

Health and Climate Change in South America

Climate change and public health in South America: a scoping review of governance and public engagement research

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Summary

This scoping review examines peer-reviewed literature of governance and public engagement at the intersection of public health and climate change in South America. The review shows significant gaps in academic publications, particularly because health was mostly a secondary theme examined in the studies. The few studies about governmental interventions (e.g., policies and programs) suggest that these have not been effective. Regarding public engagement, no studies examined social media engagement with health and climate change, and only one examined news coverage. Finally, most articles focused primarily on individual countries, with few comparative or regional analyses of South America. Strategic action addressing climate change and its effects on public health needs to be based on empirical evidence.

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Introduction

Climate change is negatively affecting human health in a variety of ways, both directly and indirectly, and regions such as South America could shoulder a disproportionately higher burden of morbidity and mortality than the Global North.¹ This can be attributed to government instability, dependence on wealthier nations, and high poverty rates, which lead to a smaller margin of action or other priorities (e.g., economic development) to prevent and prepare for climate change impacts.² This scoping review is part of the *Lancet* Countdown's effort to develop regional reports that can more accurately describe the health and climate relationship in different parts of the world. For the purpose of this review, the analytical framework of Section 5 of the 2022 *Lancet* Countdown report was used.³ Briefly, this section describes indicators of government engagement, news coverage, corporate engagement, and scientific output related to the health dimensions of climate change in South American countries. The results of the report suggest an increasing but still modest engagement across all areas.

The ways governments and societies respond to this crisis in years to come will impact the likelihood of limiting a temperature increase of 1.5 °C by 2050, which

would avert severe climate disruptions. An increase of 2 °C —just half a degree higher than the goal— would result in much more severe impacts according to the IPCC.⁴ A scenario where temperatures increased by 3 °C, although unlikely, is predicted to be disastrous and have effects all around the world. For instance, climate change is anticipated to increase mortality related to infections and non-optimal temperatures. Moreover, an increase in temperature can reduce work capacity and, hence, impact labor productivity.⁵

Governmental and societal responses to address current and future impacts on human health from climate change require empirical evidence. To our knowledge, there has been a scarce scholarly effort to review such evidence in academic literature, one that examines research about some of the key stakeholders operating within the public sphere of influence in South America. To achieve said goal, this scoping review tracks academic literature examining four main stakeholders that influence societal and political responses to issues at the intersection of climate change and public health: media, government, corporate sector, and civil society.³

We anticipated finding a small number of academic publications for this scoping review based on the specificity of the research area, as well as the evidence of previous scoping reviews in related areas — for example, Perevovtchikova et al.⁶ and Gibbes et al.⁷

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examined 57 articles each in systematic reviews of ecosystem services and sustainability in Latin America respectively. Moreover, Ammann et al.⁸ reported no articles in Latin America in a scoping review of health impact assessment and climate change around the world. Nevertheless, this review and its findings could present a roadmap for research and guide future investigations related to this topic.

We designed this search to identify the strengths, weaknesses, and gaps in this area of research in South America to contribute to an accurate and pertinent first South American regional report.⁹ Ultimately, this will also be used in future iterations of the regional report. The main goal of this scoping review is to provide a first assessment of the existing scholarly research about the intersection of public health and climate change from the perspective of public engagement and governance in South America. The review provides a broad view of current efforts, but more importantly, it identifies the main gaps that ought to be addressed and prioritised.

Methods

The steps included for our review followed the checklist outlined in the PRISMA Extension for Scoping Reviews (PRISMA-ScR) by Tricco et al.¹⁰ and complemented by the scoping review methodological framework proposed by Arksey and O'Malley.¹¹ The draft protocol was revised upon receiving feedback from the research team and a panel of experts from different areas organised by the Lancet Countdown South America. The final version of the protocol is available in Spanish upon request. For this study, we considered South America as the geographical region that stretches from Colombia to the south of Chile and Argentina. French Guiana is not included in this review, as it is an overseas department of France. The authors followed the definition used in the Lancet Countdown 2022 South America report.⁹

Search strategy and selection criteria

We searched the following electronic databases for academic articles: Scielo, Redalyc, Pubmed, ProQuest, JSTOR, and EBSCO. These databases are considered reliable and comprehensive sources of academic literature across disciplines.^{12,13} Further confirmatory searches in other databases, such as Web of Science, did not yield additional studies (*not shown*). We limited our search to results in English, Spanish, and Portuguese. Scielo and Redalyc were used primarily for articles in Spanish and Portuguese. The search did not include a temporal delimitation to try to capture all existing research in the domain of interest. The end date was December 31, 2021.

Comprehensive literature searches were conducted to include six domains related to public and political engagement: news media, social media, political activism, environmental behaviours, government, and the corporate sector. Six separate searches were conducted using all

the keywords for “location,” “climate change,” and “health,” combined with all the search terms under each of the subcategories (e.g., media, government, corporate sector). For example, the first search included all keywords under “location,” “climate change,” “health,” and “media.” A complete list of the final keywords, connectors, and categories used is provided in [Table 1](#).

The final lists of keywords were decided based on the authors' expertise and in coordination with experts in this area of research that provided feedback to preliminary versions of the lists. In addition, an iterative process was conducted to refine the search terms, with multiple searches conducted to determine which keywords provided the higher precision. Keywords were translated into Spanish and Portuguese to search for articles in those languages.

We included all empirical and theoretical papers published in peer-reviewed publications that included the search terms combined as described above as a central part of the study or as a variable of their research.

We excluded the following materials: 1) grey literature; 2) editorials; 3) meta-analysis, systematic reviews, literature reviews, or scoping reviews (the ones that were found did not fit with the criteria described below); 4) letters to the editor; 5) corrections; and 6) acknowledgements to reviewers.

Study selection process

All the results were imported into the online systematic review software Rayyan. To ensure reliability between reviewers, a training exercise was conducted before the screening process started. Furthermore, the reviewers could see all the articles and the reason for their exclusion or inclusion and decide on ambiguous articles collectively.

During level 1 screening, two authors checked titles and abstracts independently. At this stage, we excluded articles that were not specific to the region, non-academic articles, and articles in which, although the keywords were included, were not a central part of the research. During level 2 screening, all authors examined the full text. A multi-step process was applied for the analysis of inclusion ([Fig. 1](#)).

Data management and characterization/charting

We tabulated data extracted from the selected articles, including authors, year of publication, title, research objectives, category, and summary of the findings.

Analysis, summarising, and reporting results

The results section presents a description of the main topics of analysis in the studies, the country or countries under examination, and the characteristics of the authors, particularly their institutional affiliation.

The analysis and synthesis of literature included quantitative analysis (i.e., descriptive statistics) and qualitative analysis (i.e., content analysis). For the

Location	Argentina OR Colombia OR Ecuador OR Venezuela Or Brazil OR Perú OR Guyana OR Uruguay OR Paraguay OR Suriname OR Bolivia OR Chile.
Climate change	"climate crisis" OR "climate change" OR "global warming" OR "greenhouse effect" OR "climate disruption"
Health	health AND "infectious diseases" OR Zika OR Malaria OR "cardiovascular diseases" OR "respiratory diseases" OR injuries OR "mental health" OR dehydration OR "impacts on mental health" OR "infectious diseases due to lack of hygiene" OR malnutrition OR "diseases water-borne" OR "vector-borne diseases" OR "food-borne diseases"
Media	newspapers OR television OR radio OR "social media" OR "alternative media" OR magazines OR news
Environmental behaviours	recycling OR "green products" OR "water conservation" OR "energy conservation" OR "environmental attitudes" OR "environmental commitment"
Government	politi* OR law OR accords OR government OR policy OR governance OR diploma* OR "public administration" OR state OR populism OR policies OR "government institutions" OR ministr* OR "government agenc*" OR legislat*
Political activism	mobilization* OR vote OR protest* OR violence OR manifestation* OR NGO* OR "social movement" OR activism
Corporate sector	corporation* OR company OR companies OR CSR OR "corporate social responsibility" OR greenwashing OR industr* OR "corporate culture of health" OR entrepreneur*
Social media engagement	Facebook OR Twitter OR TikTok OR Instagram OR Snapchat OR YouTube

Table 1: Search keywords.

qualitative analysis, reviewers extracted common themes that emerged from the findings, and the team discussed the results. Given the reduced number of studies included we did not perform formal analysis of data and reporting quality, but every study was evaluated independently by all reviewers.

Results

In total, 20 papers were included in the final analysis (Fig. 1). Governance was the category with the most articles with 14. Corporate engagement had two and media had three. Environmental behaviours had one. The categories of political activism and social media yielded no relevant results. Out of the total, 15 papers specifically focused on a single country or South America. The remaining five had a broader focus but

included at least one South American country in their analysis (Table 2). Most of the articles (with one exception) were published within the last decade (Table 3). A summary of the articles reviewed is presented in Table 4.

We examined the authors' country of origin by analysing their institutional affiliation (see Table 5). There were authors whose organisations were in the country of focus in the research, contributors who worked outside the country of focus, and contributors who were part of international organisations. Those who were not in the country of focus were mostly based outside of South America (i.e., Germany, the United States, Portugal). Brazil had the most authors within the country when it was the country of focus. Additionally, many of the authors considered living in the South American country of focus for the "other" category (i.e., the Amazon rainforest) were from Brazil. In total, the number of contributors whose institutional affiliation was not the South American country of focus (35 authors) slightly outweighed the number of authors affiliated with institutions from the country of focus (29 authors). This could suggest that the global relevance of the regional climate policies is predominantly driving the interest in

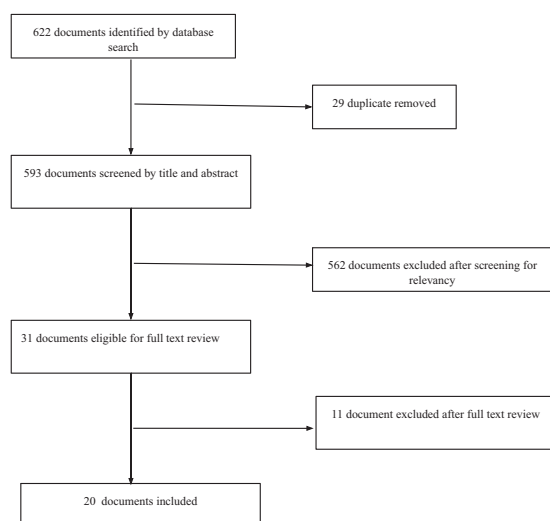


Fig. 1: Flowchart of the study selection process.

Country of focus	Number	Number in reference
Brazil	12	14-25
Colombia	5	19,26-29
Argentina	3	19,27,30
Chile	2	19
Peru	3	16,31,32
Paraguay	1	16
Uruguay	1	16

Sum of average surpasses 100% due to articles that focused on more than one South American country.

Table 2: Country of study.

Year of publication	Number	Number in reference
2008	1	30
2014	1	17
2016	4	14,16,25,31
2017	1	21
2018	3	15,19,20
2019	2	26,29
2020	4	22–24,28
2021	4	18,27,32,33

Table 3: Year of publication.

the explored topics, and the capacity to research these topics at the national and regional levels is limited.

Publication outlets

The articles analysed were published in a wide array of journals, but the vast majority were published in social sciences journals. For example, *Vniversitas* and *Revista Jurídica Piélagus* specialise in the area of law and politics. Similarly, *Context Internacional* focuses on international relations, and *Chasqui* focuses on communication. In contrast, a few centred around health and medicine such as *The Lancet Planetary Health* and *Ciência & Saúde Coletiva*. There was also representation from journals that focused on natural science such as the *Proceedings of the National Academy of Sciences of the United States of America* and *Symmetry*. Others were interdisciplinary but focused on environmental topics like *Waste Management & Research: The Journal for a Sustainable Circular Economy* and *Journal of Cleaner Production*.

It should be noted that two of the articles selected weren't published in journals. The chapter by Setti et al.¹⁴ was part of the book *Climate Change and Health*, and the chapter by Sehnem and Machado¹⁵ was part of the book *Entrepreneurial, Innovative and Sustainable Ecosystems*.

Governmental actions to address the health impacts of climate change

Most of the papers in this review centred around government actions (14 out of 20). The articles included sub-national (e.g., community-level),¹⁷ national,²⁶ and multi-country and comparative perspectives.¹⁸ Overall, the articles were descriptive. Many of the papers discussed perceptions and policy responses regarding climate change, with limited focus on specific health-related strategies.

Multi-country and comparative perspectives

Lamb et al.¹⁶ examined how access to education, democratic legal rights, and physical health could be impacted by the reduction of emissions in 20 middle-income countries (defined based on the domain known as Goldemberg's Corner, which includes

countries below 3.5 t CO₂/capita and above 70 years life expectancy, p.2). The sample included Uruguay, Paraguay, Brazil, Colombia, and Peru. To measure the basic conditions for satisfying physical health they looked at access to improved sanitation facilities, access to household electricity, and adequate nourishment. Many countries in the study were able to meet high levels of access to physical needs despite extremely low emissions, contradicting previous beliefs. Uruguay performed relatively high in the World Governance Indicator (WGI) for “voice and accountability” and “rule of law.” Consequently, it was one of the countries with the best scores overall in the study because it achieves near-universal access to sanitation coverage and secondary school enrolment, while also having a lower consumption and emission. These results highlight the challenges and limitations of adopting recommendations based on findings from other world regions.

Similarly, Gallego-Álvarez et al.¹⁹ studied how environmental concerns could interact with economic growth in a sample of 24 Latin American countries. To measure environmental performance the authors focused on the reduction of environmental stresses to human health and the protection of the ecosystem and natural resources. The results show that citizens with higher levels of education are in a better position to initiate and implement environmental cooperation schemes. Furthermore, there was a clear relationship between green or left-wing parties in power and the reduction of emissions. Regardless, the wealth of the country was not a stable contributing factor given that they found a significant difference in environmental performance in countries with similar economic levels.

Another report studied 12 countries with high-income and upper-middle-income regarding the policies on dietary guidelines and their relationship with sustainability and health.³⁴ Brazil was the only South American country included. The indicator for human health looked at dietary diversity, physical activity, food safety, energy limitation (e.g., reduction of calorie consumption and portion sizes), and nutrient-dense foods. The environmental dimension focused on sustainable agriculture, local and seasonal foods, clean energy, soil, land, and water conservation. The *Total Sustainability Score* was calculated by considering all these subdimensions of the sustainability framework. Brazil scored the highest in the Total Sustainability Score of all the countries studied. The results of this study showed some clear disconnection between physical health and socio-environmental dimensions. For example, if fish consumption were to increase to meet the current dietary recommendations, already fragile fish stocks could be severely affected. Furthermore, the authors highlighted the need for the recommendations to be tailored to each country's reality. Recommendations to reduce animal-sourced foods in low-income countries may not be equitable and can further contribute to the prevalence of undernutrition.

Author (Year)	Name of Paper	South American Country of focus	Area	Main objectives	Findings
de Andrade, H.V. (2017) ²¹	Mapeamento Das Políticas Estaduais De Adaptação Das Cidades Às Mudanças Climáticas No Brasil	Brazil	Government	Examine the climate change policies in 27 Brazilian cities.	Fifteen cities had legislation specifically related to climate change, but only 3 had legislation the focused on adaptation plans. Focus on health appears to be limited.
Beling, E. et al. (2020) ²⁴	Cobertura ambiental durante a pandemia no Brasil e em Portugal: explorando crises e (des)conexões	Brazil	Media	Explore the journalistic coverage of the Covid-19 Pandemic and the Climate Crisis to identify if there was an intertwining approach.	The coverage was fragmented, and it was complicated to understand the relationship between both crises.
Dias, K. et al. (2016) ²⁵	The use of reverse logistics for waste management in a Brazilian grocery retailer	Brazil	Environmental Behaviours	Analyse the practices of reverse logistics performed by a retailer and measure the amount of waste generated by each department.	The retailer stopped its monthly production of approximately 20 tons of biotic and abiotic material.
Dussán, H.J. et al. (2019) ²⁶	Desarrollo legal y jurisprudencia constitucional en Colombia sobre la protección del medio ambiente y los recursos hídricos	Colombia	Government	Identify and analyse the legal and jurisprudential development of the Colombian Constitutional Court related to environmental protection.	Since 1974 there have been measures for the protection of water. In 1991, the country reached what's considered as the "Ecological Constitution". Since then, the protection of water, which is understood as essential for human life, has intensified.
Dyngeland C. et al. (2020) ²³	Assessing multidimensional sustainability: Lessons from Brazil's social protection programs	Brazil	Government	To assess relationships between social protection investment and outcomes related to sustainable development goals and possible perverse outcomes arising from agricultural development that impact climate action.	Results vary greatly between subprograms and biomes. Increased food production doesn't necessarily lead to food security. Moreover, social protection programs have had a substantial effect on natural vegetation cover.
Espinoza, M. (2021) ³²	Conflicting diagnostic and prognostic framing of epidemics? Newspaper representations of dengue as a public health problem in Peru	Peru	Media	Analyse how Peruvian newspapers cover dengue and its relationship with the environment.	Results show most articles point to environmental factors but a direct relationship with climate change is lacking.
Ferreira, C. G. et al. (2020) ²²	New Governance Mechanisms Contributing to the Integration of National Climate Change Adaptation and Mitigation Policies in the Brazilian Amazon	Brazil	Government	Analyse a municipal-level environmental governance scheme based on deforestation-free commitments in Brazil.	These strategies have been successful in reducing deforestation.
Gallego-Álvarez I. et al. (2018) ¹⁹	Environmental performance concerns in Latin America: Determinant factors and multivariate analysis	Regional	Government	Analyse the Environmental Performance Index (EPI) of different Latin American countries and the factors that can influence it.	Variables such as education and political ideology are the ones that most influence the EPIs.
Guardela-Contreras L.M. (2020) ²⁸	Evolución de la política de cambio climático en Colombia	Colombia	Government	Analyse the public policy related to the climate crisis in Colombia.	There were three stages in the evolution of public policy. The first (1994–2010) focused on reducing greenhouse gases. The second (2010–2014) focused on adaptation. The third (2014–2018) focused on the NDCs of the Paris Agreement.
Hamilton I. et al. (2021) ¹⁸	The public health implications of the Paris Agreement: a modelling study	Brazil	Government	To analyse the health co-benefits to the existing NDCs and related policies and compare them to two alternative scenarios: sustainable pathways scenario and the health in all climate policies scenario.	Compared with the current NDCs, the sustainable pathway scenario would lead to a reduction of upwards of seven million deaths by 2040. The more ambitious health scenario would lead to a further reduction of almost two million deaths.
Lamb, W.F. (2016) ¹⁶	Which countries avoid carbon-intensive development?	Brazil, Perú, Paraguay Uruguay	Government	To explore the developmental outcomes and cumulative emissions trajectories of middle-income countries and asses their well-being outcomes by their access to education, democratic and legal rights, and infrastructure that supports physical health.	This study confirms that high levels of human need satisfaction are present in countries with low levels of energy consumption.
Landin, R. et al. (2014) ¹⁷	Política de mudança do clima no município de São Paulo, Brasil: reflexividade e permeabilidade do Setor Saúde	Brazil	Government	Analyse how the health sector is preparing to contribute to the Climate Change policy of 2009.	There was a positive intersectoral dialect.
Lapola, D.M. et al. (2018) ²⁰	Limiting the high impacts of Amazon forest dieback with no-regrets science and policy action	Brazil	Government	Asses whether mitigation or adaptation actions related to the Amazonian Forest Dieback should be taken now, later, or not at all.	Costs of acting now would be one to two orders of magnitude lower than economic damages. Moreover, no action would cause major social impacts that would affect transportation, food security and health.

(Table 4 continues on next page)

Author (Year)	Name of Paper	South American Country of focus	Area	Main objectives	Findings
(Continued from previous page)					
Richerzhagen, C. et al. (2019) ²⁹	Ecosystem-Based Adaptation Projects, More than just Adaptation: Analysis of Social Benefits and Costs in Colombia	Colombia	Government	Determine the potential social costs and determine how the benefits and the costs are distributed among social groups.	Social benefits exceed social costs in the process of EbA project implementation.
Sehnm, S. et al. (2018) ¹⁵	Sustainable Environmental and Social Practices in Companies in the State of Santa Catarina, Brazil	Brazil	Corporate	Assess the sustainable and social practices of 50 companies in Santa Catarina.	Two-thirds of the companies focused on the monitoring of risks and opportunities for the organisations' activity due to climate changes, more than half of the firms separate waste, and half of them train personnel in health and safety procedures at work.
Sepúlveda-Alzate, Y.M. et al. (2021) ³³	Materiality assessment: the case of Latin American listed companies	Regional	Corporate	Analyse if the sustainable practices of companies are in line with the needs of stakeholders.	This materiality of information was found to be not in alignment with organisational behaviour that is in tune with stakeholders' interests and well-being.
Setti, F.M. et al. (2016) ¹⁴	Climate Change and Health: Governance Mechanisms in Traditional Communities of Mosaico Bocaina/Brazil	Brazil	Government	To address the socio-environmental and health challenges of three traditional communities in Brazil.	Public policies have not become effective interventions against climate change, and the science behind them, especially related to health is insufficient,
Siña, M. et al. (2016) ³¹	Understanding Perceptions of Climate Change, Priorities, and Decision-Making among municipalities in Lima, Peru to Better Inform Adaptation and Mitigation Planning	Peru	Government	Understand the priorities and perceptions related to Climate Change of representatives of Lima communities.	Climate change was not very well understood and participants had trouble grasping its causes and effects.
Suarez, P. et al. (2008) ³⁰	Video-Mediated Approaches for Community-Level Climate Adaptation	Argentina	Media	Explore how video could make information about climate change more accessible.	Highlights the importance of video for raising awareness.
Wang, C.N. et al. (2021) ²⁷	Assessing Renewable Energy Production Capabilities Using DEA Window and Fuzzy TOPSIS Model	Colombia	Government	Evaluate the capabilities of 42 countries in renewable energy production.	Colombia is one of the 10 countries with the highest renewable energy production capabilities.

Table 4: Summary of publications reviewed.

Wang et al.²⁷ studied the capabilities of 42 countries to produce renewable energy as means of not only mitigating climate change but also as key to responding to an unprecedented crisis such as COVID-19. The sample included Argentina, Brazil, Chile, and Colombia. The study only mentioned in passing the health implications of renewable energy production.

Countries	Authors with institutional affiliation in South American country of focus	Authors with institutional affiliation not in country of focus	Total
Colombia	4	9	13
Perú	4	3	7
Brazil	13	9	22
Chile	0	1	1
Other (i.e., Latin America, regions)	8	13	21
Total	29	35	64

Table 5: Authorship based and not based in South America.

National level efforts: Brazil

Brazil was the country most explored in articles that looked at national-level efforts. Lapola et al.²⁰ examined the impacts of abrupt large-scale shifts in the Brazilian Amazon caused by climate change. Among sectors such as agriculture and energy and infrastructure, the authors suggested a series of health-related actions to reduce or eliminate vector- and water-borne diseases during climatic extremes, such as the elimination of open-air sewage during climatic extremes.

Hamilton et al.¹⁸ studied how the Nationally Determined Contributions (NDCs) of nine countries — Brazil was the only South American country included in the sample — would serve to meet the goals of the Paris Agreement. They modelled three different scenarios for the year 2040. The results show that the current NDCs are inadequate. Adopting more sustainable measures centred around health would avert seven million deaths related to air pollution, diet, and physical inactivity, and opting for the third and most ambitious scenario would result in a further reduction of almost two million deaths.¹⁸

National level efforts: Colombia

Colombia was the second most explored country in the articles analysed. First, using a legal, analytical, and

descriptive methodology with a predominantly qualitative approach, Guardela Contreras et al.²⁸ follow the development and consolidation of Colombia's climate change vision and policy, where three periods are identified: a first period where the country's vision in the face of climate change was mainly focused on obtaining financial benefit from projects related to the reduction of greenhouse gases (GHG); a second period where, as a result of the "La Niña" impacts, Colombia's vision focused on adaptation and disaster risk management; and a third period, marked by the need and obligation as a country to adhere to and comply with international climate-related commitments.

More specifically focusing on one aspect of climate change, Dussán and Andrade²⁶ acknowledged the recent decades of advances in regulatory and jurisprudential production of Colombia regarding the legal protection of water, arguing for a need for its further development. The advances respond to the increasing impacts of anthropogenic climate change and environmental destruction, threatening the survival and well-being of present and future generations and ecosystems. Using a legal and constitutional approach, the authors see a close relationship between the conservation of natural resources and the provision of drinking water services and a need for the state to guarantee drinking water as a public service through municipal aqueducts to preserve the lives of Colombians. The study brings out the importance of standards, supported by international law, such as "ecological constitution," "sustainable development," the fundamental right to life and health, the right to a healthy environment, and the right of nature to have its independent development and survival whose protection should not be conditioned to or understood as a means to ensure economic development.

In a qualitative study, Richerzhagen et al.²⁹ sought to bridge the knowledge gap on Ecosystem-based Adaptation (EbA). Despite the building evidence of its environmental and economic benefits in practice, there is a lack of demonstrable evidence to inform implementing agencies in Colombia on the social co-benefits and potential social costs and their distribution among individuals and social groups. As the results of the two case studies described by Richerzhagen et al.²⁹ demonstrate, social benefits exceed social costs in the process of EbA project implementation. The interviewed partners (community members that participated in the project) emphasised increased knowledge and awareness of climate change among local communities, gender empowerment, employment opportunities and perceived climate regulation. On the other hand, costs include the creation of social tensions, unfulfilled project expectations, and the risks of populations being labelled as "adapted."

Sub-national governmental actions

Several articles examined local-level initiatives. At the city level, Landin and Giatti¹⁷ examined how the health sector in Sao Paulo, Brazil, implemented the Climate Change Policy proposed in 2009. Contrary to expectations, the researchers reported a positive intersectoral dialectic relationship that broke with the traditional sectorial and reductionist policy model. It demonstrated an "*intersectoral perspective based on the importance of issues related to local public health*" (p.4149).¹⁷

De Andrade²¹ provided a more comprehensive review of city-level climate change policies in Brazil by examining 27 different cities. The study involved a survey of studies related to human vulnerability and adaptation to climate change, the specific impacts of climate change in Brazil, and mapping of regulatory frameworks (legislations) elaborated within the scope of state governments based on the National Policy on Climate Change. The results revealed that most cities (15 of 27) had legislations specifically related to climate change, and a few (n = 4) had legislation in progress. However, only three cities (São Paulo, Rio de Janeiro, and Pernambuco) had adaptation plans. In other words, a focus on health impacts appeared to be limited.

Three studies examined local governance at the municipal level. First, Ferreira²² analysed the municipal-level environmental governance scheme called the Green Municipalities Program (PMV, by its Portuguese acronym) which was started in Brazil in 2011 in an effort to reduce deforestation. The study reported that while the PMV showed excellent results in bringing together different partners, matching multi-level policies, and promoting decentralisation, with effective political coordination and articulation among stakeholders; many aspects of this governance mechanism still rely on old national economic strategies, particularly to meet market pressures to maintain the exportation of raw materials. Landholders, smallholder farmers, indigenous communities, and small counties still face challenges to accomplish their inclusion as a group (or groups) with decision-making power.

Second, a study by Dyngelanda et al.²³ also in Brazil, assessed the relationships between social protection investment and outcomes related to sustainable development goals. It relies on a longitudinal dataset spanning the period between 2000 and 2013 and covers between 3786 and 4976 rural municipalities in Brazil. When considering all outcomes, investment in social protection programs resulted in fewer positive synergies than trade-offs and negative synergies between the United Nations' Sustainable Development Goals. The study shows that increases in food production do not lead to improvements in other food security and health measures. Program effectiveness in terms of reducing poverty and health benefits is likely to be particularly influenced by associated investment in health

infrastructure and improved functioning of institutions needed to deliver health improvements.

Third, Siña et al.³¹ examined climate change perceptions among representatives from five municipalities of Lima, Peru. The main priorities of these municipal representatives are public safety and the provision of water and sanitation services. Waste management, infrastructure, and human development were also prioritised. All these aspects are determinants of public health. Authors report that environmental or climate change health impacts are not among the highest priorities. Participants also confused climate change with other environmental problems such as air pollution or ozone layer depletion. Furthermore, environmental management seems to be organised around economic interests, reinforced by technocratic arguments that further emphasise immediate economic needs over long-term planning. This study is unique since it explored decision-maker's perceptions, a population that is oftentimes challenging to access.

Finally, only one study examined small communities. A study in Brazil analysed the public policies and science production on governance mechanisms concerning climate change and health in traditional communities in Mosaico Bocaina.¹⁴ The authors concluded that similar to other regions in Latin America, public policies have not become effective interventions against climate change. Also, the authors state that climate change impacts on people's health are understudied and that there is no information on how traditional communities perceive climate change, its impacts on health and well-being, or its tackling strategies. The authors conclude that climate change adaptation clearly relates to public health and environmental issues and that climate governance and adaptation to climate change are required to achieve sustainable and healthy territories. The inclusion of traditional knowledge in the design and implementation of adaptation policies reduces inequalities while promoting socioeconomic development and the health and sustainability of traditional communities.

Corporate engagement

Corporate engagement in health and climate change was examined in two articles. These articles focused on the priorities of corporations regarding the environment and the implementation of environmental practices based on those priorities. The overarching topic of these articles was corporate practice in relation to environmental needs and whether corporations sufficiently target and follow through on the most pressing aspects of sustainable business practices.

One article looked at stakeholders' priorities (including communities impacted by industries) and corporate practices in Latin America (Colombia, Mexico, Brazil, Chile, and Argentina), questioning whether the

sustainability strategies of companies are in line with the needs of stakeholders.³³ This materiality of information was found to be not in alignment with organisational behaviour that is in tune with stakeholders' interests and well-being, particularly considering that the environmental impacts caused by some companies in Latin America are considerable. A unique aspect of the Latin American context is that the weak rule of law and the lack of presence of the State in rural and poor communities allows companies to serve such roles by providing health and social services. Similarly, the lower presence of law enforcement and corruption at local, regional, and national levels also could have an impact on the transparency of corporations.

Another article discussed the motives, challenges, and benefits of sustainable business practices in the state of Santa Catarina, Brazil.³⁵ The authors examined environmental practices for climate change and practices for public health, but they were analysed independently. The results reveal that environmental practices implemented by two-thirds of the companies focused on the monitoring of risks and opportunities for the organisations' activity due to climate change. More than half of the companies separate waste, and half of them train personnel in health and safety procedures at work. The study explored corporate strategies without really acknowledging any sort of intersectionality between environmental and social (e.g., health-related) activities.

Media and public engagement

Three articles were found related to media —this included journalism and communication broadly defined. One article²⁴ explored the journalistic coverage of environmental issues in two news sites —one from Brazil and one from Portugal— during the beginning of the COVID-19 pandemic, to identify if there was an intertwining approach to the coverage of both crises, climate and sanitary. The study found that there was a fragmentation in the coverage which made it difficult to comprehend the connections between the two crises. Furthermore, the researchers found that in Brazil, where the smoke from fires worsened the health conditions during the pandemic in the population of Amazonia, the relationship between both crises was not addressed in depth.

The second article³⁰ discussed how participatory video could be beneficial to make information regarding climate-related risks more accessible to communities. However, the focus of this article was not only on South America, nor did it encompass the more crucial aspects of media in climate change information. Rather, it mentioned Argentina as a case study in a larger argument but did so to support the use of video-mediated approaches as a useful method for raising awareness and disseminating information for climate adaptation at the community level, inspired by experiences from the

health field in risk management. Argentina was one of four countries examined.

Lastly, the third article³² focused on how print media in Peru covered the emergence of dengue and how they presented its causes and solutions. The author analysed news articles from two leading newspapers in the country. The results show that 20% of articles attributed blame to individual behaviours. In contrast, 55% of the diagnostic frames attributed blame to climatic and environmental factors. Specifically, most articles focused on above-average rainfalls and flooding caused by El Niño. There was an absence of a more substantive connection to climate change directly.

Finally, only one study examined public engagement in the form of environmental behaviours,²⁵ but the focus on health in this article is once again limited. There is a section that discusses health and beauty products in the context of reverse logistics and waste reduction. While environmental preservation and health is a key focus in the discussion, public health is not.

Discussion

A total of 20 articles were reviewed for this scoping review. The first article was published in 2008, while most articles were published in 2016 and 2020 (four in each). Considering that South America is a diverse region, we expected to find a larger number of countries represented. However, most articles focused on Brazil, likely a reflection of population size. Many countries —Bolivia, Guyana, Paraguay, Suriname, and Venezuela— were not included in any study, which represents a significant gap in knowledge for the region.

The few articles and range of topics included in this scoping review suggest that there are significant gaps in many important topics regarding health and climate change in South America. For example, no studies were found examining social media engagement with health and climate change and only one examined news coverage. Studies of social media platforms in other regions demonstrate the role of these platforms in public engagement.³⁶

Similarly, past studies have examined news coverage of climate change in newspapers in South America,^{37–41} but public health framing was not the main focus. Perhaps more importantly, researchers need to take into consideration recent and ongoing news consumption trends. A report on digital news consumption across 40 markets —including Argentina, Brazil, and Chile— shows that people pay more attention to television when they want to be informed about climate change, followed by online news sites from major news organisations.⁴² Expanding the research to include other media beyond newspapers could help to understand how climate and health news are produced and consumed in the region.

The analysis also revealed a small number of articles examining corporate practices and engagement with health and climate change. There is no research on how organizations improved employee and/or community lives and health. Considering the significant direct and indirect impact of industrial activities on people's health and well-being, more research is undoubtedly needed. Similarly, research examining public engagement, political activism, and environmental behaviours related to public health is largely missing.

Most articles focused primarily on individual countries, rather than looking at the bigger picture in South America. Future studies could include a larger sample of countries in the region to analyse and compare the diverse realities of the region. While analysing the efforts of individual agents may give insights regarding the efficacy of climate change interventions and programs,^{22,23} what is effective in one country or community that has significant resources to create and implement programs may not be as effective or even plausible in areas with significantly fewer resources at their disposal. For example, the aforementioned articles focus largely on Brazil, the South American country currently with the highest GDP. One article discussed meeting market needs to export raw materials and another analysed investment in social protection programs. Many South American countries may not have the resources to invest in these programs, let alone the research to determine if they make a difference in that country's climate change efforts. Although more funding is going towards research and development in the region, the output and quality of research still lags behind other regions of the world.⁴³ Additionally, countries in the region with the largest population, such as Brazil, Colombia, Argentina, and Peru,⁴⁴ were the most represented in the articles. Additionally, future research should try to explore and prescribe potential solutions to climate change issues and its health co-benefits, especially in low-income countries and communities.

Studies examining governmental actions at regional, national, and local levels demonstrate that some characteristics of South American countries, such as diverse populations,^{14,29} weakness in the rule of law,^{16,44,45} limited governmental reach and impact in rural communities,²³ and a unique relationship between people and place,¹⁴ make the adoption of public health practices developed in another context challenging. Although the studies reviewed only provide a glimpse into the challenges a few countries and populations face and what policies work best, there is a major gap in this research area. Many countries and populations that are vulnerable to climate change have not been taken into consideration in these studies, such as Bolivia. Indigenous communities' knowledge and the knowledge of local communities policy planning on climate change and health are rarely incorporated in research. Furthermore, the benefits for health from mitigation and adaptation policies

across sectors need to be researched to leverage the opportunities for public health that climate action represents, as suggested by Hamilton.¹⁸

The studies examined highlight some specific areas of improvement governments should focus on. Although the evidence is scant, the few studies conducted about public policies and programs related to climate and public health suggest that these policies have not been effective.¹² Similarly, more research on decision-makers is needed, but the existing evidence suggests misunderstandings about climate change still exist.³¹ Studies in other countries and regions that present recommendations for the integration of public health considerations into climate change policies could be useful in the meantime.⁴⁶ More education and a more comprehensive grasp of the subject—of both politicians and the general population—undoubtedly leads to more effective climate action.¹⁹

Furthermore, governments shouldn't dial back their sustainability efforts to attain higher human development. As Lamb¹⁶ points out, several countries can meet high levels of physical needs while maintaining extremely low carbon emissions. In addition, sustainability measures also have long-term benefits, for they lead to significant reductions in mortality and morbidity when compared to less sustainable scenarios.¹⁸ Importantly, successful efforts tend to rely on measures that are region and population-specific. For example, Brazil's dietary guidelines were able to achieve the highest sustainability scores, and these often reiterate the importance of including seasonal and local foods.³⁴ The inclusion of traditional knowledge in the design and implementation of climate policies has also been shown to reduce inequality and promote socio-economic development.¹⁴

There are opportunities at the international level for South American scholars to further engage with other scholars working in the areas of research examined in this scoping review and leverage knowledge from other associated realities that can help increase the success of local policies. For example, the Nairobi Work Programme (NWP) works on impacts, vulnerability, and adaptation to climate change and closing the knowledge gaps for adaptation. Health is a key thematic area of it. The work that the NWP produces, based on UNFCCC data, includes reports on adaptation knowledge gaps of the Paraná Delta.⁴⁷ Unfortunately, few South American universities are currently engaged — the University of Rosario, Argentina was the first South American University to join the partnership this year — so more engagement is necessary.

Limitations

This study has some limitations. First, we included only academic publications, which significantly limited the sample size of the articles analysed. Government documents such as policy briefs and other grey literature could be included in future reviews to provide a larger scope of research about health and climate change in the region.

Additionally, our sample could have been limited by the databases from which we collected articles. Existing qualifying articles may not have been included if they were not uploaded to the databases. For example, individual book chapters of edited volumes might not be listed in databases. Similarly, university-based publications are sometimes not indexed and might have been missed from our searches.

Another limitation is that additional keywords could have been included. However, we believe the current combination of keywords was broad enough to capture most studies available. For example, a post hoc search including the keywords “advocacy” and “heat stress” did not result in any additional articles.

Finally, Dutch or French keywords were not included in the search for practical reasons. Although unlikely, this could have limited the number of relevant articles that appeared, especially regarding Suriname, whose official language is Dutch.

Conclusions

The small number of academic articles in this scoping review is worrisome, although not surprising. This issue is not unique to this area of research and reflects the disparities in research output between rich and poor countries. Moreover, most of the studies reviewed examined health as mostly a secondary theme.

Addressing climate change's impact on public health requires evidence-based action. Current strategies by government, NGOs, industries, and academia often rely on incomplete information or recommendations developed in different contexts. Increased research investments in social sciences and interdisciplinary collaborations are essential. Empirical evidence tailored to local contexts and respectful of socio-cultural and economic differences should guide informed decision-making.

Contributors

All authors contributed to the conceptualization and design of the review. BT, CG, MS, MFS, and SH contributed to the analysis and writing of the article.

Declaration of interests

We declare no competing interests.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.lana.2023.100603>.

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