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## **Navigating Environmental Justice Framework: A Scoping Literature Review Over Four Decades**

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### **Abstract**

The scoping literature review examines nearly four decades of scholarly contributions, navigating the evolution of the environmental justice framework from its nascent roots to its contemporary dimensions. It aims to provide a comprehensive overview of its conceptual trajectory, identifying key themes, pillars, and current directions. Spanning 7,001 publications, the review employs lexical-metric content analyses to synthesise the corpus and reveal semantic clusters and temporal trends. The data underscore the increasing scholarly interest in environmental justice, manifested in a well-established field of study and multidisciplinary approaches. The analyses identify four pillars underpinning the framework: assessing built environment quality, mitigating climate change effects, promoting responsible research and innovation (RRI), and emphasising human dimensions. The pillars reflect the classic justice dimensions (i.e., distributive, procedural - also in its participatory sense - and recognition justice, respectively), while restorative justice is a cross-cutting dimension. They undergo significant transformations over time, defining some directions toward which the current scientific debate seems to orient: ensuring everyone's well-being, realising just transition, reducing global inequalities, and facing societal challenges together. Overall, the review delineates two complementary and interconnected frameworks: environmental justice as a theoretical framework for global issues and environmental justice as a concrete framework for situated issues. The conceptual frameworks have implications for environmental governance and activism, advocating for democratic, participatory, and cooperative approaches. Furthermore, they suggest avenues for future research, particularly in understanding social dynamics that bridge global and local concerns, aligning research agendas with the interests and needs of affected communities.

### **Keywords**

Environmental justice framework; scoping literature review; lexical-metric content analysis; temporal perspective

## Introduction and Objectives

In an era marked by amplified awareness of environmental degradation and social inequalities, understanding and addressing the equitable distribution of environmental burdens and benefits have become paramount<sup>1,2</sup>. As contemporary societies struggle with unprecedented environmental challenges, ranging from climate change and pollution to resource depletion and biodiversity loss, examining environmental justice is an essential effort with concrete implications<sup>3,4</sup>.

Environmental justice has not only emerged but also evolved as a critical framework for investigating the intricate relationships between society and the environment<sup>5,6</sup>. Its scope has broadened beyond its initial focus on ethnic background to encompass various dimensions of inequality, including socioeconomic status, geographic location, and power dynamics<sup>7,8</sup>. Over time, environmental justice has evolved into a multifaceted and pivotal domain within the broader field of environmental studies, aiming to empirically assess environmental inequities and their interconnected socio-economic and ethical ramifications through theoretical developments, policy analyses, and normative discussions<sup>9,10</sup>. This evolution provides insights into the holistic understanding of the intersecting factors that influence inequalities and the growing recognition of the mutual link between environmental sustainability and social justice<sup>11,12,13</sup>.

This scoping literature review crosses nearly four decades of the academic landscape to trace the conceptual trajectory of the environmental justice framework from its nascent roots to its contemporary dimensions, delineating its nuanced contours.

Over the years, numerous literature reviews have been published to map the environmental justice framework<sup>14,15,16</sup>. These works have adopted various approaches, contributing to a rich scientific

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<sup>1</sup> World Health Organization. 2015. Connecting Global Priorities: Biodiversity and Human Health: A State of Knowledge Review. <<https://www.who.int/publications/i/item/9789241508537>> (Last accessed on April 11, 2024).

<sup>2</sup> Charles Harper and Monica Snowden. *Environment and Society: Human Perspectives on Environmental Issues*. (London, Routledge, 2017).

<sup>3</sup> Peter Stoett. *Global Ecopolitics: Crisis, Governance, and Justice*. (Toronto, University of Toronto Press, 2019).

<sup>4</sup> Éloi Laurent. *The New Environmental Economics: Sustainability and Justice*. (Hoboken, John Wiley & Sons, 2020).

<sup>5</sup> David Schlosberg. "Theorising Environmental Justice: The Expanding Sphere of a Discourse." *Environmental Politics* 22 (2013): 37-55.

<sup>6</sup> Julian Agyeman, David Schlosberg, Luke Craven and Caitlin Matthews. "Trends and Directions in Environmental Justice: From Inequity to Everyday Life, Community, and Just Sustainabilities." *Annual Review of Environment and Resources* 41 (2016): 321-340.

<sup>7</sup> Julie Sze and Jonathan K. London. "Environmental Justice at the Crossroads." *Sociology Compass* (2008): 1331-1354.

<sup>8</sup> Rachel Morello-Frosch, Miriam Zuk, Micheal Jerrett, Bhavna Shamasunder and Amy D. Kyle. "Understanding the Cumulative Impacts of Inequalities in Environmental Health: Implications for Policy." *Health Affairs* (2011): 879-887.

<sup>9</sup> Gordon Walker. *Environmental Justice: Concepts, Evidence and Politics*. (London, Routledge, 2012).

<sup>10</sup> Ryan Holifield, Jayajit Chakraborty and Gordon Walker, eds. *The Routledge Handbook of Environmental Justice*. (London, Routledge, 2018).

<sup>11</sup> Henrik Åhman. "Social Sustainability—Society at the Intersection of Development and Maintenance." *Local Environment* 18 (2013), 1153-1166.

<sup>12</sup> Melissa Leach, Belinda Reyers, Xuemei Bai, Eduardo S. Brondizio, Christina Cook, Sandra Díaz, Giovana Espindola et al. "Equity and Sustainability in the Anthropocene: A Social–Ecological Systems Perspective on Their Intertwined Futures." *Global Sustainability* 1 (2018): e13.

<sup>13</sup> James S. Mastaler. "Social justice and environmental displacement." *Environmental Justice* 12 (2019): 17-22.

<sup>14</sup> Knoble, Charles, and Danlin Yu. "Environmental justice: An evolving concept in a dynamic era." *Sustainable Development* 31, no. 4 (2023): 2091-2108.

<sup>15</sup> Wallimann-Helmer, Ivo, Basil Bornemann, Pius Krütli, and Dominic Roser. "Environmental justice in interdisciplinary perspective." *GAIA-Ecological Perspectives for Science and Society* 30, no. 2 (2021): 126-128.

<sup>16</sup> Bullard, Robert D. "Environmental justice—once a footnote, now a headline." *Harvard Environmental Law Review*. 45 (2021): 243.

debate on the concept. Some have used environmental justice to reflect on relevant issues<sup>17,18,19</sup>, while others have focused on specific applications through which to discuss environmental justice<sup>20,21,22</sup>. However, no study has yet provided a comprehensive and historical analysis of the evolution of themes and their nuances over time. This gap is addressed by the methodological approach adopted in the present work, which utilises lexical-metric techniques, thus enabling the investigation of large amounts of data. This represents a novelty since previous reviews have not employed automatic content analyses and modern text-mining procedures. This approach allows for a historical perspective on the conceptual framework of environmental justice and "has constructive and heuristic functions for developing critical views of the past as well as the future"<sup>23</sup> (p. 671). Viewing environmental justice as a historical product facilitates tracing the theoretical evolution of the concept and situating it within various institutions, communities, and practices that organise it with different degrees of visibility and meaning.

The scientific literature is thus used here as a proxy to understand how the academic world has positioned itself regarding historical events, political decisions, economic measures, and legislative regulations concerning environmental justice. While recognising that scientific literature often articulates as a response to "actual" changes, with a delay effect due to the time required for elaborating and publishing a contribution, it often critically engages with them, proposing alternative views.

The primary objective of this review is to unravel complexity, offering a panoramic view of the scholarly contributions that have shaped and defined the environmental justice framework and its various dimensions. By synthesising a diverse body of literature spanning the last 40 years, the review aims to identify key themes, pillars, and current directions, map the conceptual terrain, navigate the evolution of thought in the field, and elucidate its implications for contemporary environmental governance and activism. This comprehensive approach ensures that no aspect of the environmental justice framework is overlooked.

In the subsequent sections, the review delves into the nuances of the environmental justice framework, categorising literature based on thematic clusters and identifying gaps and trends across the decades. The goal is to navigate the past and present and pave the way for future research avenues. This review aspires to offer a more comprehensive understanding of the environmental justice framework, serving as a valuable resource for scholars, policymakers, and advocates interested in unravelling the complex interplay between environmental concerns and social justice and committed to advancing the principles of justice in the face of environmental challenges.

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<sup>17</sup> Bauer, Willi. "Reframing urban nature-based solutions through perspectives of environmental justice and privilege." *Urban Planning* 8, no. 1 (2023): 334-345.

<sup>18</sup> Beretta, Ilaria, and Caterina Bracchi. "Climate-neutral and Smart Cities: a critical review through the lens of environmental justice." *Frontiers in Sociology* 8 (2023): 1175592.

<sup>19</sup> Godwyll, Josephine Marie, and Christine N. Buzinde. "Conceptualizing linkages between community well-being and access to public space: an environmental justice perspective." *Journal of Environmental Planning and Management* 66, no. 5 (2023): 928-954.

<sup>20</sup> Canfield, Katherine, Adrian Cato, Kathleen Torso, and Kate Mulvaney. "Waves of change: A preliminary literature review of non-drinkable water and environmental justice research." *Hydrological Sciences Journal* 69, no. 1 (2024): 120-138.

<sup>21</sup> Karasaki, Seigi, Jessica J. Goddard, Alasdair Cohen, and Isha Ray. "Environmental justice and drinking water: A critical review of primary data studies." *Wiley Interdisciplinary Reviews: Water* 10, no. 5 (2023): e1653.

<sup>22</sup> The need of an environmental justice approach for wastewater based epidemiology for rural and disadvantaged communities: A review in California

<sup>23</sup> Valentina Rizzoli, Paula Castro, Arjuna Tuzzi and Alberta Contarello. "Probing the History of Social Psychology, Exploring Diversity and Views of the Social: Publication Trends in the European Journal of Social Psychology from 1971 to 2016." *European Journal of Social Psychology* 49 (2019): 671–687.

## Data Sources and Methods

This scoping review was inspired by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses – PRISMA 2020 statement<sup>24</sup>. The Scopus database was employed to identify the records<sup>25,26,27</sup>, which were retrieved by searching “environmental justice” in titles, abstracts, and keywords of journal articles, editorials, and reviews published in English from the first appearance to the end of 2023.

The search retrieved 7,395 documents, comprising 89.9% journal articles (n = 6,650), 8.7% reviews (n = 640), and 1.4% editorials (n = 105). The temporal distribution of documents, as illustrated in Figure 1, reveals that the term "environmental justice" first appeared in 1986 in two publications, with a consistent upward trend in scientific interest, especially in recent years (e.g., n = 1,034 publications in 2023, n = 899 in 2022, and n = 732 in 2021).

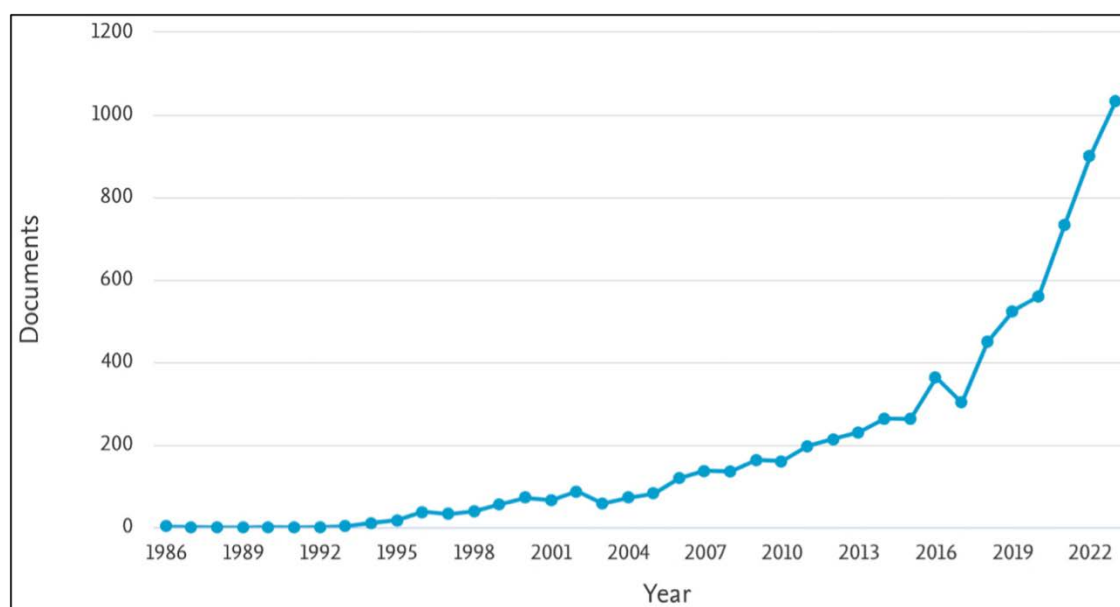


Figure 1. Documents by year.

The documents are indexed within various subject areas, especially social sciences (35.1%) and environmental sciences (30.9%). Additionally, journals such as *Environmental Justice* (n = 390 publications), followed distantly by *Local Environment* (n = 197), *International Journal of Environmental Research and Public Health* (n = 192), and *Sustainability* (n = 152) frequently host publications on environmental justice. Among authors, S.E. Grineski, University of Utah (n = 54 publications), T.W. Collins, University of Utah (n = 50), and J. Chakraborty, University of California, Santa Barbara (n = 47) are the most active contributors, followed by I. Anguelovski, Universitat Autònoma de Barcelona (n = 35) and R. Morello-Frosch, University of California, Berkeley (34).

<sup>24</sup> Matthew J. Page, Joanne E. McKenzie, Patrick M. Bossuyt, Isabelle Boutron, Tammy C. Hoffmann, Cynthia D. Mulrow, Larissa Shamseer et al. “The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews.” *BMJ* 372 (2021).

<sup>25</sup> Lauren Z. Atkinson and Andrea Cipriani. “How to Carry Out a Literature Search for a Systematic Review: A Practical Guide.” *BJPsych Advance* 24 (2018): 74–82.

<sup>26</sup> Tracy Gardner and Simon Inger. How Readers Discover Content in Scholarly Publications.

<<https://digitalcommons.unl.edu/scholcom/13/>> (Last accessed on April 11, 2024).

<sup>27</sup> Maarten Wolsink. “Social Acceptance Revisited: Gaps, Questionable Trends, and an Auspicious Perspective.” *Energy Research & Social Science* 46 (2018): 287–295.

The documents were screened to eliminate duplicates and items without available abstracts (n = 394). Thus, the review covered 7,001 publications. Their abstracts were subjected to lexical-metric content analyses using the IRaMuTeQ software<sup>28</sup>. The analyses focused on abstracts for two reasons: first, abstracts immediately and effectively convey the core content of a publication (i.e., its objectives, methods, and key findings), thus serving as a valid proxy for accessing the general content of the entire contribution; second, abstract exhibit stable linguistic characteristics (e.g., standardization and conciseness), making them suitable for lexicon-based statistical examinations<sup>29</sup>.

The textual corpus underwent initial pre-processing, including normalisation (elimination of replicas of graphic forms), lemmatisation (transformation of graphic forms into lemma), and segment extraction (identification of repeated sequences of adjacent words). Then, descriptive statistics were computed to assess the corpus's suitability for subsequent analyses (see Table 1).

Table 1. Lexical-metric measures.

Number of occurrences (i.e. total words)	1,357,009
Number of forms (i.e. distinct words)	30,137
Number of lemmas (i.e. distinct words after lemmatisation)	23,311
Number of hapaxes (i.e. words appearing only once)	8,627
(Hapaxes/Occurrences) x 100	0.64
(Hapaxes/Lemmas) x 100	37.01
Number of text segments (i.e. adjacent words after segment extraction)	34,249

A descendant hierarchical classification was run following the Reinert method<sup>30</sup>. This analysis synthesises textual corpora (in this case, the 7,001 abstracts) by detecting semantic classes of words through associative measures based on the Chi-square test and visualising them with a dendrogram<sup>31</sup>. Each class represents a key theme in the academic landscape of environmental justice, providing valuable insights into its nuances and mapping its multifaceted conceptual terrain.

Subsequently, a temporal analysis was performed using a customised R software package<sup>32</sup>. The yearly classes' presence was displayed, and their statistical over-representations (based on the Chi-square test) were marked according to the association's intensity<sup>33,34</sup>. The results endeavour to navigate the evolution of thought in the field, identifying gaps and trends and delving into current directions.

<sup>28</sup> Pierre Ratinaud. Iramuteq: Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires. <[www.iramuteq.org](http://www.iramuteq.org)> (Last accessed on April 11, 2024).

<sup>29</sup> Arjuna Tuzzi. "What to put in the bag? Comparing and contrasting procedures for text clustering". *Italian Journal of Applied Statistics/Statistica Applicata* (2010): 77–94.

<sup>30</sup> Max Reinert. "Une Méthode de Classification Descendante Hiérarchique: Application à l'Analyse Lexicale par Contexte." *Les Cahiers de l'Analyse des Données VIII* (1983): 187–198.

<sup>31</sup> Pierre Ratinaud and Pascal Marchand. "Application de la Méthode Alceste à de "Gros" Corpus et Stabilité des "Mondes Lexicaux": Analyse du "Cable Gate" avec Iramuteq." *Actes des 11e Journées Internationales d'Analyse Statistique des Données Textuelles*. Liège, Université de Liège (2012): 835–844.

<sup>32</sup> Pierre Ratinaud. "Visualisation Chronologique des Analyses Alceste: Application à Twitter avec l'Exemple du Hashtag #mariagepourtous." *Actes des 12e Journées Internationales d'Analyse Statistique des Données Textuelles*, Paris, Inalco / Sorbonne Nouvelle (2014): 553–565.

<sup>33</sup> Valentina Rizzoli, Paula Castro, Arjuna Tuzzi and Alberta Contarello. "Probing the History of Social Psychology, Exploring Diversity and Views of the Social: Publication Trends in the European Journal of Social Psychology from 1971 to 2016." *European Journal of Social Psychology* 49 (2019): 671–687.

<sup>34</sup> Giacomo Chiara, Diego Romaioli and Alberta Contarello. "Migrations in Postcolonial Italian Literature: Qualitative Quantitative Analysis in a Social Representation Framework." *Social Science Information* 62 (2023): 106–134.

## Results

### Mapping key themes, pillars, and dimensions of environmental justice: A panoramic view

The descendant hierarchical classification identified fourteen classes, covering 95.89% of the text segments (n = 32,840).

Upon observing the dendrogram in Figure 2, the classes can be interpreted as distinct key themes or broader overarching pillars defined by varying degrees of interconnectedness. Four pillars have been identified. Tracing the dendrogram's branches from top to bottom, a primary division emerges, separating four classes (7, 6, 11, and 10) and forming the first pillar. The remaining ten classes are further distributed into three main clusters, delineating the second pillar (classes 5, 4, 13, and 12), the third pillar (classes 1, 14, 3, and 2), and the fourth pillar (classes 9 and 8).

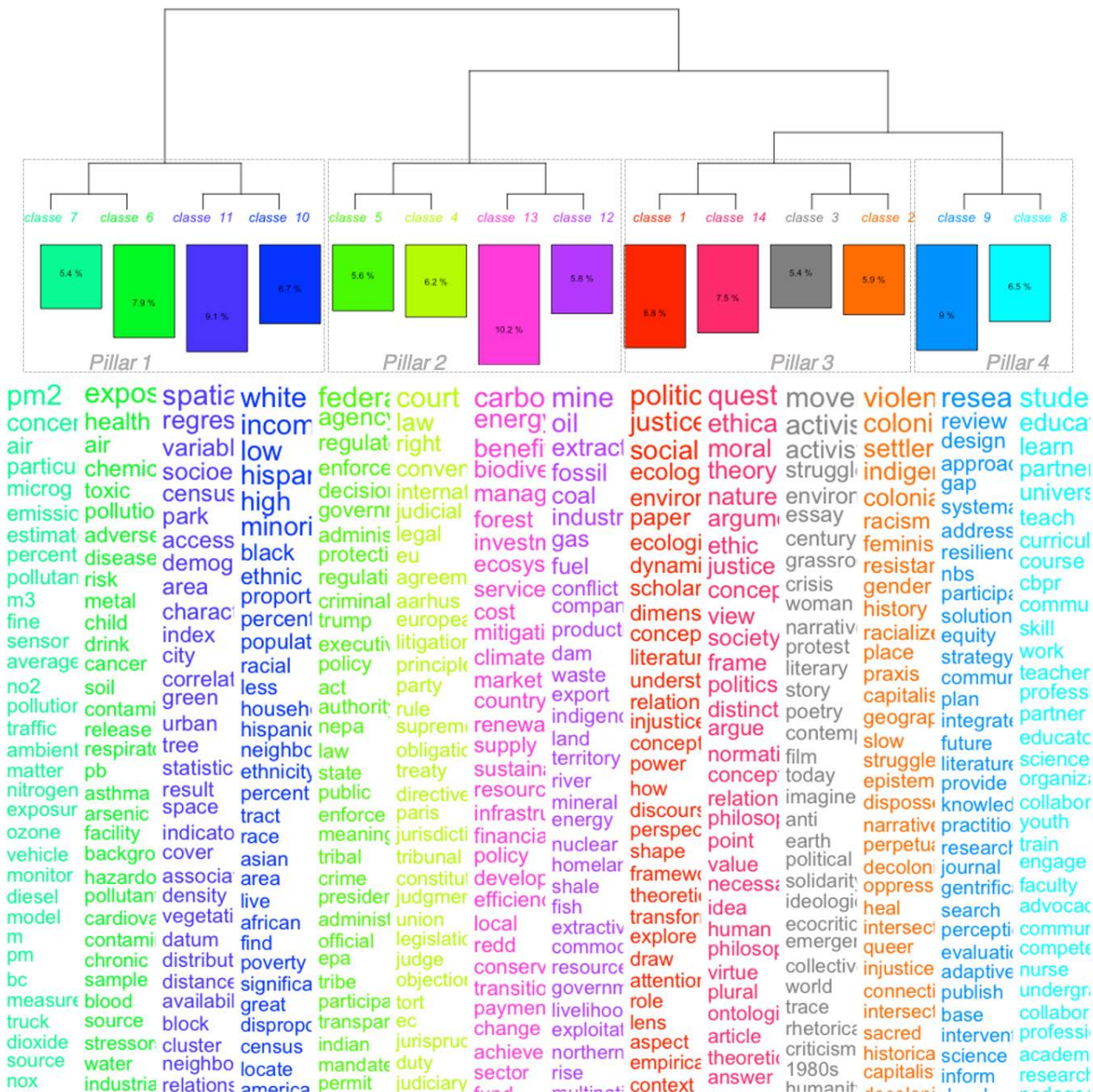


Figure 2. Dendrogram summarising key themes (i.e. classes) and pillars.

Note: For each class, some words are listed; they are the most characteristic according to the Chi-square test. All listed words have a p-value of < .0001.



Each pillar and key theme are described below and summarised in Table 2, which lists the first three most statistically representative publications and journals based on their Chi-square values.

### *Pillar 1: Quality assessments of built environments*

This pillar (accounting for 29.1% of the text segments) frames environmental justice using objective indicators to assess the quality of built environments. It encompasses the causes, consequences, and monitoring strategies related to pollution in urban areas (*Urban pollution*, 13.3%, classes 7 and 6), as well as the morphology and demography of human settlements (*Urban geography*, 15.8%, classes 11 and 10). Specifically, the semantic classes composing this pillar are:

- *Air quality and monitoring indexes (class 7)*. It focuses on air pollution (e.g., smog and polluting emissions), along with indicators for monitoring it and developing prediction models, such as concentrations of specific pollutants and their effects due to long-term exposures.
- *Environmental contamination and public health (class 6)*. It addresses the impact of hazardous pollutants on human health. Pollution spans from air to water or soil, focusing on highly industrialised contexts and analysing potential correlations with the incidence of severe diseases.
- *City planning and green indicators (class 11)*. It discusses cities' morphology, urban fabric, and related indicators, with particular attention paid to green spaces in land-use planning and their fair allocation and accessibility.
- *Demographic data and ethnic inequalities (class 10)*. It delves into the distribution of urban population based on ethnic background and socioeconomic status, shedding light on potential housing inequalities or situations of residential segregation.

### *Pillar 2: Mitigation efforts for climate change*

This pillar (27.8%) provides a view of environmental justice related to limiting the effects of climate change. It consists of reflections on legislative and institutional agendas to reduce greenhouse gas emissions (*Normative framework*, 11.8%, classes 5 and 4), the energy issue and its associated challenges (*Energy management*, 16.0%, classes 13 and 12). The semantic classes constituting this pillar are:

- *Policies and regulations (class 5)*. It addresses the decision-making processes, governance structures, administrative requirements, and assessment tools underlying pro-environmental actions at the national level.
- *Conventions and treaties (class 4)*. Unlike the previous one, this class refers to a supranational level, encompassing the legal and juridical dimensions of agreements between nations concerning climate change mitigation, their implementations and related potential compliances or disputes.
- *Carbon neutrality and economic growth (class 13)*. It tackles the energy issue, focusing on the current phasing-out of fossil fuels facilitated by renewable and sustainable sources. Energy is conceptualised as an economic commodity subject to market laws; thus, this process is considered a viable investment opportunity, supported institutionally, to foster national development.
- *Energy transition and local exploitation (class 12)*. It provides a view of energy based on the often irreconcilable gap between transition processes and exploited rural communities.

### *Pillar 3: Human dimensions of justice perspectives*

This pillar (27.6%) frames environmental justice through a definitional and historical lens. It emphasises the social dynamics involved in the mechanisms of justice, or perceived injustice, by individuals or communities. Attention ranges from socio-political and philosophical analyses of justice constructs (*Cultural reflection*, 16.3%, classes 1 and 14) to historical interpretations of

grassroots activism and social movements (*Social action*, 11.3%, classes 3 and 2). The semantic classes composing this pillar are:

- *Justice and its multi-level conceptualisations (class 1)*. It focuses on environmental and ecological justice, inviting scholars to delve into its multidimensional nature and formulate new epistemological frameworks and precise conceptualisations.
- *Ethics in human-nature relationships (class 14)*. Similarly, this class reflects on justice within the broader context of human-nature relationships. The discussion also adopts philosophical positions, exploring the construct's value-related, moral, and ethical dimensions.
- *History of social movements (class 3)*. From a historical perspective, it addresses the emergence and evolution of social movements and grassroots activism as sources of influence and drivers of change. Tracing this centuries-long trajectory to the present day, it also utilises cultural products, such as literary texts or films, to narrate a story of struggle and solidarity.
- *Power dynamics and social conflicts (class 2)*. It complements the previous class by revisiting the traditional conception of environmental justice. It examines the complex relationships between dominant and marginalised social groups, studying oppression and violence. It views resistance as a form of struggle against injustice and environmental racism.

#### *Pillar 4: Responsible Research and Innovation (RRI) frameworks*

This last pillar (15.5%) is closely interconnected with the third, as shown by the dendrogram's branches. It embeds the view of environmental justice within the RRI framework, which advocates for public engagement in research processes to align scholarly goals and outcomes with social needs and challenges. The two classes composing this pillar are:

- *Participatory research for nature-based solutions (class 9)*. It shares similarities with class 1 regarding scientific and academic interest in environmental issues. However, while class 1 primarily referred to theoretical reflections and basic research, this class emphasises applied research, including action or intervention research. The goal is not to develop comprehensive conceptual frameworks but to provide practical solutions in concrete cases. The aim is, therefore, to transfer knowledge to practitioners so that they can plan strategies tailored to specific communities through their direct involvement.
- *Educational responsibility of academia (class 8)*. It builds upon the other two missions of academia beyond the 'research' mission discussed in the previous class: teaching and public engagement. It highlights the importance of transferring knowledge to new generations of students (and, thus, potential future scholars) and non-academic audiences. This class also includes studies that engage in co-creating knowledge with communities involved in projects.

Table 2. Recap of pillars and key themes, with the most representative publications and journals.



Pillars		Key Themes	Most Representative	Most Representative Journals
Quality assessments of built environments	Urban pollution	Air quality and monitoring indexes (class 7)	Dinkelacker et al. (2022) <sup>1</sup> Morelli et al. (2019) <sup>2</sup> Vodonos & Schwartz (2021) <sup>3</sup>	Atmospheric Environment Environmental Science and Technology Science of the Total Environment
	Urban geography	Environmental contamination and public health (class 6)	Rothenberg et al. (2023) <sup>4</sup> Padula et al. (2021) <sup>5</sup> Van Horne et al. (2021) <sup>6</sup>	Int J Environmental Research and Public Health Environmental Health Perspectives J Exposure Science and Environmental Epidemiology
Mitigation efforts for climate change	Urban geography	City planning and green indicators (class 11)	Wang & Lin (2022) <sup>7</sup> Xu & Wang (2023) <sup>8</sup> Donovan et al. (2021) <sup>9</sup>	Urban Forestry and Urban Greening Landscape and Urban Planning Applied Geography
		Demographic data and ethnic inequalities (class 10)	Perlin et al. (2001) <sup>10</sup> Grineski et al. (2017) <sup>11</sup> Woodruff et al. (2003) <sup>12</sup>	Population and Environment Environmental Research Social Science Quarterly
	Normative framework	Policies and regulations (class 5)	Bass (1998) <sup>13</sup> Phelan & Phelan (2008) <sup>14</sup> Burger et al. (2010) <sup>15</sup>	J Professional Issues in Engineering Education and Practice Harvard Environmental Law Review Ecology Law Quarterly
		Conventions and treaties (class 4)	Marsden (2009) <sup>16</sup> Samvel (2020) <sup>17</sup> Yerezhpekyzy et al. (2021) <sup>18</sup>	Environmental Law and Management J Environmental Law European Energy and Environmental Law Review
Energy management	Carbon neutrality and economic growth (class 13)	Puaschunder (2016) <sup>19</sup> Mathur et al. (2014) <sup>20</sup> Muttitt & Kartha (2020) <sup>21</sup>	Climate Policy Energy Policy Climate Change	
	Energy transition and local exploitation (class 12)	Greenberg (2023) <sup>22</sup> Malin & DeMaster (2016) <sup>23</sup> Granovsky-Larsen & ... (2023) <sup>24</sup>	Extractive Industries and Societies Marine Policy J Land Use Science	
Cultural reflection	Justice and its multi-level conceptualisations (class 1)	Sebastien et al. (2019) <sup>25</sup> Cadieux (2016) <sup>26</sup> Leonard (2012) <sup>27</sup>	Local Environment Geoforum Current Opinion in Environmental Sustainability	
		Wood & Roelich (2020) <sup>28</sup> Moernaut et al. (2019) <sup>29</sup> Kenter & O'Connor (2022) <sup>30</sup>	Environmental Politics Environmental Values Ethics Policy and Environment	
	History of social movements (class 3)	Gandy (2002) <sup>31</sup> Guasco (2021) <sup>32</sup> Marland (2013) <sup>33</sup>	Environmental History Green Letters Literature Compass	
Human dimensions in justice perspectives	Social action	Power dynamics and social conflicts (class 2)	Graddy-Lovelace (2023) <sup>34</sup> Gay-Antaky (2023) <sup>35</sup> Dowler & Ranjbar (2018) <sup>36</sup>	Environment and Society Advances in Research Environment and Planning E - Nature and Space Gender Place and Culture
		Participatory research for concrete solutions (class 9)	Stieb et al. (2019) <sup>37</sup> Dick et al. (2020) <sup>38</sup> Kabisch et al. (2016) <sup>39</sup>	Environmental Evidence Environmental Science and Policy Qualitative Research J
Responsible Research and Innovation (RRI) frameworks	Educational responsibility of academia (class 8)	Shallcross & Robinson (2007) <sup>40</sup> Adams et al. (2023) <sup>41</sup> De Marco et al. (2014) <sup>42</sup>	Social Work Education J Education and Teaching J Environmental Studies and Sciences	

In the domain of environmental justice, each of the identified pillars can be understood through the lens of classic dimensions recognised in the literature. Specifically, Pillar 1 relates to distributive justice, which concerns the equitable distribution of burdens and benefits; Pillar 2 pertains to procedural justice, which ensures fairness in decision-making processes; Pillar 3 invokes principles of recognition justice, which involves respecting human dignity and cultural status; lastly, Pillar 4 stresses the participatory meaning of the procedural justice, which entails the right to contribute to community development meaningfully. Additionally, the dimension of restorative justice, providing opportunities to correct harmful practices or damages, intersects with the first three pillars, albeit in varying ways.

***Navigating gaps, trends and current directions of environmental justice: A temporal perspective***

The temporal analysis shows that key themes and pillars of environmental justice experience peaks and dips in attention over the years. However, it is noteworthy that each theme remains present over time and is never irrelevant. Therefore, the trends and the corresponding current directions described below should be understood as part of a complex, articulated, and layered debate. Specifically, the four pillars identified earlier will now be described in their historical evolution, highlighting the main changes in framing environmental justice and the current directions of the debate.

Figure 3 graphically illustrates the overrepresentations of classes in specific years, with varying shades indicating their intensity proportional to the strength of the association between class and year. The uncoloured years should not be understood as periods characterised by the absence or underrepresentation of classes but rather as periods in which classes are present according to their expected values.

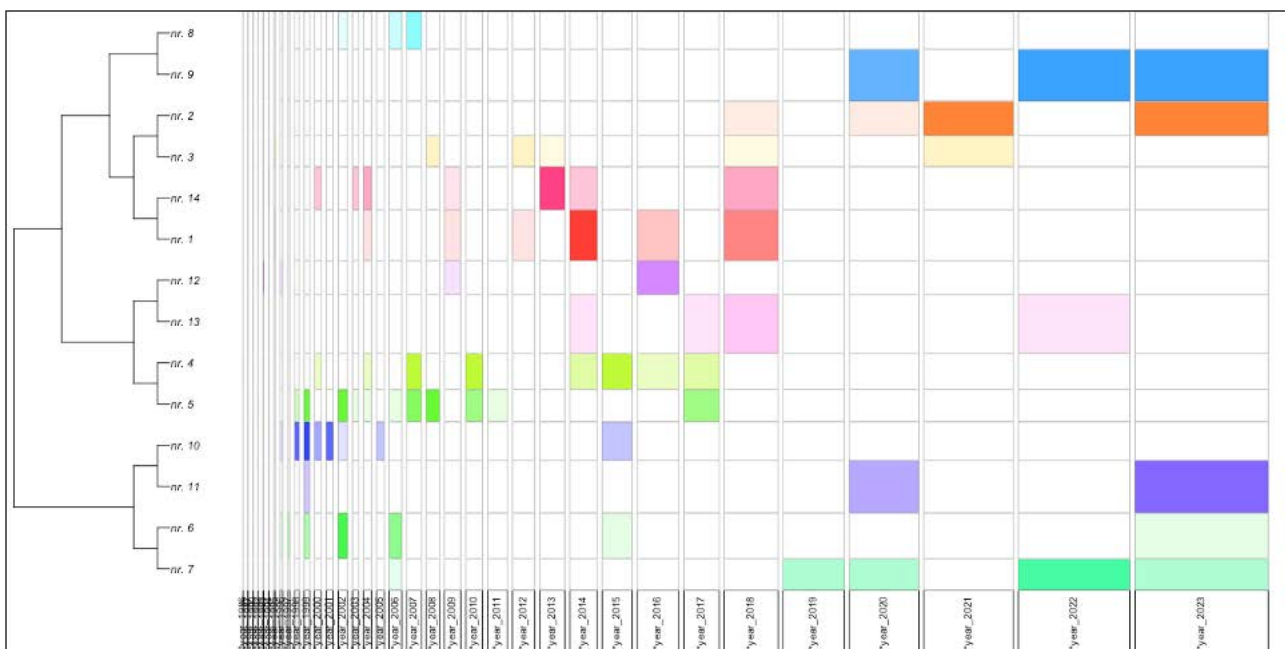


Figure 3. Classes' over-representations during the years.

Note: The height of the bars for each class is proportional to the size of the class in terms of the number of texts it contains. The width of the cells is proportional to the frequency of texts in a given year. The colour tone is proportional to the strength of the association between class and year.

*Direction 1: Environmental justice as ensuring everyone's well-being*

Pillar 1 on quality assessment of built environments has consistently drawn attention in scientific literature across the last four decades regarding urban pollution and geography. However, significant differences in its connotations have emerged over time. Issues related to environmental contamination and public health (class 6) or demographic data and ethnic inequalities (class 10) were particularly prominent in the early 2000s and even until 2015, albeit with some gaps. Conversely, in the last five years (from 2018-2019), the reflection on the quality assessment of built environments seems to have mainly focused on air quality and monitoring indexes (class 7), notably in 2022, and city planning and green indicators (class 11), prevalent in 2023. Interest is shifting towards an inclusive view of environmental justice, less centred on specific indicators targeting vulnerable groups (such as the sick, children, ethnic minorities, or the less affluent). Instead, the focus has broadened beyond ensuring access to health and services; the quality of the built environment also involves urban planning and monitoring to preserve all residents' well-being. This trend suggests a shift from a narrower, more restorative-focused environmental justice framework to a broader interpretation rooted in distributive justice principles.

#### *Direction 2: Environmental justice as realising just transition*

Pillar 2 on mitigation efforts for climate change receives comparatively less attention in recent scientific literature regarding energy management and, especially, normative framework. Substantial differences in contents also emerge in this case. Issues related to policies and regulations (class 5) or conventions and treaties (class 4) were particularly prominent until 2017 but lost appeal recently. On the energy side, the study of transition and local exploitation (class 12) was mainly relevant in 2009 and, after a brief gap, notably in 2016, before regressing to baseline levels of consideration. The issue of carbon neutrality and economic growth (class 13) is relatively recent and has remained attractive since 2014.

While the normative framework remains pivotal, it is increasingly regarded as an unquestionable premise for environmental justice rather than a topic to be debated. The trajectory shifts towards the energy issue, particularly towards carbon neutrality. Similar to the previous direction, the normative framework takes on broader and more generalised tones in addressing a global issue such as energy. Environmental justice thus moves from being more focused on restoring damage to specific communities to embodying the principles of procedural justice, ensuring an institutional and juridical agenda of development and growth for all.

#### *Direction 3: Environmental justice as reducing global inequalities*

Pillar 3 on human dimensions in justice perspectives follows a similar temporal trend to the previous one. The following differences emerge in cultural reflection and social action over the four decades. Issues related to justice and its multi-level conceptualisations (class 1) or ethics in human-nature relationships (class 14) were particularly relevant until 2018, diminishing in prominence after that. Conversely, concerning social action, the exploration of the history of social movements (class 3) has been mainly significant, albeit with some gaps, until 2021, while that of power dynamics and social conflicts (class 2) is more recent and highly represented from 2018, especially in the last three years.

Like the previous scenario about the normative framework, the cultural reflection on environmental justice emerges over time as a solid foundation upon which (and through which) to build subsequent considerations, even about social action. In this regard, the conceptual trajectory shifts towards a broader view of the issue, moving from the actions of specific social movements to those of macro-actors on a global scale. Reflecting the previous trends, environmental justice thus

evolves from the traditional approaches of top-down and bottom-up influences in understanding inequalities; it progresses towards a comprehensive understanding of recognition justice.

*Direction 4: Environmental justice as facing societal challenges together*

Pillar 4 on the RRI framework has evolved significantly. While until the early 2000s, the reflection was mainly centred on the educational responsibility of academia (class 8), after a gap of over a decade, it increasingly focused on participatory research for nature-based solutions (class 9), centralising the debate in the last four years.

This trend differs the most from the previous ones. The direction concerns the broader conception of public engagement, which has undergone significant redefinition over the past few decades. Initially, the debate focused on literacy, with experts responsible for transmitting knowledge to the general public. More recently, positions advocating for a close relationship of co-creation of knowledge between experts and laypeople are increasingly recognised (e.g., the citizen science approach). This shift can be interpreted in this sense: environmental justice increasingly acquires its dimension of participatory justice, intending participation as an egalitarian and non-top-down process.

Table 3. Recap of gaps, trends, and directions.

Pillars	Key Themes in the Past	Key Themes in the Present	Directions
Quality assessments of built environments	<i>(Air quality and monitoring indexes)</i>	Air quality and monitoring indexes	Ensuring everyone's well-being: from restorative to distributive justice
	Environmental contamination and public health	<i>(Environmental contamination and public health)</i>	
	<i>(City planning and green indicators)</i>	City planning and green indicators	Publication examples: from Neumann et al. (1998) <sup>43</sup> to Moos et al. (2022) <sup>44</sup>
	Demographic data and ethnic inequalities	-	
Mitigation efforts for climate change	Policies and regulations	-	Realising just transition: from restorative to procedural justice
	Conventions and treaties	-	
	Carbon neutrality and economic growth	<i>(Carbon neutrality and economic growth)</i>	Publication examples: from Bass (1998) <sup>45</sup> to Satyal et al. (2020) <sup>46</sup>
	Energy transition and local exploitation	-	
Human dimensions in justice perspectives	Justice and its multi-level conceptualisations	-	Reducing global inequalities: from restorative to recognition justice
	Ethics in human-nature relationships	-	
	History of social movements	<i>(History of social movements)</i>	Publication examples: from Alier (2000) <sup>47</sup> to Jacob et al. (2021) <sup>48</sup>
	-	Power dynamics and social conflicts	
Responsible Research and Innovation (RRI) frameworks	-	Participatory research for concrete solutions	Facing societal challenges together: from top-down to co-created participatory justice
	Educational responsibility of academia	-	Publication examples: from Washington & Strong (1997) <sup>49</sup> to Casey et al. (2023) <sup>40</sup>

**Discussion and Conclusions**

This scoping review examined nearly forty years of scientific literature to navigate the origins, evolution, and current state of the art of the environmental justice framework, thus highlighting its implications for future research.

A preliminary consideration concerns the recognised awareness of the issue's relevance, complexity, and multifaceted nature within the academic landscape. This awareness is evident from the steadily increasing interest in environmental justice, almost exponential interest in recent

years, giving rise to a well-established field of study (as proved, for example, by the fact that the journal *Environmental Justice* is entirely dedicated to it)<sup>35</sup>. Moreover, this awareness is also reflected in the willingness to approach the issue in a broad and multidisciplinary manner, proposing theoretical reflections, empirical studies, and practical applications with a critical and holistic view of the close relationship between environmental challenges and social justice. The results of this scoping review provide an overview of the environmental justice framework based on some macro-themes, which we have called pillars. The first two pillars concern efforts to assess the quality of built environments and mitigate the effects of climate change<sup>36</sup>. Alongside them, another equally relevant pillar in scientific literature regards the human dimensions underlying the definition of environmental justice<sup>37</sup>. Lastly, in connection with the previous pillar, the issue is addressed in the fourth pillar, highlighting the opportunities and responsibilities for those involved, drawing on the principles of the RRI framework and, more broadly, public engagement<sup>38</sup>. This synthetic framing of environmental justice evokes the classic dimensions of justice in the literature: distributive, procedural, especially participatory, and recognition justice. Notably, restorative justice is a cross-cutting dimension whose contribution becomes more evident in the temporal analysis of the texts under examination. From the results, the emphasis on repairing damage caused is a legacy of the past, and this dimension received less prominence in recent scientific literature.

The pillars on which the environmental justice framework is based undergo significant transformations over time, defining some directions toward which the current scientific debate seems to orient. The first direction, particularly relevant in the present literature, is attributable to the dimension of distributive justice and the pillar focused on assessing built environment quality. It suggests an inclusive conception of environmental justice that must ensure well-being for all<sup>39</sup>. The procedural justice dimension, evident in the pillar on efforts to mitigate climate change, is more apparent in the second direction identified, the least salient, namely that which sees environmental justice as a fundamental prerequisite for achieving a just transition<sup>40</sup>. The third direction, attributable to the dimension of recognition justice and the pillar on the human dimensions of justice, proposes a broad vision of the construct based on reducing inequalities on a global scale<sup>41</sup>. Finally, the dimension of participatory justice characteristic of the RRI pillar emerges in the last direction identified, namely that which conceives environmental justice as the premise for jointly addressing societal challenges in an egalitarian manner<sup>42</sup>.

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<sup>35</sup> Sylvia Hood Washington. "Editorial." *Environmental Justice* 1 (2008): 1-3.

<sup>36</sup> Elizabeth A. Corley, Jeong Joo Ahn, Yushim Kim, Joanna Lucio, Erin Rugland, and Angel Luis Molina Jr. "Conceptualizing lenses, dimensions, constructs, and indicators for urban park quality." *Environmental Justice* 11 (2018): 208-221.

<sup>37</sup> Farzaneh Khayat. "From climate injustice to resilience: what is the role of social and technological innovation?." *Environmental Justice* 16 (2023): 96-110.

<sup>38</sup> Lisa Jordan, Anthony Stallins, Shereitte Stokes IV, Elijah Johnson, and Richard Gragg. "Citizen mapping and environmental justice: Internet applications for research and advocacy." *Environmental Justice* 4 (2011): 155-162.

<sup>39</sup> Jarumi Kato-Huerta, and Davide Geneletti. "Environmental justice implications of nature-based solutions in urban areas: A systematic review of approaches, indicators, and outcomes." *Environmental Science & Policy* 138 (2022): 122-133.

<sup>40</sup> Nils Stockmann, and Antonia Graf. "Just translation? A socioecological justice lens on EU environmental governance and urban mobility transitions." *Zeitschrift für Politikwissenschaft* 33 (2023): 355-385.

<sup>41</sup> Sabaheta Ramcilovic-Suominen. "Envisioning just transformations in and beyond the EU bioeconomy: inspirations from decolonial environmental justice and degrowth." *Sustainability Science* 18 (2023): 707-722.

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The adopted lexical-metric methodological approach has proven particularly valid for addressing the questions guiding this review. However, it requires rigorous decisions by the researcher to ensure the results can be interpreted effectively and that the overall research process maintains satisfactory levels of validity and reliability. Some of these decisions, particularly those related to the construction of the corpus, such as the criteria for inclusion and exclusion of texts, deserve critical discussion here as they constitute potential limitations of this work.

The first decision concerned the selection of the data source. In this review, the analysed data were abstracts. This led to the exclusion of books and essays from the analysis despite their foundational role in scientific knowledge on a topic. Book abstracts (or essay abstracts) are not always present, available, or easily accessible. Moreover, the complexity of a book compared to a journal contribution means that a book abstract cannot be directly compared to that of a journal contribution. Therefore, in order to maintain the integrity and consistency of the data corpus, the review focused exclusively on articles, reviews, and editorials, excluding other sources such as books or essays. However, this may have introduced a bias towards disciplines that primarily disseminate scientific knowledge through journals. Additionally, the choice to use Scopus as a database, for reasons outlined in the methodological section, further suggested favouring journal contributions over books or essays, as the latter are often not indexed in this database. The same applies to other forms of publication, such as white papers, which are still crucial in the debate on environmental justice.

Another decision concerned the selection of keywords for text search. In this review, texts were selected based on the presence of a single keyword (i.e., environmental justice). This led to the exclusion of publications focusing on related terms, such as environmental equity, environmental inequality, environmental racism, etc. In the introduction, we acknowledged the complexity and multidisciplinary nature of the topic and clarified our interest in tracing the conceptual trajectory of the construct. Moreover, it would have been very challenging to account for the plethora of terms related to environmental justice, ensuring none were omitted. Such terms are sometimes derivatives of the umbrella construct of environmental justice, but in other cases, they refer to different theoretical traditions. Therefore, for methodological rigour, we focused exclusively on the construct of environmental justice. However, this may have introduced a bias towards a segment, albeit broad, of the literature at the expense of other perspectives that could have enriched the understanding of the phenomenon by defining alternative and complementary pillars and directions.

Despite these limitations, the reading of the results into pillars and directions proposed by this review allows for some conclusive considerations to be drawn.

Overall, the results can be interpreted using two complementary and interconnected frameworks: environmental justice as a theoretical framework for global issues and environmental justice as a concrete framework for situated issues.

Conceptualising environmental justice as a theoretical framework for global issues means shifting the focus from specific vulnerable groups (in a “horizontal” perspective based on socio-demographic characteristics) to broader vulnerable communities (in a “vertical” perspective based on regional factors). Today's environmental challenges are global and affect vast geographical areas; hence, without forgetting that different groups are impacted unequally, environmental justice must address entire populations and be inclusive. This requires wide frameworks and comprehensive conceptualisations. The distributive justice dimension, together with the procedural



one, assumes a fuller meaning here, less intertwined with that of restorative justice, and more focused on preventing rather than just managing problems.

However, this framework does not call for shifting attention away from local problems. In this sense, conceptualising environmental justice as a concrete framework for situated issues means having the ability to apply complexity to concrete cases. This requires the involvement of affected communities, which should not be seen as victims to be compensated but as actors and proper agents of change. The dimensions of recognition and participatory justice assume a more egalitarian meaning here, less associated with top-down visions that, once again, see affected communities as passive entities to be taken care of.

It allows reflections on potential forthcoming research avenues. Soon, one of the most pressing challenges of the scientific debate on environmental justice may be to develop knowledge and empirical assessments on the social levers that allow for the effective convergence of global and situated issues closer to the interests and needs of affected communities<sup>43</sup>.

Finally, the interpretations in terms of conceptual frameworks for environmental justice have implications for both contemporary environmental governance and activism. From a governance perspective, it means understanding and fostering forms of governance not as top-down, hierarchical, and linear processes where decisions are taken and communicated but as bottom-up, democratic, and circular processes where solutions are co-created and negotiated. From an activism perspective, it means conceiving and promoting forms of activism not as moments of protest aimed at conflict, dispute and resistance but as moments of participation oriented towards cooperation, dialogue, and change promotion. As this review's primary focus was on scientific literature, a historical comparison between academic reflections and the institutional level (political, economic, legislative, etc.) would be beyond its scope. However, it would be interesting to closely examine the correspondence or divergence of themes, pillars, and directions with the events or processes in which a certain scientific debate has arisen, developed, or changed.

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Sonia Brondi: conceptualisation, methodology, resources, supervision, validation, writing – original draft preparation, writing – review and editing, funding acquisition, project administration; Giacomo Chiara: data curation, formal analysis, investigation, methodology, software, visualisation, writing – original draft preparation, writing – review and editing; Elisa Matutini: conceptualisation, supervision, validation, writing – original draft preparation, writing – review and editing.

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The authors have no conflict of interest to declare.

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