findings identify a clear and largely unaddressed research gap regarding Vietnam–IAEA cooperation as a distinct subject of international relations research.

KEYWORDS: bibliometric analysis; international cooperation; IAEA; Vietnam; nuclear safety; research gap

1. INTRODUCTION

Over the past two decades, bibliometric analysis has become an essential methodological tool for evaluating and mapping academic activity across many fields, from the natural and engineering

sciences to the social sciences and international relations research. By providing both quantitative information (publication output, citation levels, collaboration networks) and qualitative insight (intellectual structure, thematic trends), this method helps researchers assess academic productivity, identify emerging research trends, and systematically and objectively pinpoint gaps in knowledge (Donthu et al., 2021).

Methodologically, bibliometric analysis is typically carried out through two complementary approaches: performance analysis, which indicates the contribution of research components (authors, countries, publication sources), and science mapping, which describes the relationships and intellectual structure among these components through co-citation analysis, bibliographic coupling, co-word analysis, and co-authorship analysis (Van Eck & Waltman, 2010). Building on this approach, the present study uses keyword co-occurrence analysis as its central tool for exploring the intellectual structure and developmental trajectory of the research field – a method whose systematic rigor and effectiveness have been well established in social science research (Üsdiken & Pasadeos, 1995; Backhaus et al., 2011).

To ensure the standardization and reproducibility of the review process, this study applies the PRISMA 2020 framework (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) developed by Page et al. (2021), currently regarded as the leading standard for reporting the procedures of systematic reviews. Accordingly, the review process was carried out in three successive stages: identification, screening, and data analysis (Zakaria et al., 2021).

Although the IAEA has cooperated with Vietnam since the country joined the Agency, and although both Vietnam's international cooperation in general and the IAEA's global activities have each generated substantial independent bodies of research, no bibliometric study to date has examined whether – and to what extent – the bilateral relationship between Vietnam and the IAEA has itself been treated as a distinct subject of academic inquiry. This paper addresses that question directly, using bibliometric analysis to quantify the intersection between these two bodies of literature and to characterize the nature of the limited research that does address both subjects together.

2. METHODOLOGY

2.1 Identification

Data for this review were collected from Scopus, a database widely recognized for its scope and reliability in bibliometric research (Wang et al., 2024). Two keyword groups were combined using Boolean logic: a fixed group of terms denoting international cooperation (“international cooperation”, “IAEA member states”, “technical cooperation”, “international relation”, “cooperation programmes”, “projects”, “support plan”), combined respectively with a mandatory subject-identification term – “IAEA” or “International Atomic Energy Agency” for the IAEA-related search, and “Viet Nam”, “Vietnam” for the Vietnam-related search. The search was restricted to the Social Sciences and Multidisciplinary subject areas of Scopus to ensure relevance to international relations research. The

search was executed on 14 September 2026. The initial search (within these subject areas) returned 299 documents related to IAEA international cooperation and 2,808 documents related to Vietnam's international cooperation in general.

2.2 Screening

Exclusion criteria were applied to narrow the corpus to documents suited to the research objective: only documents of the type article, conference paper, book and book chapter, editorial, conference review, and data paper, written in English, were retained; documents classified as note, short survey, review, letter, erratum, or retracted, and documents not yet in Final publication status (Article in Press), were excluded. After applying these criteria, the dataset comprised 280 documents on IAEA international cooperation (19 excluded: 18 by document type, 1 by publication stage), 2,615 documents on Vietnam's international cooperation (193 excluded: 142 by document type, 51 by publication stage), and, notably, only three documents addressing both subjects simultaneously.

2.3 Data Analysis

To clarify both the bibliometric structure and the intellectual structure of the literature, this study adopts a multi-tool analytical approach. Performance analysis – providing descriptive statistics on publication and citation trends – was conducted using Biblioshiny version 5.0 (running on RStudio), a visualization tool built on the Bibliometrix package (Aria & Cuccurullo, 2017). Science mapping – used to decode thematic networks and international collaboration patterns – was conducted using VOSviewer version 1.6.21 (Van Eck & Waltman, 2010), a tool widely adopted in bibliometric research for its powerful visualization capabilities (Lim et al., 2024). Specifically, keyword co-occurrence analysis was used to trace the evolution of research themes over time, while country-level citation analysis was used to identify international academic collaboration networks.

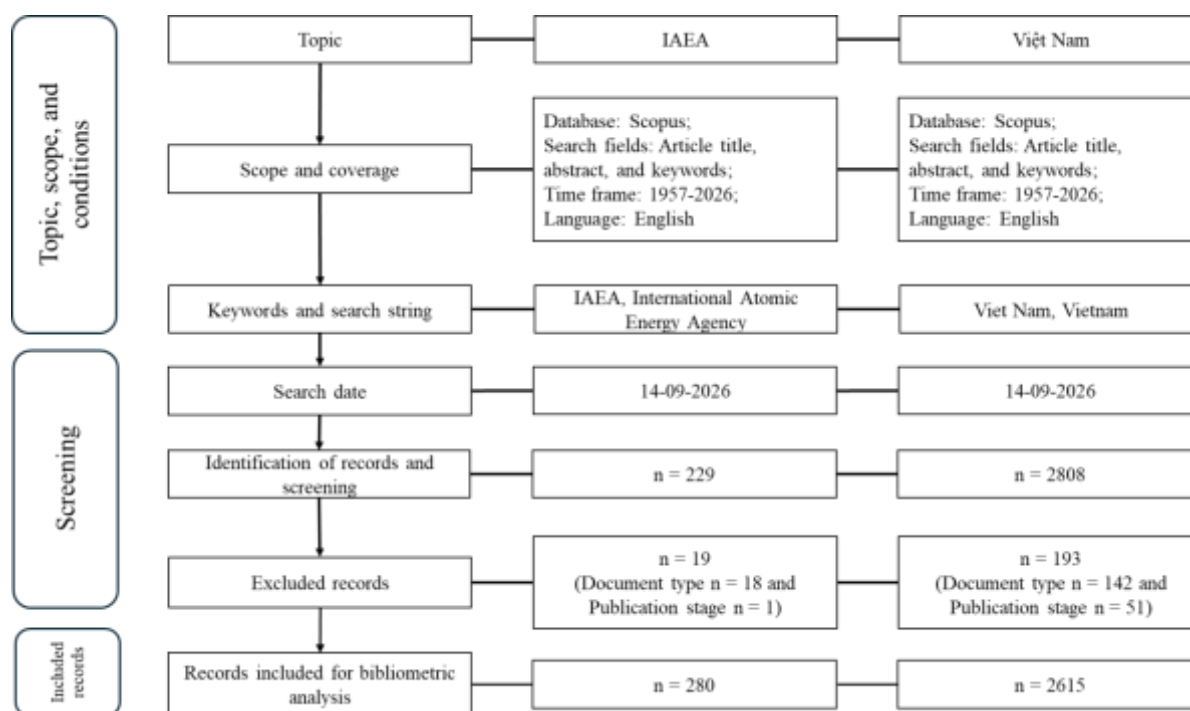


Figure 1. PRISMA 2020 identification and screening flow, applied identically to the two subjects of the review (IAEA and Vietnam international cooperation)

3. RESULTS

3.1 Descriptive Overview of the Literature

Table 1 shows that the volume of research on Vietnam's international cooperation in general (2,615 documents) is considerably larger than that on IAEA international cooperation (280 documents) – a pattern plausibly explained by the breadth of Vietnam's foreign relations compared with the IAEA's narrower sectoral mandate. Most notably, only three documents address both subjects simultaneously, spanning 2002–2018 – a figure that starkly illustrates the research gap this study seeks to address, while the very high international co-authorship rate within this small overlapping set (33.33%) and its high average citation count (21.33 citations per document) indicate that, although rare, this cross-cutting research tends to be highly collaborative and relatively well cited.

Table 1. Descriptive statistics of the bibliometric datasets on IAEA and Vietnam international cooperation

Key data information	IAEA international cooperation (1)	Vietnam international cooperation (2)	(1) and (2) combined
Time span	1966–2026	1963–2026	2002–2018
Sources (journals, books, etc.)	179	1,575	3
Documents	280	2,615	3
Total references	8,673	128,708	157
Average citations per document	7.73	13.97	21.33
Keywords	618	6,168	10
Total authors	538	5,720	21
Single-authored documents	133	1,049	0
Co-authors per document	2.32	2.63	7.00
International co-authorship rate	16.07%	13.35%	33.33%
Annual growth rate	4.37%	8.67%	0%

Source: Compiled by the author from RStudio output (Bibliometrix/Biblioshiny package), Scopus database.

Over the period 1963–2026 – dating from the earliest social-science research on international cooperation in this field – the general trend shows that the number of studies on Vietnam's international cooperation has grown considerably faster (annual growth rate 8.67%) than the number of studies on IAEA international cooperation (4.37%), particularly after 1991 following the end of the Cold War – consistent with Vietnam's deepening international integration, as reflected in its growing social-science publication output on related topics.

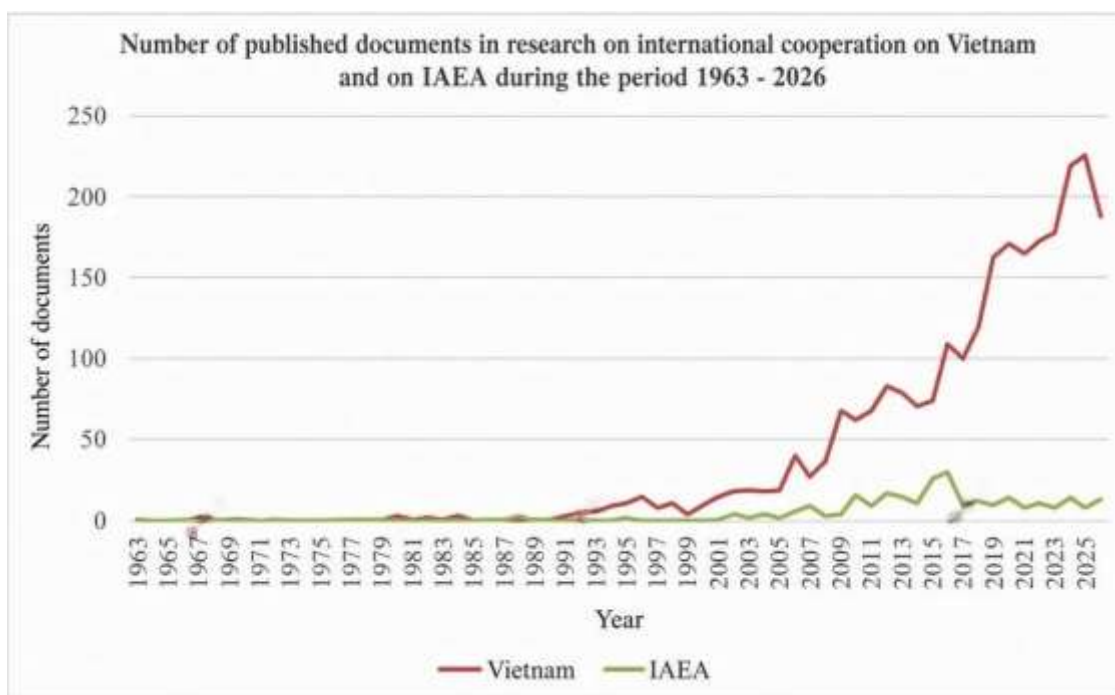


Figure 2. Number of documents published on international cooperation related to Vietnam and to the IAEA, 1963–2026

Keyword co-occurrence mapping of the Vietnam-related corpus (175 keywords selected) identifies twelve clusters, with the following keywords at the centre: climate change, Vietnam, higher education, Cambodia, Southeast Asia, China, Japan, ASEAN, Hanoi, sustainable development, policy transfer, and global health. This indicates that Vietnam's international cooperation, as represented in the international academic literature, is concentrated mainly in the fields of climate change, education, and sustainable development, while the theme of nuclear energy is virtually absent from the central keyword clusters – a further quantitative demonstration of the research gap concerning Vietnam–IAEA nuclear cooperation.

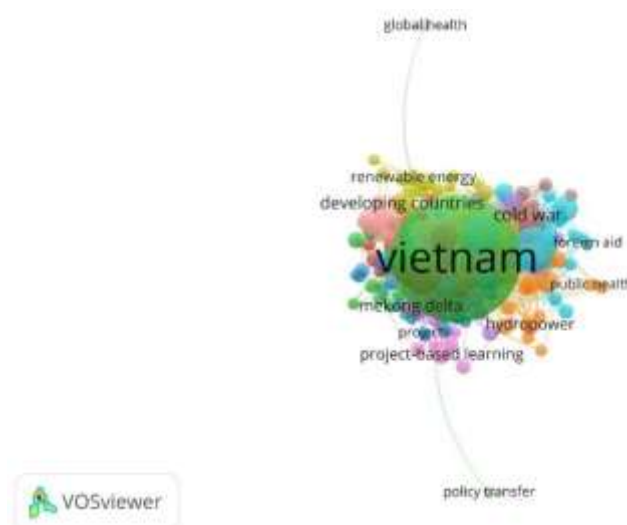


Figure 3. Network visualization of author keywords for Vietnam's international cooperation (VOSviewer)

Country-level citation analysis of the Vietnam-related corpus (42 countries selected) identifies seven clusters, centred on the United Kingdom, the Netherlands, China, Vietnam, Japan, Thailand, and India – reflecting Vietnam's traditional network of academic partners, concentrated mainly in Asia and among a small number of Western countries with long-standing development cooperation ties.

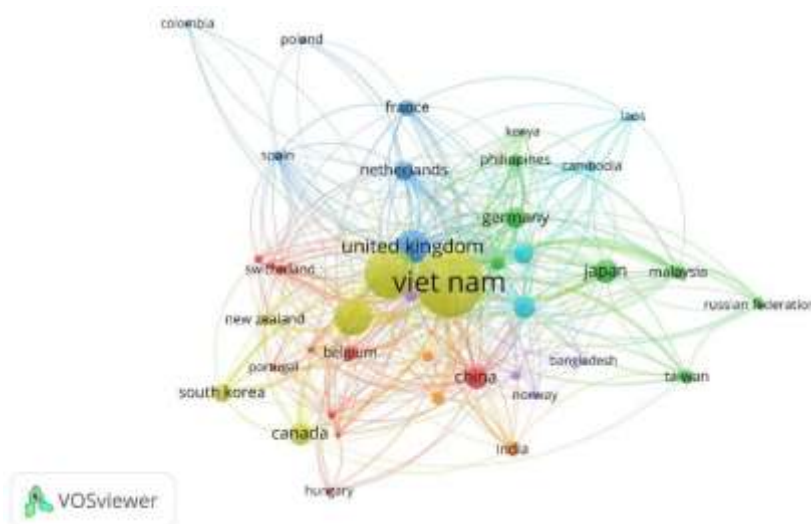


Figure 4. Country-level citation analysis for Vietnam's international cooperation (VOSviewer)

By contrast, keyword co-occurrence mapping of the IAEA-related corpus (16 keywords selected) identifies three clusters, centred on: IAEA, the International Atomic Energy Agency,

and sanctions. Closely linked secondary keywords include safeguards, nuclear security, nuclear weapons, non-proliferation, Iran, the European Atomic Energy Community, the peaceful use of nuclear energy, verification, compliance, and the additional protocol – indicating that international research on the IAEA is concentrated mainly on its safeguards, security, and non-proliferation functions rather than on its technical cooperation activities.

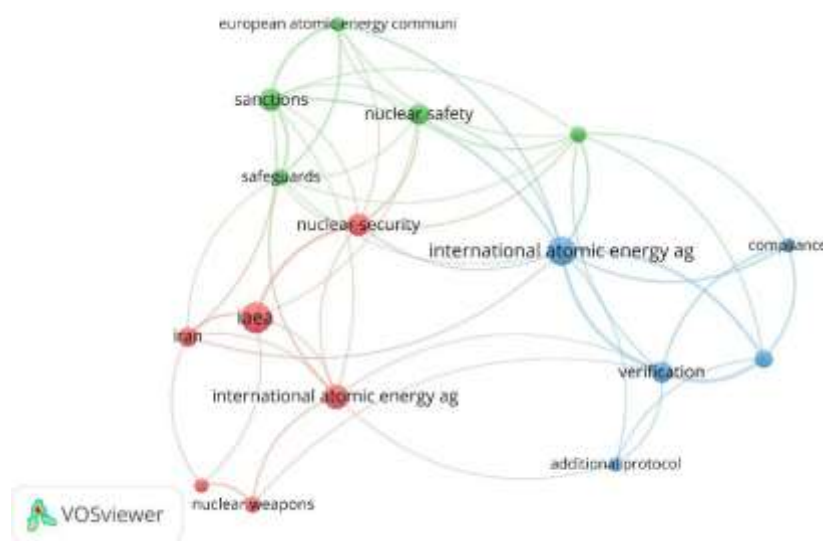


Figure 5. Network visualisation of author keywords for IAEA international cooperation (VOSviewer)

Country-level citation analysis of the IAEA-related corpus (17 countries selected) identifies five clusters, centred on Germany, China, Austria, Italy, and the United States – in which the presence of Austria (host of IAEA headquarters) is again confirmed. Other countries appearing within these clusters include the United Kingdom, Switzerland, Russia, Poland, Belgium, Canada, South Africa, Australia, Japan, India, and South Korea, reflecting the standing of these countries as active stakeholders in IAEA projects.

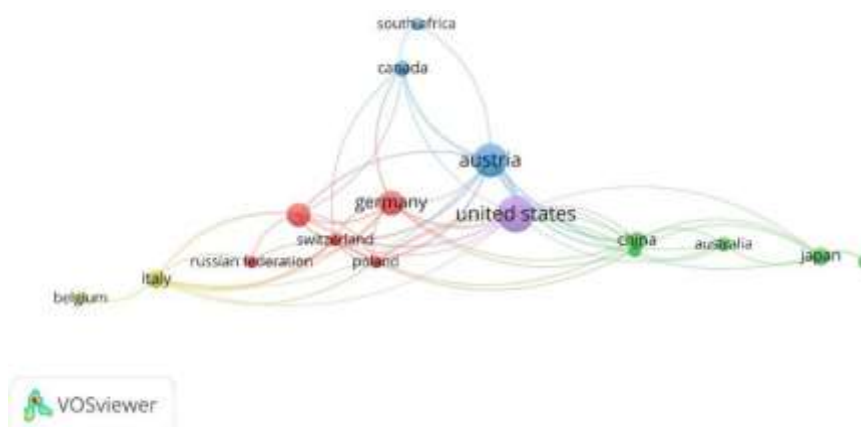


Figure 6. Country-level citation analysis for IAEA international cooperation (VOSviewer)

Given that only three documents intersect the “Vietnam” and “IAEA” subject terms, the basic information for this subset has already been presented in Table 1, and a separate VOSviewer visualization was not considered necessary.

3.2 Content Analysis of the Overlapping Literature

On the basis of the bibliometric results above, this study examines in depth the three specific documents from the intersecting set identified above, and additionally draws on the study of Iyengar et al. (2002) – a work excluded from the Scopus search results because of its early publication date (2002) and its classification under a specialized nutrition journal outside the Social Sciences subject filter, but included here for its high practical evidentiary value, located through direct manual search. The study by Phuc et al. (2026), affiliated with Vietnam National University Ho Chi Minh City and published in *Environmental Economics*, assesses the readiness of Vietnam's post-2025 nuclear liability framework (Law on Atomic Energy No. 94/2025/QH15, Decree No. 332/2025/ND-CP, Decision No. 768/QD-TTg) to allocate risk and compensate nuclear damage, benchmarked against the 1997 Vienna Convention and IAEA policy documents through comparative legal analysis. The study finds that Vietnam already aligns with five of seven international normative elements, including channeling liability to a single operator, the scope of seven compensable damage categories, limitation periods, and its financial security architecture. However, two gaps remain: a terrorism-related liability exemption broader than international norms, and Vietnam's continued non-accession to the Vienna Convention, its 1997 Protocol, the Joint Protocol, and the IAEA's Convention on Supplementary

Compensation (CSC) – leaving the country without binding cross-border procedural mechanisms under international treaty law. The authors conclude that Vietnam has a solid domestic legal foundation for internalizing most nuclear-incident costs, but that full economic and environmental compensation readiness still depends on accession to key IAEA-sponsored international conventions.

The study by Mabit et al. (2018), affiliated with the Soil and Water Management and Crop Nutrition (SWMCN) Subprogramme of the Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture (Vienna, Austria), published in *Land Degradation & Development*, is a technical agri-environmental review summarizing 20 years (1995–2018) of developing and applying radioisotope techniques to quantify soil erosion and degradation – one of the IAEA's important non-power applications of nuclear technology supported in member states. The authors synthesise results from four generations of IAEA-coordinated Coordinated Research Projects (CRPs), using fallout radionuclides (^{137}Cs , ^{210}Pb , ^7Be , $^{239+240}\text{Pu}$) and compound-specific stable isotope (CSSI) techniques to determine rates and sources of soil erosion and deposition, drawing on field data collected through the IAEA Technical Cooperation Programme in more than 70 member states – including case studies in Morocco, Madagascar, and Vietnam (Lam Dong Province). The results show that conservation farming practices evaluated using isotopic techniques can reduce soil erosion by 36% to 59%

depending on crop type, confirming that nuclear/isotopic techniques have moved from purely research tools to practical decision-support tools for soil conservation management in IAEA member states, including Vietnam.

The study by Iyengar et al. (2002), involving IAEA representatives (Vienna, Austria) together with Japan's National Institute of Radiological Sciences (NIRS) and the atomic energy agencies of eight other Asian countries – including the Dalat Nuclear Research Institute of Vietnam – published in the United Nations University's Food and Nutrition Bulletin, reports the results of the IAEA-coordinated Coordinated Research Project “Reference Asian Man Project – Phase II”, aimed at estimating daily intake and body burden of trace elements of significance for radiation safety and nutrition. The research team analyzed approximately 700 dietary samples from nine Asian countries – representing more than half of the world's population – using high-sensitivity nuclear techniques (neutron activation analysis, mass spectrometry, inductively coupled plasma spectrometry, and atomic absorption spectroscopy) to determine four major minerals and eight trace elements, with rigorous inter-laboratory quality assurance coordinated through a central reference laboratory in Japan. The results reveal substantial cross-country differences, with Vietnam recording the lowest dietary iron intake among the countries surveyed – a finding with public health policy implications, and evidence of Vietnam's early participation (since the mid-1990s) in the IAEA's Coordinated Research Project network, in a little-known non-power application area.

The study by Ho et al. (2020), conducted by a research team from the University of Science, Vietnam National University Ho Chi Minh City, and published in Scientific Reports (part of the Nature portfolio), is an environmental radioactivity study determining gross alpha and gross beta activity concentrations in groundwater samples from southern Vietnam. The authors analysed 108 untreated and 118 treated groundwater samples, comparing activity levels against Vietnam's national technical regulations as well as World Health Organization and IAEA standards, and estimating the annual effective dose from ingestion of groundwater attributable to key radionuclides (Po-210, Ra-226, Pb-210, Ra-228) using age-dependent dose conversion factors published by the International Commission on Radiological Protection (ICRP). The results show that most samples fell within permissible activity levels, although the annual effective dose attributable to Po-210 in some samples exceeded the WHO/IAEA recommended reference level of 0.1 mSv/year; water treatment was confirmed to be effective in substantially reducing alpha-emitter activity. Notably, the article directly cites the IAEA's Criteria for radionuclide activity concentrations for food and drinking water as a technical reference alongside national regulations – a practical illustration of the “hardening” of IAEA soft-law standards into environmental radiation research and management practice in Vietnam.

Taken together, these four studies provide valuable empirical evidence of the depth and multidisciplinary character of Vietnam–IAEA cooperation, spanning agricultural applications, nutrition and health, environmental radiation monitoring, and nuclear liability law, and demonstrate that Vietnam joined the IAEA's Coordinated Research Project network relatively early (from the mid-

1990s). However, a common feature of the three technical-application studies is that each is a scientific-technical report on the results of a specific cooperation project, none of which sets out to analyze or evaluate the cooperative relationship itself – as an independent subject of international relations research with its own actors, mechanisms, principles, and drivers, which is the approach this study pursues. The study by Phuc et al. (2026) alone reveals a notable “cooperation gap”: although Vietnam has domesticated most international norms on nuclear liability, it remains outside several key IAEA-sponsored conventions – a potential direction for further analysis, particularly in the context of the renewed Ninh Thuan nuclear power project. Overall, however, these studies engage with the IAEA only at the level of citing reference standards, without providing direct data or analysis of the state of the bilateral Vietnam–IAEA relationship.

4. DISCUSSION

Three findings emerge from this bibliometric review. First, the disparity in volume and growth rate between the Vietnam-related corpus (2,615 documents, growing at 8.67% per year) and the IAEA-related corpus (280 documents, growing at 4.37% per year) reflects the differing breadth of the two subjects rather than any substantive judgement about the importance of nuclear cooperation. Second, and more significantly, the almost complete separation between the two keyword networks – Vietnam's research clustering around climate, education, and sustainable development, and IAEA's research clustering around safeguards, sanctions, and non-proliferation – shows that, at the level of the international academic literature, nuclear cooperation has not yet become a salient feature of how Vietnam's international engagement is studied, nor has Vietnam become a salient case within IAEA-focused scholarship. Third, the fact that only three documents intersect both subjects, and that all three (together with one additional study located through supplementary search) are technical or legal-comparative reports on discrete cooperation projects rather than studies of the cooperative relationship itself, confirms that Vietnam–IAEA cooperation has not yet been treated as an independent object of international relations research. This is a significant gap given the scale, longevity, and strategic relevance of the relationship, particularly in the context of Vietnam's renewed nuclear power programme.

5. CONCLUSION AND RECOMMENDATIONS

Using bibliometric analysis under the PRISMA 2020 protocol, combining performance analysis (Biblioshiny) with science mapping (VOSviewer), this study has mapped two large but largely disconnected bodies of Scopus-indexed literature – one on IAEA international cooperation, the other on Vietnam's international cooperation – and has shown that only a handful of documents address both subjects together, none of which analyses the bilateral relationship as an independent research subject. These findings substantiate the existence of a clear research gap and provide a structural justification for future empirical research examining the mechanisms, achievements, and challenges of Vietnam–IAEA cooperation in radiation and nuclear safety, nuclear security, and nuclear safeguards.

This study has several limitations. The analysis relies on a single database (Scopus) restricted to the Social Sciences and Multidisciplinary subject areas, which may exclude relevant literature indexed under natural science or engineering categories, as illustrated by the manual addition of Iyengar et al. (2002). Future research should extend the search to additional databases and subject areas, and should build directly on the gap identified here through an in-depth empirical study of Vietnam–IAEA cooperation.

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