Environmental Management
https://doi.org/10.1007/s00267-024-02097-8

Insights into Ecological Resettlements and Conservation-led Displacement: A Systematic Review

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Received: 8 August 2024 / Accepted: 20 November 2024

Abstract

A systematic literature review (SLR) on ecological resettlements and conservation-led displacement (hereafter 'ER') is essential for guiding future research and conservation strategies, yet it has not been conducted. We performed a comprehensive two-stage review—a review of reviews and a review of empirical articles from Web of Science and Scopus—using the Preferred Reporting Items for Systematic Review and Meta-analysis Protocols (PRISMA-P). We extracted and analyzed data from 164 research articles, revealing three key themes in ER research: publication trends and geographical distribution, methodological approaches and data types, and thematic focus with associated governance and equity indicators. Notably, we found no systematically reviewed articles on ER, underscoring the pioneering nature of this study. Empirical publications began in 2001, despite ER practices dating back to the nineteenth century, covering 108 journals, and reflecting the discipline's diversity. The articles involved authors from 28 countries, addressing cases in 52 nations, predominantly led by academic institutions (>90%), and featuring diverse cross-institutional collaborations ($n = 332$). The research examined 96 unique Indigenous and local communities displaced from 12 ecosystem types (both terrestrial and marine) and conservation initiatives globally. A wide range of methodologies was employed, including interviews, field observations, focus groups, and ethnography, with over 80% using a combination of these methods. While 15 data collection tools were explored, the focus mainly targeted human-centric aspects such as livelihoods, cultural shifts, and access limitations (>90%), leaving other dimensions and institutional aspects of ER underexplored. Government-led ER initiatives ($n = 149$) were prevalent, but concerns regarding informed consent, participatory decision-making, human rights, and forced evictions were frequently reported (>90%), indicating global governance challenges in conservation. The thematic analysis highlighted social inequalities related to livelihoods, rights, and governance, including employment loss and compensation fairness. Eco-environmental challenges explored deforestation, habitat degradation, climate change, and biodiversity impacts, emphasizing the need to enhance ecological value while balancing development and conservation. The publication trend of ER-related articles aligns with international policy discourses on human rights, poverty alleviation, governance, and sustainable development post-2000, suggesting these issues must be considered in global policy discourses. We discuss critical findings and outline future research pathways and conservation strategies that strive for balanced coexistence between humans and nonhuman entities through an equity, justice, and sustainability lens in a pluralistic approach for the Anthropocene and beyond.

Keywords Co-existence · Conservation strategy · Ecological resettlement · Human rights · Political ecology

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Introduction

The intricate, intertwined relationship between humans and nature dates to antiquity. Over time, shifts in neoliberal conservation policies, the industrial revolution, globalization, political ecology, colonialism, exploitation, and evolving human-nature dynamics (Rantala et al. 2013; Rai et al. 2019; Fanari 2022; Pandey et al. 2024a) have intensified pressure on natural systems, increased inequality, and heightened the risk of extinction for nonhuman life on Earth (Myers et al. 2000; Estrada et al. 2017). As a result, formal global biodiversity conservation efforts began in the latter half of the 19th century with the establishment of Yellowstone National Park in 1872 in the United States aimed at safeguarding non-human entities in their natural habitat (Haines 1974; Agrawal and Redford 2009; Ripple et al. 2022). This conservation initiative involved the relocation, evacuation, and displacement of people from their original residences (Youdelis 2016; Eichler and Baumeister 2021; Pandey et al. 2024a). This foundational approach led to the global adoption of protecting biodiversity hotspots, which broadly refers to areas or regions with exceptionally high biodiversity at the ecosystem, species, and genetic levels (Marchese 2015) and harbor an exceptional concentrations of the endemic and vulnerable species of wild fauna and flora (Myers et al. 2000; Mittermeier et al. 2011), particularly when establishing protected areas (PAs) dedicated to conserving biodiversity (Maclean and Strade 2003; Kabra 2009; Murdock 2021) but ultimate sources of ecosystem services for human uses (Mittermeier et al. 2011). As a result, there are over 286,200 recorded PAs globally, spanning both terrestrial and marine ecosystems (UNEP-WCMC and IUCN 2023). Although many other alternative approaches have been adopted to integrate people with nature, such as community stewardship in conservation (Maraseni et al. 2014; Pandey and Pokhrel 2021) the approach of displacing people from nature persisted globally (Agrawal and Redford 2009; Mahapatra et al. 2015; Pandey et al. 2024a). Such displacements attracted the attention of scholars because of their multifaceted impact on society, ecology, and the environment. While scholarly attention has focused on conservation-led displacement and ecological resettlements, a systematic comprehension of such global research in this domain has yet to materialize. In line with the concept of risk-based relocation as defined by Yarina and Wescoat (2023), we use the term 'ER' to refer to both ecological resettlements and conservation-led displacements for clarity, simplicity, and consistency. In this paper, we consider the definition of ER as the physical displacement of human populations, residences, properties, or settlements from their original places of residence to other areas, primarily driven by the motive of biological conservation.

A comprehensive grasp of scholarly works on ER is pivotal not only in shaping conservation measures but also in fostering a conducive environment for the coexistence of humans and nonhuman entities (Braito et al. 2017; Fanari 2022). This harmonious coexistence within a safe environment is fundamental to achieving local-level livelihoods, ensuring ecosystem integrity, and aligning with the Sustainable Development Goals (SDGs) (UN 2015; Pascual et al. 2017). Further, such synthesis serves as a reference to guide the pathway toward fulfilling the targets set by the Convention on Biological Diversity (CBD 2022; Yinuo 2022) and contributes to the objectives outlined by the United Nations Framework Convention on Climate Change (UNFCCC) (IPCC 2023). The various dimensions—whether socio-economic, ecological, environmental, or their interconnections (US EPA 2015; IPBES 2019; CBD 2022; IPCC 2023)—are all associated and interlinked with ground-level ER. Therefore, a global endeavor focused on synthesizing ER-related scholarly works presents an invaluable opportunity to enable well-informed decision-making at local, regional, and global levels. This can facilitate the adoption of conservation strategies more harmoniously and respectfully for the welfare of both humans and nonhumans on our shared planet.

In the realm of reviewed literature, several syntheses on ER have been undertaken, spanning various themes and scales. Some reviews concentrate on specific facets, such as social equity in conservation research (Friedman et al. 2018), managed and planned retreats (O'Donnell 2022), or typological frameworks delineating the spectrum of relocation (Yarina and Wescoat 2023). There are also reviews exploring topics like protection and impoverishment (Geisler 2003), chronological syntheses on natural resource management and Indigenous communities (Mishra et al. 2021), thinking beyond colonial conservation model in partnership with the local and Indigenous communities (Moola and Roth 2019; Corbera et al. 2021), and the impact of biodiversity offsetting on social systems (Tupala et al. 2022). Further, certain review articles offer global perspectives on conservation and displacement (Brockington and Igoe 2006; Agrawal and Redford 2009) and the relationship between parks and people (West et al. 2006; Adams and Hutton 2007). These reviews are often either confined to regional or continental scales (Geisler and De Sousa 2001; Curran et al. 2009; Lele et al. 2010), individual countries (Lasgorceix and Kothari 2009; Shahabuddin and Bhamidipati 2014; Wilmsen and Wang 2015), specific landscapes (Rangarajan and Shahabuddin 2006; Harihar et al. 2014), or seascapes (Stratford 2009; Benjaminsen and Bryceson 2012). They often adopt the traditional approach, which makes it difficult to reflect the track and trend of scholarly works, identify the existing focus areas, and pinpoint research gaps for future studies. Moreover, some

recent reviews focus on diverse aspects using a systematic approach, such as comparing conservation governance (Friedman et al. 2018; Karki et al. 2021; Zhang et al. 2023), evaluating the impact of environmental curricula on conservation (Ardoin et al. 2020) prioritizing conservation-valued areas (Areendran et al., 2020), and examining the roles of citizen scientists in marine conservation (Kelly et al. 2020). However, these reviews remain somewhat distant from the specific focus of empirical research synthesis on ecological resettlement and conservation-led displacement.

From the lens of empirical studies, the research landscape regarding ER has been expanding globally, acknowledging its multifaceted implications. For instance, some scholars have delved into the socio-economic aspects of resettled communities (Maclean and Strade 2003; Mahapatra et al. 2015; Lam et al. 2016; Otsuki 2023), positive and negative consequences of the impact post displacement (Rantala et al. 2013), political ecology for fair conservation model (Fanari 2022) and beyond colonial conservation involving local and Indigenous people (Moola and Roth 2019; Corbera et al. 2021; Zaitchik 2018), while others have focused on the ecological dimensions of conservation (Peng et al. 2020), examining aspects like land cover changes in resettled and evacuated areas (Platt et al. 2016). Further, some studies have addressed the dual impacts of ER, elucidating both positive outcomes and negative repercussions on people and ecosystems (Rangarajan and Shahabuddin 2006; Xiong and Wang 2010; Moola and Roth 2019; Lo 2021; Zhang et al. 2023). A few scholars have reported on specific effects, such as alterations in the water regime (Jia et al. 2022), the erosion of ethnobotanical knowledge (Katin 2020), the impact on plants and soil (Zhang et al. 2020), and species conservation (Peng et al. 2020) concerning ER. However, this body of research is fragmented, concentrating on specific themes and individual sites instead of offering a comprehensive synthesis that encompasses the global landscape of integrated ecological, socio-cultural, and institutional dimensions (Plieninger et al. 2015). Further, key research questions remain unanswered, such as: What are the research trends? What are the thematic focuses of past research? What methodologies have past research followed? What are the future areas of research concerning ER? A holistic review and synthesis have yet to be carried out to fill these gaps.

In this context, we endeavor to gain a holistic understanding of the global research landscape concerning conservation-led displacement and ecological resettlements (ER). Specifically, the study aims to achieve three primary goals: first, to synthesize the global trends in empirical ER research; second, to summarize the methodological approaches employed in past studies; and third, to identify thematic focuses within selected articles, thereby highlighting potential gaps for future research and informed decision-making. To do so, we utilize a double-step method of the Preferred Reporting Items for Systematic Review and Meta-analysis Protocols (PRISMA-P), meticulously assessing all empirical and review articles up to 2023 that predominantly focus on ER, using the two largest science databases, viz., Web of Science and Scopus. We present the results according to the objectives and discuss the critical findings, delving into conclusions and suggestions for future research and conservation measures. This aims to facilitate the harmonious coexistence of people and nature through informed policy decisions and affirmative actions for the Anthropocene and beyond.

Methods

Literature Searching and Screening Strategy

Various methodologies have been developed worldwide to conduct systematic literature reviews (SLR) and meta-analyses. For instance, the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocol (PRISMA-P) (Shamseer et al. 2015; Moher et al. 2015; Page et al. 2021) and the SLR approach by the Collaboration for Environmental Evidence (Haddaway et al. 2020) outline steps from problem identification to communication. Similarly, the International Collaboration for Automation of Systematic Reviews (ICASR) (O'Connor et al. 2019) aims to avoid duplicating efforts and establishes guidelines for validating existing tools in SLR. Realizing the merits of the PRISMA framework to reduce biases in identifying research gaps (Reeves et al. 2005; Adams et al. 2018; Yarborough 2021), increase credibility (Humaidan and Polyzos 2012), adhere to ethical considerations in scholarly works (Weijer and Miller 2004) and enhance the reproducibility of scientific analysis (Pozsgai et al. 2021), we have adopted a two-step PRISMA framework for searching and screening articles from science databases. This double-step includes 1. review of reviews; and 2. the review of empirical articles. Moreover, an SLR offers advantages over conventional approaches by reducing bias (Haddaway et al. 2020) and ensuring the review's replicability and validity (Reeves et al. 2005; Adams et al. 2018; Yarborough 2021). The benefits of adopting a double-step strategy are to provide a more thorough understanding of the literature, ensures comprehensive identification of research gaps, and reduces selection bias or leftover bias (i.e., article selection bias when specifying a particular list of articles in the database that are wrongly categorized). For instance, in our case, many empirical articles were mistakenly listed in the review articles' category and vice versa. If we had not adopted the double-step systematic literature review, those incorrectly classified articles would have been missed in

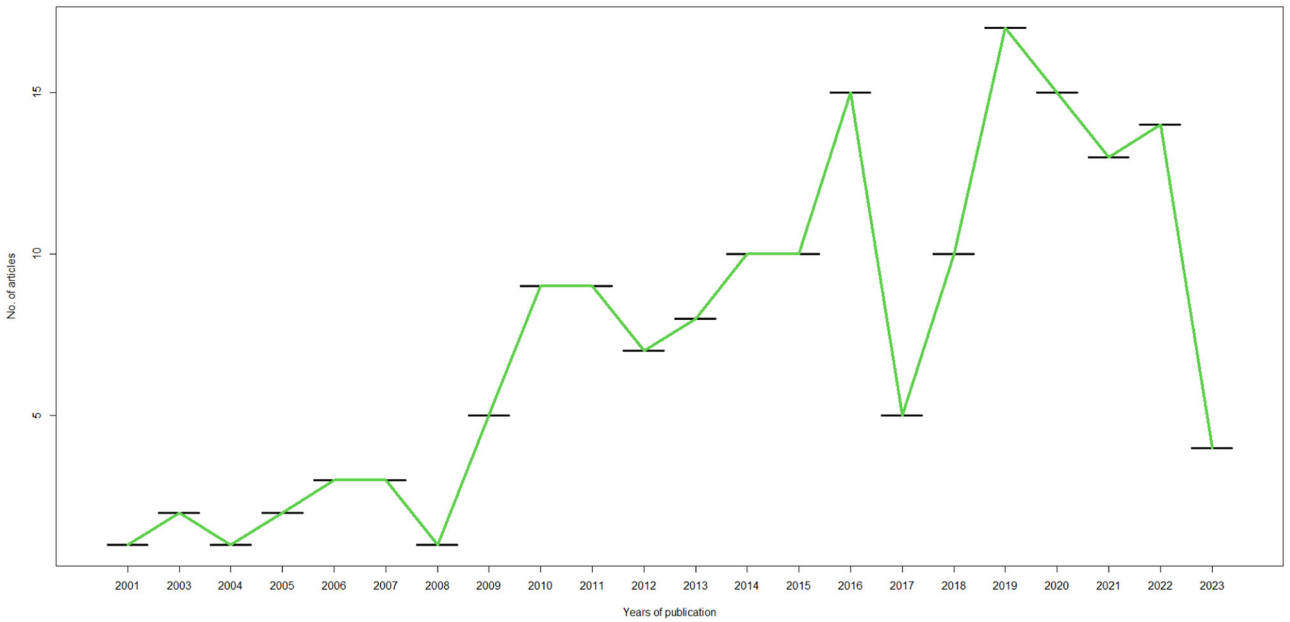

Fig. 1 The number and trend of peer-reviewed articles published on ER-related empirical studies across the globe ($n = 164$)

further analysis, potentially misleading the findings. This strategy enhances the overall reliability of the review process. For clarification of the step-by-step approach adopted in this study, please refer to the Supplementary file_S1.

During the two-step systematic literature search, we strictly adhered to the standardized PRISMA procedure for both phases. Firstly, we conducted brainstorming sessions to explore keywords, their synonyms, and suitable alternatives. Secondly, these identified terms were used iteratively to comprehensively map the relevant literature in the field. At this stage, we meticulously finalized the search keywords, ensuring coverage of synonymous words referenced in more than 20 existing pieces of literature on the subject, e.g., (Schmidt-Soltau and Brockington 2007; Benjaminsen and Bryceson 2012; Vehrs and Zickel 2023; Yarina and Wescoat 2023). The final keywords used for searching were, *"Conserv*" OR "Ecolog*" AND "Displac*" OR "Resettl*" OR "Relocat*" OR "Disposs*" OR "Realig*" OR "Retreat*" OR "Evict*"*, after validating among the authors ($n = 3$) and referring to the previous studies. These efforts would be considered with the sensitivity and specificity essential for a thorough and accurate systematic literature review (Haddaway et al. 2020) to ensure the reduction of bias, adherence to ethical considerations, and coverage of all articles in every journal irrespective of the subject matter. Thirdly, we utilized these search strings to explore the review articles and empirical research articles from two prominent scientific databases, Web of Science and Scopus, covering all publications up to April 12, 2023, when the articles were searched and downloaded for further screening and data extraction.

Subsequently, the identified review articles underwent screening at the title, abstract, and full-text levels to pinpoint the research gaps pertinent to our study (see *details in* Supplementary file_S2). Based on these identified research gaps, we delineated the objectives for this research and applied a similar process for sourcing research articles Within this set of empirical studies, PICO (Population, Interventions, Comparators, Outcomes) criteria were applied for metadata extraction (*see details in* Supplementary file_S3). The search keywords for research articles were deployed at the topic level, encompassing titles, abstracts, and keywords, ensuring a comprehensive scope that included high-quality literature on the subject. Additionally, specific searches were conducted within gray literature and thematic libraries, such as human rights libraries (e.g., human rights commissions, UN declarations), the World Wildlife Fund (WWF) database, webpage of International Union for Nature Conservation (IUCN) and the webpage of the Protected Areas Congress to comprehend and triangulate information on the topic. To maintain consistency, both types of accessed literature (review and empirical) underwent three stages of screening: title, abstract, and full text (Supplementary file_S3). Since the screening was done by a single person, we did not check for consistency or calculate a kappa score. However, this was later validated separately by two co-authors; therefore, the final version reflects a strong consensus.

Literature Screening and Shorting

Articles were evaluated based on specific inclusion criteria, focusing on primary research addressing ecological resettlement and conservation-led displacement of human settlements and their properties due to conservation efforts. This review exclusively examines conservation-related or ecological displacement, relocation, resettlement, or dislocation of humans by identifying specific geographical areas and communities reported to be physically displaced, rather than cases of access restriction or dispossession alone. Only peer-reviewed journal articles listed in selected science databases and written in English were included. Book chapters, hard copy articles, non-English articles, and those not listed in the selected databases were not considered. Articles that did not explicitly cover biodiversity or ecosystem conservation, theoretical studies, global reviews, or displacements related to climate change, development, restoration, rehabilitation, or wildlife relocation were excluded from metadata extraction and further analysis.

Using the keywords, the initial search yielded many articles at the topic level (15,734 empirical articles + 977 review articles = 16,711) from the selected databases. Since terms like "conservation" and "resettlement" are used across various disciplines, including biological, physical, and social sciences, the search results were broader than expected. These 16,711 articles underwent a three-stage screening process: title-level screening, followed by abstract-level screening, and finally, full-text screening before data extraction, as shown in Fig. 1. This meticulous process narrowed the selection to 271 articles specifically reporting empirical studies on ecological resettlement and conservation-led displacement (see *details in* Supplementary file_S2). After a rigorous full-text review, 164 articles met the predefined criteria (PICO and other inclusion standards) for metadata extraction. All subsequent analyses and conclusions are based on these 164 research articles. Notably, no systematic review articles on ecological resettlement and conservation-led displacement were identified in the global literature, confirming that this study represents the first systematic review (SLR) on the topic. The review of previous scholarly work also aimed to identify trends and thematic gaps for this study, but the absence of peer reviewed SLR articles on this subject affirmed the novelty of this review.

The two-step SLR offers distinct advantages over the conventional review and single-stage SLR approach. Firstly, it differentiates between research and review articles, addressing potential biases from misclassification. For example, this study included 64 empirical articles initially classified as reviews for further screening and sorting in the second phase (*see details in* Supplementary file_S3). Secondly, it allows for iterative keyword use from prior reviews and quantification of the background literature to ideate the research question base on the gaps on the review papers, enriching search terms and existing typologies. Thirdly, it validates the uniqueness of the review project within the extensive literature, providing a systematic and comprehensive approach. Lastly, a review of reviews helps identify research gaps and conceptualize research questions that enhance confidence in the review work.

Data Extraction and Analyses

Data extraction occurred in two distinct stages. Initially, metadata were extracted, and categorical coding was done for the variables of interest. This included information such as article location, study duration, publication date and journal, methodological approaches utilized, the ecosystem unit related to human settlement, research focus, and article conclusions. Subsequently, a critical appraisal was conducted using 'CADIMA' online platform (Cadima 2024), extracting the variables of interest, and placing this information into predefined categories within a standardized data frame. This allowed for a consistent extraction of variables and metadata from the selected articles. To ensure clarity, the terminology used in the articles was extracted verbatim and grouped under broader headings or treated as separate entities when their meanings or essences closely aligned or differed, respectively, for the proposed analysis. Both qualitative and quantitative tools were employed for data analysis. Qualitative data underwent configurative synthesis, while quantitative data underwent statistical tests when applicable. All analyses and Mann-Kendall tests were conducted using MS Excel and RStudio platforms (R Core Team 2023), and the results are presented accordingly. Metadata and further analyses are based on the 164 empirical articles.

Results

Status, Trend, and Geographic Distribution of ER Articles

A total of 164 peer-reviewed empirical articles related to ER were identified from 2001 to 2023 in two prominent science databases, Web of Science and Scopus. The publication frequency varied over the years, with the highest number occurring in 2019 and the lowest in 2001, 2004, and 2008. The articles demonstrated three distinct periods of publication: a sparse volume before 2008, a moderate increase between 2009 and 2016, and a notable rise beyond 2016. Statistical analysis revealed a significant ($p < 0.05$) increase in publication trends concerning ER articles from 2001 onwards [Mann–Kendall test, $z = 4.05$, $n = 22$, $p < 0.05$,

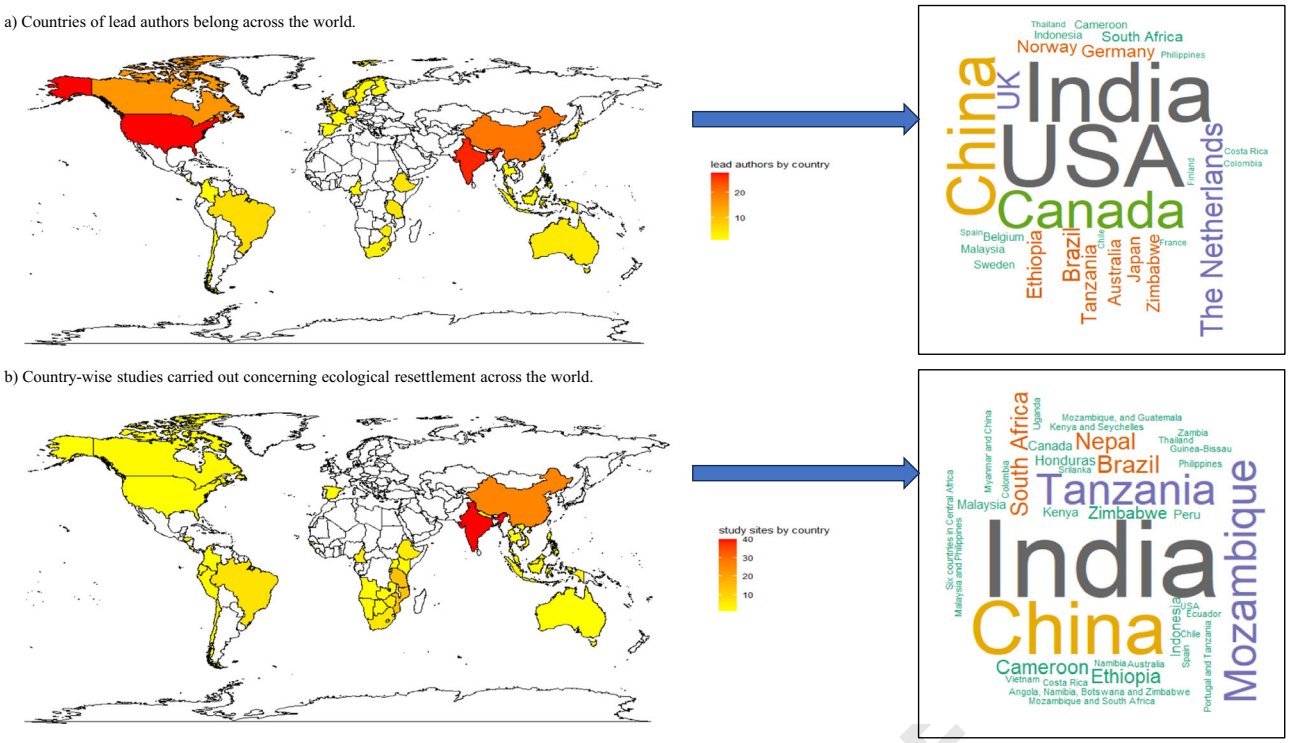

Fig. 2 The world map shows (**a**) the countries where lead authors are primarily affiliated, as mentioned in the articles, and (**b**) the countries where the study areas are located ($n = 164$). The size of the country names in the word clouds on the right side of the maps indicates the frequency of author affiliations or study sites

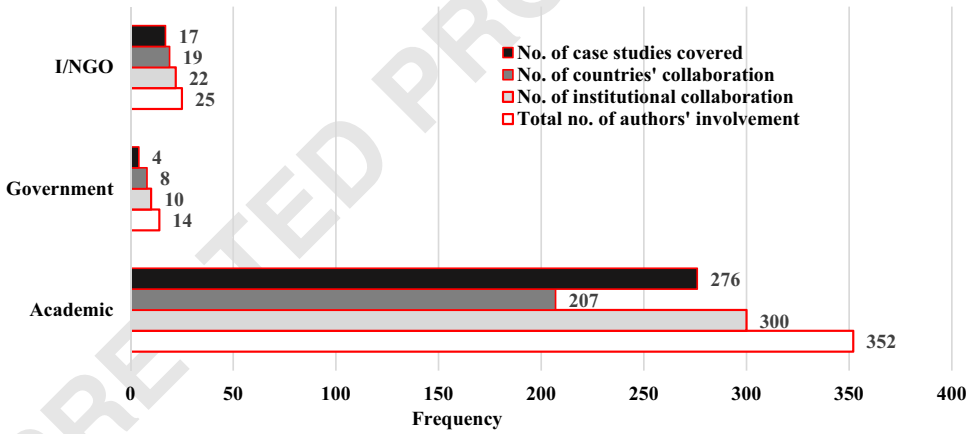

Fig. 3 The lead author's affiliation (y-axis), the total number of authors' involvement, and their institutional and country collaboration ($n = 164$)

confidence interval: 0.50–0.89, Sen's slope = 0.69, $R^2 = 0.58$] (Fig. 1).

These articles were published in 108 journals with a wide range of scopes and aims. About 6% of the articles were published in the journal with the highest number of articles, Conservation and Society. The second highest number of articles was published in Geoforum and Land Use Policy, each comprising six articles (3.6%). Ecology and Society, and the Journal of Sustainable Forestry each published four articles (2.4%). The majority, about 73% ($n = 79$) of the journals, featured only one article each (*see details in* Supplementary file_S2 and S3). The ER articles spanned 52 countries globally, with lead authors from 28 nations. Most study sites were concentrated in India, followed by China, Mozambique, and Tanzania, while researchers from the USA, India, China, Canada, and the UK predominantly led the research. Despite European authors' involvement in ER-related research, their study sites were notably scarce. Indian and Chinese authorship and study sites were prevalent, yet there was a lack of proportional African authorship in on-site research. Regions such as the American continents, Central Africa, the Middle East, Europe, and Australasia were underrepresented in ER research, with minimal reported studies (Fig. 2).

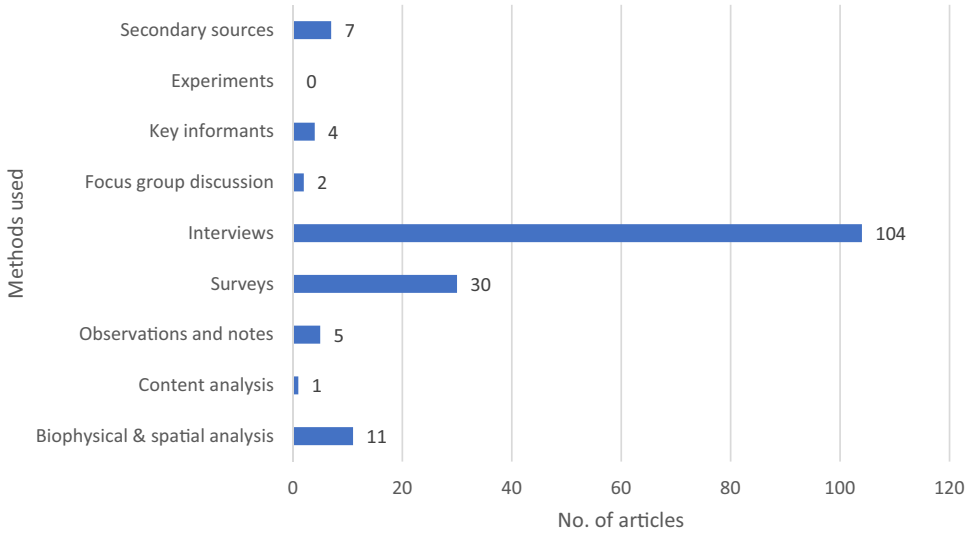

Fig. 4 The primary methods used by the past research on the ER domain

Academic authors were predominant, accounting for over 90% of the research, while a combination of non-governmental organizations (NGOs) and government authors collectively contributed to about 10% of the selected articles in this domain. Cross-country collaborations were less frequent when led by academic authors compared to those led by other institutional authors (NGOs and governments). A total of 297 case studies were reported worldwide, involving 391 scholars affiliated with 332 institutions in past ER research (Fig. 3).

Methodological Approaches and Theoretical Framework used in the Selected Articles

A mixed method of qualitative and quantitative approach was dominant in the past research. Scholars employed a diverse array of methods (Fig. 4) and tools for data collection (Table 1), and theoretical frameworks (Table 2). A wide range of methods were used, including interviews, field observation surveys, focus group discussions, narratives and discourse analysis, ethnography, life history, field notes, and biophysical and spatial data assessments. Over 75% of the articles ($n = 126$) employed a combination of two or more methods in their research.

The articles drew from a wide spectrum of data types and sources ($n = 15$). The primary data type utilized was socio-economic (58%), followed by socio-political aspects (19%). Among the research data types, 127 articles relied solely on primary sources, while 9 used exclusively secondary sources, and 28 employed a combination of both. Most articles focused on social aspects, encompassing economic and cultural dimensions, while data types such as biophysical, a blend of biophysical and social, chemical, ethnological, spatial, and spatial-ecological were less frequently utilized in past ER-related empirical articles (Table 1).

Table 1 Type of dataset used in the articles and their sources ($n = 164$)

Type of data/ information	Both primary and secondary sources	Primary sources	Secondary sources	Total
Biophysical	–	1	–	1
Biophysical and social	–	1	–	1
Chemical	–	1	–	1
Ethnobotanical	–	1	–	1
Political	–	-	2	2
Social	–	8	–	8
Socio-cultural	–	2	–	2
Socio-ecological	1	3	–	4
Socio-economic	11	81	3	95
Socio-economic and ecological	–	1	–	1
Socio-economic and spatial	–	1	–	1
Socio-political	14	15	2	31
Socio-spatial	1	8	1	10
Spatial	–	4	1	5
Spatial and ecological	1	–	–	1
Total	28	127	9	164

Approximately 28% of the articles employed specific theoretical frameworks in their research, but most of these frameworks were not consistent across the articles (Table 2). Only the Sustainable Livelihood Framework (SLF) and the Impoverishment Risks and Reconstruction (IRR) frameworks were relatively popular, each referenced by three articles (*refer to* Supplementary file_S3 *for a detailed list of the theoretical frameworks covered*).

Table 2 The number of theoretical frameworks used in the article concerning the topic ($n = 164$)

Theoretical framework used	Number of articles	Remarks
Sustainable Livelihood Framework (SLF)	3	A total of 46 articles used 41 theoretical frameworks.
Impoverishment risks and reconstruction (IRR) framework	3	
Comparative approach	2	
Identical or unique framework or concept used	38	
Framework not reported or used	118	Not used

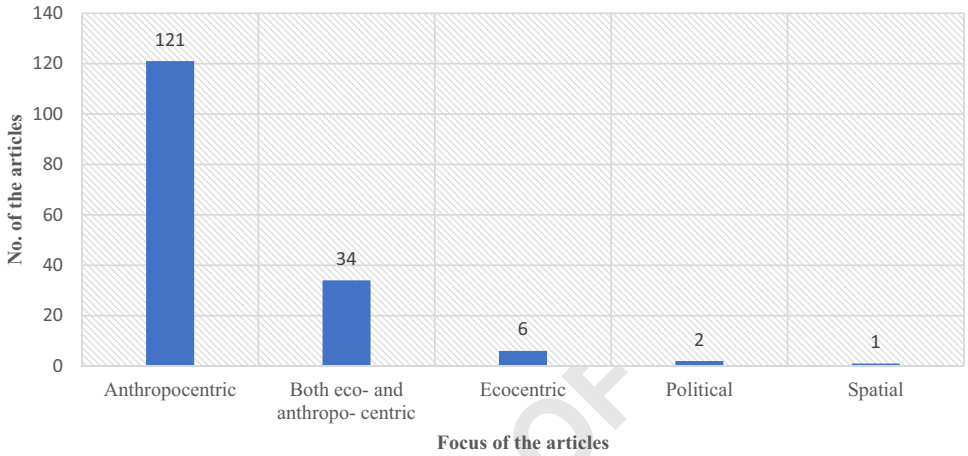

Fig. 5 The proportional tendency of articles focuses on the past research articles on the topic ($n = 164$)

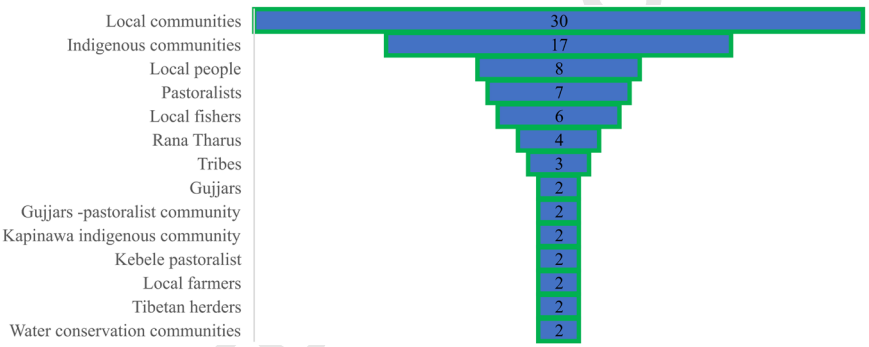

Fig. 6 Unique identity communities displaced from their residences, as reported two or more times, with a focus on the studies conducted on them. The x-axis represents the number of articles, while the y-axis displays the categories of communities referenced in the research. The community labels used here correspond to the names mentioned in the cited articles ($n = 164$)

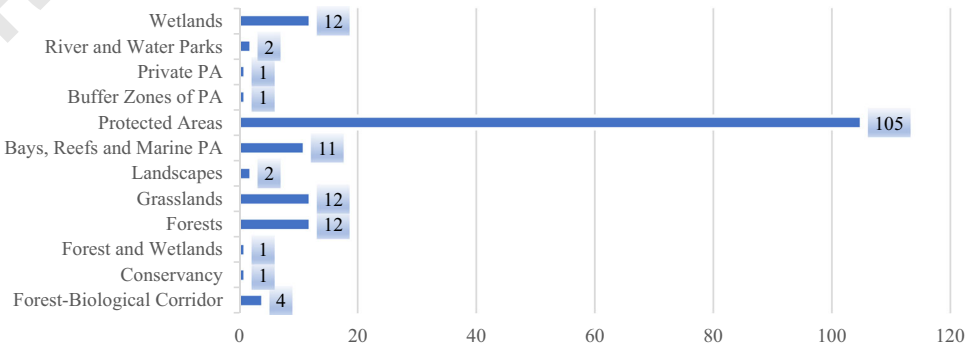

Fig. 7 Ecosystem types and conservation initiatives from which communities were reported to be displaced, as referenced in the selected articles. The x-axis represents the number of articles, while the y-axis labels the ecosystem types and conservation initiatives mentioned in the articles ($n = 164$)

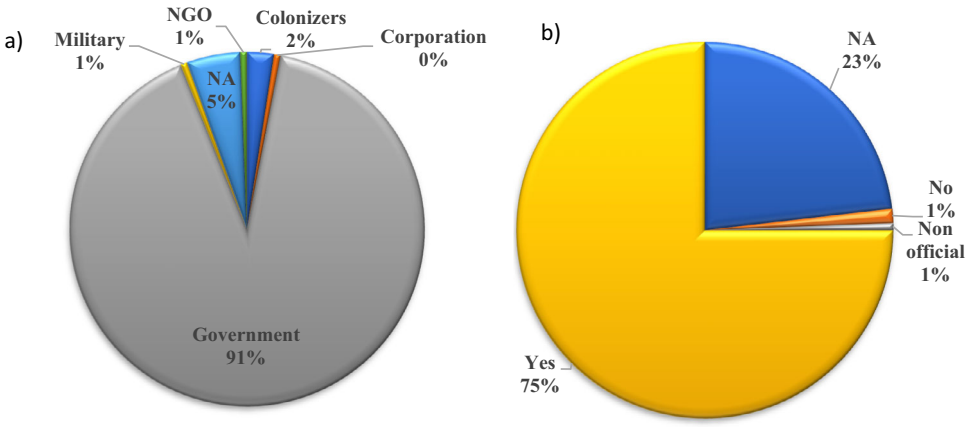

Fig. 8 The proportion of leadership by institutions during ER and the mode of decision-making are presented as follows: **a** Institutions, organizations, or parties leading ER decision-making as reported in the articles, and **b** whether formal decisions for ER were made ($n = 164$)

Research Focus Areas of ER Articles

Nearly three-quarters (74%) of the articles focus solely on the human aspects of ER, while around 20.7% attempt to strike a balance by considering the benefits for both ecological and human elements. A small proportion, comprising only 5.5% of the research, provides insights from ecological, political, and spatial viewpoints combined (Fig. 5).

The research encompassed a wide spectrum of communities, spanning 96 distinct Indigenous and local peoples impacted by ecological resettlement (ER), as observed in the 164 articles. Most articles focused on 'local communities' (18%) and 'Indigenous peoples' (10%). Other studies centered around specific ethnic and cultural groups (*see the detailed list of communities referenced in past ER studies in* Supplementary File_S3). Among these groups, fourteen were reported in two or more pieces of literature (Fig. 6).

The articles identified a total of nine ecosystem types and conservation initiatives, collectively comprising 12 categories, in the context of ER (Fig. 7) from which people were displaced. Over three-fifths of the articles (64%) referred to ER cases originating from protected areas, such as national parks, conservation areas, wildlife reserves or sanctuaries, and strict nature reserves. Additionally, various types of ecosystem conservation—including grasslands, forests, wetlands, coral reefs, and marine areas—also triggered the displacement of communities.

Key Governance Indicators and Concerns on Fairness in Social and Eco-environmental Aspects

Making decisions regarding the implementation of the ER strategy and taking active leadership in the field is pivotal. We found that most ER initiatives were decided and led by governments (91%), with less than 5% led by the military, NGOs, private sector, or colonial authorities at the local level. Additionally, 5% of the articles did not mention leadership or decision-making on the topic (i.e., NA). Notably, 75% of ERs were executed through formal decision-making processes, while 23% of the studies did not specify whether decisions on ERs were made (Fig. 8).

Table 3 The reported ER on obtaining free prior informed consent from the displaced Indigenous and local people ($n = 164$)

Informed consent obtains	Type of data collection			Row total
	Primary	Secondary	Both	
Yes	76	2	16	**94**
No	10	1	1	**12**
Not available	41	6	11	**58**
Column total	**127**	**9**	**28**	**164**

Similarly, the articles reported whether consent was obtained from evictees before or during the resettlement process. Over half of the articles (57%) indicated consent was taken from the displaced individuals; however, the type of consent (verbal, written, forceful, agreeable, or disagreeable) was not specified. Over 40% of the articles reported that free, prior informed consent was either not granted by the evictees or not mentioned, suggesting that ER was carried out through forceful actions without the consent of the local and Indigenous people (Table 3).

The thematic analysis of social, ecological, and environmental attributes of the concerns, issues, and challenges highlighted by the selected articles reveals a clear skew toward social aspects over eco-environmental research (*refer to the details in* Supplementary file_S3). Among the social focus, the highest proportion of articles (84%) addressed substantive concerns such as livelihood, food security, and the well-being of people affected by ER, followed by distributional issues (60%) and recognition concerns (50%). In contrast, very few articles covered eco-environmental issues related to ER, with miscellaneous eco-environmental aspects highlighted in only 12% of the articles. The thematic analysis of social and eco-environmental

dimensions uncovers a range of issues related to livelihoods, rights, and governance, such as employment loss, fairness in compensation, traditional rights, and access to resources, as well as the effects of climate change and biodiversity conservation. The eco-environmental perspective emphasizes challenges like deforestation, habitat degradation, and wildlife issues, focusing on enhancing ecological value and preserving ecosystems while striving to balance development and conservation efforts.

Discussion

Consolidating scholarly works into a single paper is crucial for communicating past trends and tracking the discipline. We employed a two-step systematic review approach for both review and empirical articles, yielding higher-quality outcomes. Notably, there have been no systematically reviewed articles in Web of Science and Scopus from 2001 to 2023 on ecological resettlements and conservation-led displacement (ER), underscoring the novelty of this paper. The trend in empirical research on ER has emerged post-2000 and continues to grow. Geographically, authorship and study sites are concentrated in specific regions, leaving vast areas unexplored. While most articles are led by academic authors, there is limited cross-institutional collaboration beyond academia. Various research methods, including observations, surveys, interviews, and focus group discussions, have been utilized, but there is a lack of integration of multiple data types within single articles, which would enhance replicability and comparability. Despite government-led ER initiatives dominating the landscape, findings reveal hegemonic practices and poor governance in global conservation policies. Over a hundred distinct local and Indigenous communities have been adversely affected while conserving more than ten ecosystem types. These practices threaten the livelihoods of vulnerable populations and undermine conservation efforts. Issues such as livelihood loss, food security, cultural erosion, lack of recognition, resource rights, and inadequate economic incentives have been consistently reported. These insights are essential for local and global policymakers, encouraging informed decisions to improve conservation governance and promote harmonious coexistence for the well-being of people and the planet.

Asymmetric Thematic and Geographic Coverage of ER Research

ER articles have shown a growing trend and covered a wide range of aspects. We note that ER-related publications began in 2001, although ER strategy is traced back to the 19th century. The publication trend aligns with an increasing emphasis on balancing social, ecological, environmental, and governance aspects for sustainable development (UN 2015; Pascual et al. 2017). Despite this, the total of 164 articles in the field is notably small compared to related areas like equity in conservation science (Friedman et al. 2018) or ecosystem service trade-off studies (Aryal et al. 2022; Pandey et al. 2024b). Initially, ER research primarily focused on anthropocentric aspects, but there has been growing interest in exploring ecological, political, and spatial dimensions in recent decades, indicating a diversification in research focus within the domain. Most articles adopt an anthropocentric perspective, with less than 5% focusing on ecological, political, or spatial aspects of ER, signaling a dominance of anthropocentric research (Moola and Roth 2019; Massarella et al. 2021). Multidimensional ER focus studies could foster a more balanced understanding of findings, leading to informed decisions for future conservation pathways that promote harmonious coexistence between people and nature (Rangarajan and Shahabuddin 2006; Plieninger et al. 2015).

We also found an asymmetric distribution of articles across geographic regions. West et al. (2006) suggest that the scarcity of studies from Europe is due to the different challenges posed by protected areas compared to Africa, where individual protected areas have a significant impact on rural populations (Rantala et al. 2013; Rai et al. 2019). However, despite the recognition of these issues in Europe (Plieninger et al. 2015) the social ties, ecological factors, and institutional arrangements remain inadequate to effectively translate policy into practice, as reflected in this review, which largely focuses on perspectives from the developing world (West et al. 2006; Aryal et al. 2022; Bhattarai et al. 2024). In contrast to a study focusing primarily on the USA (O'Donnell 2022), our findings emphasize the dominance of lead authors from the USA. Most of the research (Friedman et al. 2018; Aryal et al. 2022; Bhattarai et al. 2024) including ER-related articles are concentrated in developing Asian countries like India and China, suggesting that ER concerns are more prominent in the developing world than in developed countries like the USA and Canada (Moola and Roth 2019; Eichler and Baumeister 2021). Due to the limited involvement of authors from the developing world, challenges remain in ensuring fairness in research funding, access to local resources, and fully addressing the underlying issues on the subject (Karki et al. 2021; Aryal et al. 2022). As global partnerships and collaborations in research and knowledge sharing align with the Sustainable Development Goals (SDGs) envisioned by global communities (UN 2015), we recommend expanding collaborative authorship beyond academic circles and geographic boundaries for broader applications of research findings.

While cross-country research on the topic is increasing, the limited involvement of governmental and civil society scholars raises concerns about the integration of research findings into policy discourses (Plieninger et al. 2015). Although ER research is globally relevant and collaborative, involving diverse nations, a significant portion of cross-country studies lacks local authorship (Maclean and Strade 2003; Lam et al. 2016). This gap raises questions about the critical reflection and insights into the micro-level dimensions of ER, potentially overlooking the voices of the evictees and their deep cultural interconnectedness with nature, which has existed since time immemorial (Braito et al. 2017; Eichler and Baumeister 2021; Zaitchik 2018). External researchers often struggle to fully explore the root causes and consequences of this connection, which can introduce bias into the research design (Kelly et al. 2020). To address this challenge, employing a citizen scientist approach that involves multidisciplinary and transdisciplinary authorship and research techniques (Massarella et al. 2021; Fanari 2022), along with a holistic and integrative research design (Rangarajan and Shahabuddin 2006; Plieninger et al. 2015), may offer deeper insights into the local socio-political dynamics of conservation strategies, engage diverse background scholars, and providing pragmatic solutions for policy decisions.

Methods and Theoretical Framework Used in ER Research

A diverse array of methods was employed, predominant anthropocentric approach in previous research has been influenced by the mixture of both qualitative and quantitative methods. Various combinations of socio-cultural, socio-economic, socio-political, and spatial methods were commonly utilized, resembling research focused on participatory natural resource management (Chaudhary et al. 2018; Acharya et al. 2020). However, these methods lack clarity in capturing differential experiences and impacts within societies, such as variations based on sex, age groups, ethnicity, cultural differences, or access to resources and assets (Harihar et al. 2014; Liu et al. 2020; Kabra and Das 2022; Pandey et al. 2024a). Also, the multifaceted dimension of neoliberal economic impact, paradigm shift on the conservation dynamics, issues of equity and justice, and beyond human aspects are poorly reflected in past studies (Rantala et al. 2013; Mahapatra et al. 2015; Moola and Roth 2019; Lo 2021; Pandey et al. 2024a). These findings suggest a need for further exploration to disentangle and analyze social dimensions more nuancedly, indicating ample research opportunities in this regard (Kabra 2009; Chaudhary et al. 2018). Moreover, crucial aspects such as human rights, environmental justice, governance issues, informed consent, participatory decision-making, and other political ecological concerns related to ER have not been thoroughly addressed in the past, despite their significance in contemporary socio-political governance and human-nature dynamics (Braito et al. 2017; Friedman et al. 2018; Fanari 2022; Pandey et al. 2023). This indicates potential avenues for future research in these areas.

Besides the social dimensions, we found limited studies focused on the political, ecological, and ecosystem aspects concerning ER. Although ER often aims to benefit wildlife and preserve ecosystem integrity, previous studies have focused limited on assessing the changing status of ecological and ecosystem health indicators resulting from ER (Platt et al. 2016; Svarstad et al. 2018; Zhang et al. 2023). A mere fraction—less than 5% of the articles—have delved into biophysical, ethnobotanical, chemical, spatial, and combined social and biophysical aspects related to ER, further highlighting the need for future research in this area, particularly considering the site-based and tradition-based implications of displacement (Massarella et al. 2021; Zaitchik 2018). These studies also fall short in recognizing the contributions of local and Indigenous communities, who expropriate Indigenous lands due to wildlife and ecosystem preservation (Rantala et al. 2013; Pandey et al. 2024a). They fail to adequately capture both the positive and negative impacts on biodiversity in evacuated and resettled areas (Geisler 2003; Fanari 2019). Moreover, only a handful of articles have explored the political and spatial dimensions of ER (Rantala et al. 2013; Platt et al. 2016; Svarstad et al. 2018; Fanari 2022; Zhang et al. 2023), including conflicts arising at the interface between communities and protected areas, changes in water regimes or ecosystem functionality, and alterations in vegetation cover post-ER in relocated and evacuated sites. However, there remains a significant gap in understanding on-the-ground changes in ecosystem status, displacement effects, ecological indicators, vegetation loss, and recovery (Pandey et al. 2022), impact on climate change and ongoing carbon discourses (Maraseni et al. 2014; Pandey et al. 2024b, 2024c), pre-and post-resettlements for both evacuated and resettled sites compared to their surrounding environments (Platt et al. 2016; Pandey et al. 2024c, 2024d).

Furthermore, a variety of theoretical frameworks ($n = 41$) have been employed in previous studies on ER. However, there is a disparity that impedes comprehensive comparison and discussion of research findings, as a significant portion of studies forgo the use of any specific framework (Maclean and Strade 2003; Harihar et al. 2014; Lam et al. 2016). A limited number of authors have provided comprehensive insights into the knowledge, tools, and strategies needed for establishing thriving, sustainable, and resilient communities and ecosystems (Miller et al. 2012). Scholars have suggested certain frameworks over others, such as the Environmental Justice (EJ) framework,

which is acknowledged for its substantial coverage across social, ecological, and environmental spheres within social-ecological systems (Baxter 2000; Schlosberg 2013; Fitz-Henry 2022). They highlight the EJ framework's capacity to encompass various dimensions, addressing social equity, ecological concerns, and institutional and environmental aspects across different systems (Ostrom 2014; Plieninger et al. 2015; Yaka 2019; Fanari 2022). Although each framework has its merits and limitations, adopting a multi-faceted framework could facilitate a more equitable exploration of ER, providing balanced insights for informed decision-making from equity, justice, sustainability, and political ecological perspectives in the Anthropocene and beyond.

Communities Evacuated for Ecosystem Conservation

Communities play a central role in ER studies, experiencing both positive and negative outcomes from the resettlement process (Rantala et al. 2013; Corbera et al. 2021). Our research indicates that scholarly attention has been directed toward documenting over 95 distinct types of communities affected by ER. Although Rantala et al. (2013) reported that the previously better-off families gained while women and the poorest households lost from the resettlement in Tanzania, there is a likelihood of impacting those poorest across the globe even though they were not reported (Rangarajan and Shahabuddin 2006), indicating the likelihood of escalating the negative impacts on the world poorest and probably gain by the elites while implementing conservation strategy like ER (Fanari 2022; Pandey et al. 2024a). The reported communities in the articles constitute only a subset of the many communities that might exist on the ground, with many more yet to be documented (Maclean and Strade 2003; Mahapatra et al. 2015; Sengupta and Jha 2020) pointing that there are many more resource-dependent dwellers on the ground than reported in the articles. In the contemporary research landscape of ER, it is essential to address the diverse backgrounds of communities with limited resources, aligning with environmental objectives (NPC 2019; Basheer et al. 2022) and considering the prevailing injustices within the social system related to unequal treatment based on class, caste, ethnicity, gender, or geographical origin (Vallance et al. 2011; Chaudhary et al. 2018). Equally significant is the need to reconcile nature with people through conservation principles to achieve a sustainable balance between human and nonhuman spheres (Braito et al. 2017; Corbera et al. 2021). This often results in trade-offs between social welfare and the conservation of natural ecosystems (Aryal et al. 2022; Pandey et al. 2024b), particularly in terrestrial ecosystems globally (Kun et al. 2019; FAO 2022; Basheer et al. 2022). It is imperative to explore the impacts of ER on site-specific Indigenous and local communities, safeguarding their traditional cultural norms, practices, and skills that are intertwined with nature who are the real conservationists more than environmentalists (Moola and Roth 2019; Zaitchik 2018). Acknowledging the indigenous and traditional approach of nature conservation along with the local and indigenous peoples will drive a conservation strategy toward a win-win scenario; however, displacement should be regarded as a last resort after exploring all options that integrate people and nature (Kabra and Das 2022).

Ecosystem conservation is a primary justification for displacing and evacuating communities from their habitats. Across various studies, approximately 12 types of ecosystem conservation initiatives, both terrestrial and marine, have been identified as sources of displacement. Among these, most articles (64%) focus on evacuations from protected areas (PAs) (Rai et al. 2019; Fanari 2019; Ripple et al. 2022), indicating a potential rise in future resettlements if more PAs are declared or expanded. The expansion of PAs seems inevitable, given the ongoing loss of diverse and pristine ecosystems worldwide (FAO, 2022; Kun et al. 2019). In response, the goal has been set to protect at least 30% of the world's land, inland waters, coastal areas, and oceans—up from the current 17% of terrestrial and 10% of marine areas—by 2030 (CBD 2022). However, the realization of these goals will likely result in further displacement, disproportionately affecting the poorest populations (Pandey et al. 2024a). Achieving this goal requires a careful balance between socioeconomic, ecological, environmental and institutional concerns while aligning with the Sustainable Development Goals (SDGs), United Nations Conventions (e.g., the UN Convention on Combat Desertification, the UN Convention on Biological Diversity, the UN Framework Convention on Climate Change), and other international and national objectives aimed at fostering a fair society and sustainable ecosystems in today's ever-changing world (Plieninger et al. 2015; Aryal et al. 2022; IPCC 2023; Pandey et al. 2023). This calls for thoughtful conservation strategies at both global and (sub)national levels to harmonize social, economic, and environmental goals, treating nature and people as interconnected rather than separate entities and for mutual benefits.

Historically, the strategic site selection for ER has focused on buffer zones and biological corridors to displace settlements. These zones serve a dual purpose, functioning as both production areas and vital biodiversity corridors that maintain ecological integrity while supporting social activities (Curran et al. 2009). They can provide numerous valuable examples within a single landscape (Harihar et al. 2014; Katin 2020; Thapa and Tuladhar 2021). Therefore, future research should encompass landscapes or seascapes at broader levels, incorporating biological corridors, buffer zones, and areas both inside and outside protected systems.

This comprehensive approach can reflect holistic and integrated responses from social-ecological systems (Harihar et al. 2014; Ostrom 2014; Pandey et al. 2024c), aiding informed conservation decision-making. By balancing research initiatives and reporting, unbiased evidence from the ground will help 21st-century decision-makers address humanitarian and environmental challenges concurrently on our shared planet (Rangarajan and Shahabuddin 2006; Plieninger et al. 2015; Braito et al. 2017; Fanari 2022).

Accountable Governance in ER

Policy decisions concerning natural resources and the welfare of people are typically made by the government on behalf of citizens, prioritizing fairness, the well-being of their constituents, and the sustainability of natural ecosystems (Braito et al. 2017; Massarella et al. 2021). These decisions are expected to be accountable to citizens through the established governance systems of a country (Baxter 2000; Cadman and Maraseni 2012; Murdock 2021; Lo 2021). However, we found that a significant proportion of the articles (>40%) noted the absence of free, prior, informed consent in ER processes involving local and Indigenous communities. Even in cases where consent was reported to have been obtained from local and Indigenous people, there were instances where military forces were involved, non-formal decisions were made, and uncertainty surrounded the nature of the consent received (whether verbal, written, forced, agreeable, or disagreeable) (Schmidt-Soltau and Brockington 2007; Kabra 2009; Spierenburg 2013). This indicates that issues of accountability in conservation persist on the ground, especially in ER strategy. The lack of accountability and informed consent in conservation strategies like ER has a cascading effect on human rights, information rights, the right to free, prior, informed consent, and participation, violating the principles of good governance (Spierenburg 2013; Lam et al. 2016; Katin 2020; Sengupta and Jha 2020). Such ER strategy ultimately undermines conservation outcomes and disrupts the harmonious coexistence of humans and nature (Agrawal and Redford 2009; Mutanga et al. 2015; Moola and Roth 2019; Zaitchik). To address these shortcomings in ER strategy, governments should be accountable to their citizens, ensuring that decisions regarding people and natural resources adhere to the principles of good governance, particularly in conservation planning.

Access to natural resources is vital for the livelihoods of local and Indigenous communities residing in and around them. While many articles have highlighted the denial of access to natural resources among displaced communities (Mahapatra et al. 2015; Lam et al. 2016; Sengupta and Jha 2020), there is limited reporting on whether these displaced individuals face restricted access to the specific protected areas from which they were evacuated or in the new resettlement sites (Maclean and Strade 2003; Mahapatra et al. 2015; Otsuki 2023). Understanding the impact of ER on access to ecosystem services in both resettled and evacuated areas is crucial (Rai et al. 2019). This understanding not only helps protect the resource rights of Indigenous and local communities but also minimizes the effects of displacement and supports the enhancement of natural systems across social-ecological landscapes and seascapes (Kabra and Das 2022; Pandey et al. 2024a). Adhering to the principle of "conservation with sustainable use" is an essential step in implementing conservation strategies effectively in today's world, ensuring the sustainability, equity, and justice of socio-ecological landscapes and seascapes.

Lessons Learned and Limitations

This study enhances our understanding of ecological resettlement (ER) in both practical application and theoretical contexts. The theoretical implications are extensive, encompassing social-ecological systems related to ER (Ostrom 2014), political ecology, and environmental governance concerning dispossession and political decision-making (Svarstad et al. 2018; Fanari 2022), and the importance of a plural approach in addressing socio-ecological sustainability, equity, and justice concerns (Rantala et al. 2013; Fanari 2022). The findings also contribute to biodiversity conservation and sustainable development (IPBES 2019; CBD 2022), while providing insights into social justice, equity, and the rights of marginalized communities (Miller et al. 2012; Schlosberg 2013; Mohai and Saha 2015; Rai et al. 2019). Additionally, this review broadens perspectives on ecological justice (Baxter 2000; Schlosberg 2013) and ethical considerations for both human and nonhuman beings, as well as planetary justice (Baxter 2000; Martin et al. 2013; Kashwan et al. 2020; Fitz-Henry 2022). ER has multifaceted and interconnected implications for socio-cultural, ecological, political, neoliberal, equity, justice, and environmental issues across spatiotemporal and relational scales (Rangarajan and Shahabuddin 2006; Schmidt-Soltau and Brockington 2007; Rantala et al. 2013; Braito et al. 2017; Massarella et al. 2021; Fanari 2022). Therefore, resolving issues and concerns related to ER should be approached from a pluralistic perspective (Plieninger et al. 2015; Fanari 2022).

The findings also provide valuable insights for policy formulation and implementation, especially at the intersection of social, ecological, and environmental factors. This holistic understanding can serve as a consolidated reference for achieving diverse objectives, ranging from local livelihood support and poverty reduction to meeting the SDGs (UN 2015), the targets of CBD (CBD 2022), and addressing

climate change issues under the United Nations Framework Convention on Climate Change (UNFCCC) (IPCC 2023). Systematic review studies like this provide comprehensive information for national and international stakeholders working in the conservation field (Agrawal and Redford 2009). In practice, the likelihood of future ecological resettlement (ER) operations is nearly certain due to the diminishing contiguous and pristine ecosystems worldwide (Kun et al. 2019; FAO 2022) and the ambitious global target of achieving at least 30% ecosystem protection (CBD 2022). Drawing lessons from past ER practices and revisiting conservation policies is crucial. Additionally, it is essential for governments and relevant authorities, from local to global conservation forums like the CBD, to not only achieve Sustainable Development Goals (SDGs) and figurative targets but also to align human and nonhuman interests, ethical considerations, and the welfare of all living beings and ecosystems across socio-ecological landscapes (Harihar et al. 2014; Pandey et al. 2023) for planetary justice in the contemporary dynamic world.

However, as one of the first studies to adopt a systematic literature review (SLR) in conservation-led displacement and ecological resettlement (ER), this study could not encompass all aspects of the PRISMA framework. ER has multispectral implications across societal, cultural, ecological, environmental, spatial, temporal, and relational dimensions, necessitating various thematic theoretical frameworks alongside the systematic review framework. These areas present opportunities for future research. Further, it is important to note that this paper does not cover all ER strategies and knowledge observations reported in the 164 published empirical articles from the two scientific databases analyzed. This review aimed to consolidate trends in ER scholarly works in these databases, focusing on English-language articles. However, there may be gray literature, book chapters, hardcopy literature, and non-English articles that explore other perspectives on ER and were not included. As such, the findings and implications should be considered cautiously. Additionally, the study did not address relocation strategies for wildlife or the displacement and resettlement of people due to other reasons, such as warfare, climate change, restoration, or other environmental or anthropogenic causes, which remain beyond the scope of our research and leave room for future exploration. Nevertheless, this study serves as a pioneering compilation of scientific articles on global ecological resettlements and conservation-led displacement, identifying future research gaps and aiming to enhance informed decision-making processes in this discipline.

Conclusion

This study conducts a global survey of peer-reviewed articles using a double-step systematic approach to explore ecological resettlements and conservation-led displacement (ER) from the Web of Science and Scopus databases, resulting in a selection of 164 empirical ER articles encompassing 297 case studies. The analysis reveals a growing interest in ER, as indicated by the increasing publication of research articles over time. However, the limited synthesis efforts and absence of systematic reviews in previous studies underscore the space for future research on the ER domain. The diversity in cross-country authorship and study areas reflects positive collaboration in scholarly work regarding the global implications of the findings. Still, the lack of local authorship hinders the understanding of micro-level socio-political dynamics, which may diminish the significance of the research issues. Local authorship is essential for a thorough investigation of critical issues related to ER. While various methods, including interviews, field observations, focus group discussions, and ethnography, were employed to cover social aspects, the ecological, environmental, and institutional dimensions—such as political ecology, neoliberal economic impacts, and post-Anthropocene issues—remain underexplored, indicating opportunities for future research in these areas.

ER has direct policy implications, necessitating governments' involvement since the policy is primarily driven by government actions. Their participation is essential for integrating research findings into the policy process. While past studies have focused on socio-economic datasets, incorporating socio-economic and eco-environmental perspectives is crucial for understanding the dual impacts of ER and facilitating informed decision-making. This can be achieved by adopting a comprehensive research framework that includes nonhuman entities as well. Moreover, natural ecosystem conservation leading to ER often jeopardizes socio-cultural identities and livelihoods, sometimes through forced evictions without prior informed consent, facilitated by government power. Such coercive actions against vulnerable and Indigenous communities must cease. Future ER initiatives should promote democratic governance and participatory decision-making at the grassroots level, not just in policy documents. The thematic analysis of social and eco-environmental dimensions reveals various issues persist related to livelihoods, rights, and governance, including employment loss, compensation fairness, and access to resources, alongside the impacts of climate change and biodiversity conservation in relation to the 'displacement effect'. Eco-environmental challenges include deforestation, habitat degradation, and wildlife concerns, emphasizing the

need to enhance ecological value while balancing development and conservation needs.

Learning from past missteps is critical for reshaping future ER endeavors to align with sustainable development principles and improve governance, ensuring the coexistence of human and nonhuman entities on our shared planet. Our study serves as a reference for pursuing plausible future pathways. Based on the analysis, several crucial insights emerge for future research and policy directions regarding ER. First, comprehensive studies covering the multifaceted impacts of ER are lacking; thus, exploring all dimensions of ER—including political, social, economic, cultural, ecological (wildlife), environmental, and spatial spheres—would provide balanced insights for informed decision-making. Second, despite some cross-country collaboration, the involvement of transdisciplinary, institution-affiliated scholars is notably limited, diminishing the likelihood of mainstreaming research findings into policy and actions. This highlights the need to enhance collaborative research efforts. Third, host country leadership can offer valuable insights into the socio-political dynamics at the ground level, considering factors such as language, culture, and micro-political experiences that have been under-explored in past studies on ER. Finally, employing various theoretical frameworks in research facilitates comparative discussions and allows for empirical observations leading to logical conclusions. This review serves as a reference for revisiting existing conservation policies, particularly ER-related strategies, and highlights research gaps in major areas of ER dimensions to advance the discipline. The central goal of this review is to inform decision-makers, practitioners, academicians, and researchers worldwide, encouraging them to engage with grounded information to make rational decisions that consider socio-economic, ecological, environmental, and institutional aspects. By adopting a pluralistic approach across political ecology, equity, justice, and sustainability perspectives, we aim to maintain harmonious coexistence between people and nature through informing conservation planning. This approach seeks the sustainability of ecosystems and socio-ecological landscapes, adhering to a no-harm principle as a win-win solution for human and ecosystem wellbeing.

Data availability

No datasets were generated or analysed during the current study.

Supplementary information The online version contains supplementary material available at https://doi.org/10.1007/s00267-024-02097-8.

Acknowledgements The first author extends sincere thanks to the Australian Government and the University of Southern Queensland for providing the Research Training Program Stipend Scholarship and International Fees Research Scholarship that enabled this study. Further, the first author wishes to acknowledge the Government of Nepal for granting study leave for this research.

Author Contributions Author contribution statement Mr. Hari Prasad Pandey: Conceptualization, Visualization, Data Curation, Formal Analysis; Methodology; Validation; Writing-original draft preparation, Review, and Editing. Prof. Tek Narayan Maraseni: Writing-Review and Editing, Supervision.Prof. Armando A. Apan: Writing-Review and Editing, Supervision. All authors read, agreed, and consented to publication.

Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

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