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Between Climate Vulnerability and Inclusive Education Policy: A Scoping Review on Learners with Autism Spectrum Disorder

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Abstract

Climate change and climate-related multi-hazard disaster risk pose growing challenges for inclusive and special education. Learners with autism spectrum disorder (ASD), however, remain underrepresented both in the empirical evidence base and in the international policy instruments that govern education-sector climate response. This scoping review maps the extent, range, and nature of scholarship at the intersection of climate vulnerability, climate-related and multi-hazard disaster risk, and inclusive or special education for learners with ASD. The review followed the PRISMA-ScR guidelines and the methodological framework of Arksey and O'Malley. A search of Web of Science, Scopus, ERIC, and PubMed on 26 July 2026 returned 1,290 records. After deduplication and screening (Cohen's $\kappa = 1.00$), 21 studies met the eligibility criteria. The findings organise into five thematic clusters: earthquake and multi-hazard preparedness (n = 9), climate-linked hydrometeorological hazards (n = 3), sustainability and environmental education (n = 3), climate discourse and representation (n = 1), and multi-hazard educational continuity (n = 5). The corpus is heavily concentrated in Türkiye following the 6 February 2023 Kahramanmaraş earthquake sequence. Safety-preparedness interventions using video modelling, digital social stories, Behavioural Skills Training, and immersive VR-ABA demonstrate that autistic learners can acquire and maintain safety-critical skills. Engagement with the global normative frameworks that govern this field (the Sendai Framework, UNCRPD, SDG 4, the UNESCO Greening Education Partnership, and IPCC AR6) is nevertheless uneven, and no included study evaluates climate-mitigation curricula or maps ASD-specific integration into national or international climate policy. Reorganised through CBM Global's four-domain policy framework of Personal, Programmes, Policy, and Political action, the corpus proves empirically mature at the first two levels but structurally underdeveloped at the last two.

Keywords: autism spectrum disorder; climate change; disaster risk reduction; inclusive education; special education policy; scoping review; PRISMA-ScR; UNCRPD; Sendai Framework

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Introduction

Climate change has become one of the defining structural pressures on contemporary educational policy. The Intergovernmental Panel on Climate Change's Sixth Assessment Report treats vulnerability not as a uniform property of populations but as a socially distributed condition, shaped by pre-existing marginalisation as much as by physical exposure (IPCC, 2022). Education systems occupy a dual position within this framing. They are at once sites of climate-related risk and instruments through which societies can mediate that risk. The UNESCO Greening Education Partnership (UNESCO, 2022), the Sendai Framework for Disaster Risk Reduction 2015–2030 (UNDRR, 2015), and Sustainable Development Goal 4 converge on a shared claim: inclusive, equitable, and disability-responsive education is constitutive of climate action rather than adjacent to it. The operational question of which learners the sector has actually prepared for, and by what means, remains only partially answered.

The scale of the problem is well documented in the broader disability literature. People with disabilities make up an estimated 15 % of the world's population, approximately 1.3 billion people, of whom some 800 million live in low-income countries (CBM Global, 2020; United Nations Department of Economic and Social Affairs, 2018). Their global mortality rate during natural disasters runs up to four times higher than that of the non-disabled population (Stein & Stein, 2022), and pre-existing psychosocial disabilities triple the risk of death during heatwaves (Bouchama et al., 2007, as cited in Stein & Stein, 2022). Lindsay et al.'s (2023) scoping review of forty-five studies, covering more than 2.3 million participants across thirteen countries and a twenty-year period, identifies four cross-cutting impacts of climate-related extreme weather events on people with pre-existing disabilities. These are compounding effects on physical and mental health, disruption of education and work, barriers to accessing health and community services, and the development of resilience strategies grounded in social supports. Sandoval and colleagues' (2025) survey of 168 lived-experience sources documents a further dimension: the systematic inaccessibility of climate activism itself, together with eco-ableist policy patterns that treat disability as an unavoidable casualty rather than a design consideration. The particular subpopulation of learners with autism spectrum disorder, whose sensory, communicative, and behavioural profiles interact distinctively with climate-related exposures, has nonetheless been mapped only in fragments.

Learners with autism spectrum disorder (ASD) occupy a distinctive analytic position within this debate. The population concerned has grown considerably over the past two decades. The most recent surveillance report of the Centers for Disease Control and Prevention's Autism and Developmental Disabilities Monitoring (ADDM) Network identifies autism spectrum disorder in approximately one in thirty-one 8-year-old children in the United States (Shaw et al., 2025), a prevalence more than fourfold higher than the one-in-150 rate reported when the Network began systematic monitoring in the early 2000s. Comparable upward trends appear across high-income and, increasingly, middle-income

countries. Several features of the autism phenotype leave these learners disproportionately exposed to climate-related hazards: sensory hyper- and hypo-reactivity, dependence on predictable environmental structures, communication differences that complicate the interpretation of emergency instructions, and reduced tolerance for novel or high-arousal contexts (American Psychiatric Association, 2013). The exposures at issue include acute events such as extreme heat, wildfire smoke, flooding, and disaster-triggered displacement, alongside slower-onset stressors such as degraded air quality and disrupted daily routines. The epidemiological expansion of the ASD population and the intensifying frequency of climate-related and multi-hazard events together make the intersection of autism education and climate risk a demographically consequential policy question in its own right. Recent epidemiological and observational work has begun to document these exposures, covering associations between prenatal and postnatal air pollution and neurodevelopmental outcomes as well as behavioural and psychosocial responses of autistic children to earthquakes, floods, and pandemic-related educational disruption (Eroglu et al., 2024; Şimşek et al., 2026; Vivek et al., 2026). The intersection between climate vulnerability and inclusive education policy for autistic learners has nevertheless received only fragmented conceptual attention.

Schools sit at the operational front line of both preparedness and response. Curriculum content, teacher training, school-based emergency planning, evacuation and shelter arrangements, and family–school communication all shape whether learners with ASD are protected, informed, and included when climate-related or multi-hazard events occur. The United Nations Convention on the Rights of Persons with Disabilities (United Nations, 2006) and the Sendai Framework mandate disability-inclusive disaster risk reduction, while SDG 4 mandates inclusive and equitable quality education. Translating these normative commitments into provision that is specifically responsive to autistic learners has proved uneven and empirically underexamined (Watfern & Carnemolla, 2025). Recent single-case and multiple-probe intervention studies from Türkiye and elsewhere show that autistic learners can acquire and generalise earthquake and evacuation safety skills when instruction is delivered through evidence-based practices such as video modelling, digital social stories, and three-dimensional simulation (Kurt et al., 2024; Trinh et al., 2026; Ulaşman & Sivrikaya, 2025). Whether these findings have reached national inclusive education policy frameworks or global education-sector climate adaptation guidance remains largely unaddressed in the extant literature.

Contemporary events sharpen the urgency of this question. The 6 February 2023 Kahramanmaraş earthquake sequence in Türkiye generated a substantial body of empirical work on the psychosocial, educational, and behavioural consequences for autistic children and their families. Parallel literatures document autistic learners' experiences of wildfires in Southern Europe and North America, tsunamis in East Asia, and flash floods in South Asia (CBM Global, 2023). These studies indicate that the intersection of climate vulnerability, multi-hazard disaster risk, and inclusive education for learners

with ASD now constitutes a distinct and rapidly developing field of inquiry, one that has not to our knowledge been systematically mapped.

The present scoping review addresses this gap. Guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR; Tricco et al., 2018) and the methodological framework of Arksey and O'Malley (2005) as subsequently refined by Levac et al. (2010), the review maps the extent, range, and nature of scholarship at the intersection of climate vulnerability, climate-related and multi-hazard disaster risk, and inclusive or special education policy and practice for learners with ASD. Specifically, four research questions guide the synthesis:

RQ1. What is the extent and nature of the empirical and conceptual literature at the intersection of climate vulnerability, climate-related hazards, and inclusive education for learners with ASD?

RQ2. How do included studies conceptualise the vulnerability of learners with ASD in relation to climate change, climate-related hazards, and environmental exposures?

RQ3. What educational policy, curricular, and school-based responses are described in the literature, and how do these align with global normative frameworks — the UNCRPD, the Sendai Framework, SDG 4, the UNESCO Greening Education Partnership, and IPCC AR6?

RQ4. What research and policy gaps are identified, and what implications do these hold for special and inclusive education policy?

By mapping this emergent field, the review aims to inform special and inclusive education policy at national and international levels and to establish an initial evidence base for the systematic integration of ASD-inclusive considerations into education-sector climate adaptation and disaster preparedness policy frameworks.

Method

Protocol and reporting standard

The review was conducted in accordance with the methodological framework of Arksey and O'Malley (2005), as subsequently refined by Levac et al. (2010) and by the Joanna Briggs Institute Manual for Evidence Synthesis (Peters et al., 2020). Reporting follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR; Tricco et al., 2018). The authors developed the protocol a priori and documented it before database searching. The eligibility framework, search strategy, exclusion codes, and charting variables were finalised before database searching and applied consistently thereafter. Because scoping reviews do not require quality appraisal of individual sources of evidence (Peters et al., 2020; Tricco et al., 2018), no risk-of-bias

assessment was conducted. The Findings and Discussion instead provide a narrative account of methodological strength across the corpus.

Eligibility criteria

Eligibility was operationalised through the Population–Concept–Context (PCC) framework recommended for scoping reviews (Peters et al., 2020).

Population. Studies were eligible if they included learners with a stated diagnosis of autism spectrum disorder (ASD), across any age band, with a substantive emphasis on the school-age population. Studies with mixed-disability samples were included only when ASD-specific data could be separated at the reporting level.

Concept. The concept dimension covered climate change, climate variability, climate-related and multi-hazard disaster risk, and climate-linked environmental exposures. Consistent with the multi-hazard approach of the Sendai Framework for Disaster Risk Reduction 2015–2030 (UNDRR, 2015), the concept was operationalised broadly enough to include geophysical hazards such as earthquakes and tsunamis, provided these were framed within school-based multi-hazard preparedness or inclusive disaster-response policy, even where the hazard itself was not climate-caused. This decision was documented a priori and applied uniformly at screening.

Context. Studies were required to demonstrate a meaningful connection to an educational setting, education policy, curriculum, school-based practice, teacher preparation, or the family–school interface. Purely biomedical, genetic, pharmacological, or clinical-etiology studies without any education or policy anchor were excluded.

Publication-type criteria restricted the corpus to peer-reviewed empirical or conceptual articles and policy-oriented analyses. Systematic and scoping reviews were retained separately, for backward citation screening only. Editorials, letters, and short commentaries were excluded, and language was restricted to English. The publication window was 2015–2026 for the Web of Science, Scopus, and PubMed searches. For ERIC it was extended back to 2005 in order to capture the foundational post-Hurricane Katrina literature on disability and disaster preparedness, a decision recorded in the protocol.

Information sources

Four electronic databases were searched on 26 July 2026: Web of Science Core Collection (all indices), Scopus, ERIC, and PubMed. PsycINFO was initially planned as a fifth source but had to be dropped because institutional-licensing constraints precluded record export. PubMed was substituted as the fourth database for its broad coverage of the behavioural, environmental-health, and disability-related literature relevant to the review question. Grey literature from major international organisations such as UNESCO, UNDRR, UNICEF, WHO, OECD, and IPCC was treated as eligible, but the

electronic-database search returned no such records meeting the eligibility criteria, and no additional grey-literature search was therefore conducted.

Search strategy

The search strategy was developed iteratively through pilot searches in Web of Science and Scopus. A two-block Boolean strategy was adopted. The first block combined ASD terminology ("autism spectrum" OR autism* OR ASD OR asperger* OR "pervasive developmental" OR neurodivergen*). The second combined climate-change, climate-related-disaster, and environmental-exposure terminology ("climate change" OR "climate crisis" OR "global warming" OR "climate vulnerabilit*" OR "climate adapt*" OR "climate resilien*" OR "climate risk*" OR "eco-anxiety" OR "climate anxiety" OR "extreme weather" OR heatwave* OR "heat wave" OR wildfire* OR flood* OR drought* OR "air pollution" OR "air quality" OR "environmental change" OR "disaster preparedness"). The educational and policy dimension was operationalised at the eligibility-screening stage rather than at the database-query level. Building it into the query would have excluded studies that address the intersection substantively without using education-specific keywords in the title or abstract, a common structural limitation of database searching in young interdisciplinary fields.

Selection of sources of evidence

All records identified through the database search were exported to Rayyan (Ouzzani et al., 2016), a web-based systematic-review management platform. The electronic search returned 1,290 records: 457 from Web of Science, 426 from Scopus, 80 from ERIC, and 327 from PubMed. Automated deduplication in Rayyan, supplemented by a script combining DOI matching with title normalisation, removed 494 duplicates. Manual pair review of Rayyan's fuzzy-match suggestions identified two further duplicates, leaving 794 unique records for title-and-abstract screening.

Screening was conducted in Rayyan's blinded mode, with author and journal information concealed to reduce identification bias. The first author screened all 794 records at the title-and-abstract stage. A second reviewer, an independent expert in special education, screened a randomly selected 20 % of the corpus (n = 159) so that inter-rater reliability could be calculated. Agreement was assessed using Cohen's kappa (Cohen, 1960). Observed agreement was 100 %, corresponding to $\kappa = 1.00$. No consensus discussion or arbitration was therefore required.

Exclusion decisions at the title-and-abstract stage were coded using an a priori scheme of eight primary codes: E1 (population not ASD-focused), E2 (no climate or environmental concept), E3 (no educational or policy context), E4 (purely biomedical or clinical), E5 (unsuitable publication type, including review articles retained for backward citation screening only), E6 (inappropriate sample or design, including animal, cell-culture, and non-separable mixed-disability studies), E7 (residual duplicate), and E8 (non-English or full text unavailable). Two subcodes were added during pilot

screening to document sources of terminological noise. E2a covered records in which "sustainability" referred to intervention or programme sustainability rather than climate or environmental sustainability. E2b covered records in which "ASD" referred to Achievement School District, Anaerobic Soil Disinfestation, or Atrial Septal Defect rather than Autism Spectrum Disorder. In total, 769 records were excluded at this stage.

Twenty-five records were sought for full-text retrieval, and full text was obtained for 24 of them. One record (Costa, 2013) was excluded at the full-text stage because the full text could not be obtained after repeated attempts through the university proxy, open-access repositories, and interlibrary loan. At the consensus stage both reviewers re-evaluated each retrieved full text against the eligibility criteria, and three further records were excluded on scope grounds. Tse et al. (2022), a physical-exercise intervention with no climate, disaster, or environmental-hazard component, was excluded under E2. Stover et al. (2013), a study of postsecondary science communication in which the participants were not autistic learners and ASD figured only as a case-comparator on the autism-vaccine controversy, was excluded under E1. Shepley et al. (2016), a study of "environmental text" in the sense of environmental print such as signage and labels rather than climate or ecological content, was also excluded under E2. The final corpus therefore comprised 21 studies. Figure 1 presents the PRISMA-ScR flow diagram.

Data charting process

The first author developed a structured data-charting form in Microsoft Excel and piloted it on three records chosen to represent the methodological range of the corpus. The final charting variables were: study identifier; author(s) and year; country and setting; study design; population, including ASD-specific sample details, age range, and sample size; hazard or concept type; hazard category (a–g); educational context; policy level (macro, meso, or micro); theoretical or conceptual framework; principal findings at the hazard × ASD × education intersection; policy implications reported; identified gaps and recommendations for future research; alignment with the five global normative frameworks named above; and reviewer analytic notes. The first author charted each included study against its full text, and the second author verified the extractions for 20 % of the corpus. Table 1 presents the charted dataset in summary form, with the full version in the supplementary material.

The reviewers approached the corpus as external evaluators of the extant literature and of the intervention, curriculum, and policy studies mapped within it, rather than as members of any of the research teams whose work is synthesised. Neither reviewer had contributed to any included study, and neither was in a position to advocate for or against the findings of a particular study. This external-evaluator stance was maintained through eligibility screening, data charting, and thematic synthesis. We disclose it here to make the reviewers' analytic position relative to the corpus explicit.

Synthesis of results

Consistent with scoping-review methodology (Peters et al., 2020; Tricco et al., 2018), synthesis followed two steps. The first was a descriptive numerical summary of the corpus by publication year, geographic distribution, methodological design, sample characteristics, and hazard category. The second was an inductive thematic synthesis organised around the hazard-and-concept clusters that surfaced through charting. Alignment with the five global normative frameworks was mapped separately, as a distinct analytic layer. Because the review set out to map the extent and nature of the field rather than to evaluate intervention effectiveness, no quantitative meta-analytic techniques were applied.

Findings

Overview of the corpus

The final corpus comprises 21 studies published between 2007 and 2026 at the intersection of climate vulnerability, climate-related and multi-hazard disaster risk, and inclusive or special education for learners with autism spectrum disorder (ASD). The chronological distribution is markedly asymmetric. Only three studies (14.3 %) appeared before 2020, whereas 12 (57.1 %) were published between 2024 and 2026. Two developments account for this concentration: the 6 February 2023 Kahramanmaraş earthquake sequence in Türkiye, and the accelerating global attention to climate-linked risks for neurodivergent populations.

Türkiye dominates the geographical distribution (n = 8; 38.1 %), followed by the United States (n = 4), the United Kingdom (n = 2), and Australia (n = 2). Italy, Japan, India, and Vietnam each contribute a single study, and one further study spans the United Kingdom, United States, and Canada. The corpus is methodologically heterogeneous. Qualitative designs predominate (n = 9) and include phenomenological analyses, reflexive thematic analyses, content analyses, and Photovoice. Single-case experimental designs (SCED) account for a further three studies (Garcia et al., 2016; Kurt et al., 2024; Ulaşman & Sivrikaya, 2025), and two studies used group-comparison experimental designs (Self et al., 2007; Trinh et al., 2026). The remaining seven each represent a distinct design: a cross-sectional multicentre survey using standardised instruments (Eroglu et al., 2024), a longitudinal case–control design with the Vineland Adaptive Behaviour Scales (Valenti et al., 2012), a multi-cohort environmental-epidemiology study (Hash et al., 2025), a survey combined with geographic-information-system spatial analysis (Nakai et al., 2021), a scoping review (Watfern & Carnemolla, 2025), a design-based development study (Edmonds, 2017), and a conceptual practitioner-guidance article (Stenhoff et al., 2020).

Sample sizes ranged from three SCED participants to more than 1,100 children in the ECHO-PATHWAYS air-pollution cohort. In studies with exclusively autistic samples the range was 3 to 103 participants. Where mixed-disability samples were used, ASD formed a distinct reporting subgroup in every case retained after screening.

Five thematic clusters

The included evidence organises itself into five substantively distinct thematic clusters, mapped in Table 1 and elaborated below.

Cluster 1 — Earthquake and multi-hazard preparedness (n = 9). Earthquakes are the single dominant hazard in the corpus. Nine studies (42.9 %) directly examine the impact of earthquakes on autistic learners, and a further study (Nakai et al., 2021) addresses earthquake-triggered tsunamis. Seven of the nine earthquake studies are situated in Türkiye and address the 6 February 2023 Kahramanmaraş sequence, making that event the empirical centre of gravity of the entire field.

Two complementary methodological strands are visible. On the impact-documentation strand, Turkish qualitative studies triangulate parental (Kay et al., 2025; Şahin & Kaya, 2025; Şimşek et al., 2026) and teacher (Kay et al., 2026) perspectives, while Eroglu et al. (2024) add quantitative confirmation through parent-report scales administered to 103 children across three provinces of differing earthquake exposure. Agreement across these designs is unusually strong. Every impact study reports post-earthquake increases in core autism symptomatology, behavioural problems, self-care regression, and disruption of educational continuity, and the magnitude of impact scales with the duration of educational interruption. Eroglu et al. (2024) found significantly larger increases in core autism symptoms, irritability, and hyperactivity in Hatay and Şanlıurfa, the two provinces with prolonged special-education service disruption, than in the Ankara control group. Late-diagnosed ASD stood out as a high-risk sub-population. Valenti et al. (2012) offer a foundational longitudinal counterpoint from the 2009 L'Aquila earthquake, documenting a steep decline in adaptive behaviour during the first months after the disaster ($p < 0.01$ across all Vineland domains), with only partial recovery at one year despite intensive intervention.

On the intervention strand, two studies using single-case experimental designs (Kurt et al., 2024; Ulaşman & Sivrikaya, 2025) and one experimental VR–ABA study (Trinh et al., 2026) show that autistic learners can acquire, generalise, and maintain the "drop, cover, and hold on" protocol along with post-earthquake evacuation skills when instruction is delivered through evidence-based practices. Kurt et al. (2024) established a four-week maintenance interval using video modelling. Ulaşman and Sivrikaya (2025) reported maintenance at one, three, and five weeks using digital social stories. Trinh et al. (2026) found significant improvements in situational readiness following an immersive Unity3D-based ABA and discrete-trial-training simulation. The safety-instruction procedures used across these studies share a common theoretical lineage in the family of Errorless Teaching Methods, which minimise learner error during acquisition through prompt-dense delivery, systematic prompt fading, and progression by mastery criterion. Reading video modelling, digital social stories, and discrete-trial-training under this common umbrella clarifies their internal coherence and, more practically, what implementation requires. The effectiveness reported in the corpus depends on delivery fidelity, and fidelity depends in turn on

special-education teachers, paraprofessionals, and increasingly parents receiving structured training in errorless-teaching principles before they apply the procedures at school, at home, or in disaster-preparedness contexts. These intervention studies therefore establish two things at once: the technical means to prepare autistic learners for seismic events exists and travels across cultural contexts, and practitioner and parent training is the precondition for taking it to scale.

Cluster 2 — Climate-linked hydrometeorological hazards (n = 3). A smaller but conceptually important cluster addresses climate-linked hydrometeorological hazards. Vivek et al. (2026), the only flood-focused study in the corpus, gives a qualitative account of 14 caregivers of children with disabilities, autism among them, during the December 2023 Chennai flash floods, and attributes the rising frequency of such events to climate change and shifting monsoon patterns. Their findings foreground caregiver-driven "experience-informed preparedness" as an unrecognised form of adaptation. Nakai et al. (2021) address tsunami risk on Japan's Pacific coast through GIS-based spatial analysis of Emergency Shelters for Vulnerable People (ESVPs). They quantify staffing and spatial requirements at five professional staff and 135.9 m² for 33 children with neurodevelopmental disorders, and identify altitude, vertical evacuation capacity, and estuary-free evacuation direction as the decisive shelter-siting criteria. Hash et al. (2025), drawing on the ECHO-PATHWAYS three-cohort consortium (n = 1,166), extend the cluster to slower-onset stressors. Cumulative NO_2 exposure interacted with adverse childhood experiences to predict sleep-related impairment in middle childhood ($\beta = 0.43$, 95 % CI 0.08–0.78 per ACE). Although the authors do not themselves frame the study in climate terms, we read this as rare quantitative evidence for the kind of compound-stressor pathway that IPCC AR6 treats as characteristic of climate vulnerability.

Cluster 3 — Sustainability and environmental education (n = 3). Three studies map sustainability-oriented educational responses. Özergun-Köse and İmer-Çetin (2025) conducted a needs analysis with twenty Turkish science and special-education teachers. They identified resource efficiency, recycling, and environmental protection as priority sustainability content for middle-school autistic learners, and recommended visualisation and technology-mediated interventions as the pedagogical vehicle. The other two studies treat nature-based learning as an educational modality. Galbraith and Lancaster (2020) used Photovoice with three Australian parents of children with autism spectrum condition to document how access to wild nature supported children's deep interests, adaptation to change, creative play, and emotional regulation. Friedman et al. (2025) drew on fourteen practitioners across the United Kingdom, United States, and Canada, and identified an "ecology of affordances," the demanding practitioner role, and trust as the foundations of effective nature-based learning. Taken together, the three studies point to a growing but methodologically thin evidence base for sustainability content and nature-based pedagogy in autism education.

Cluster 4 — Climate discourse and representation (n = 1). Only one study directly addresses the representation of neurodivergent populations in climate change research and policy. Watfern and Carnemolla (2025), whose scoping review is the closest methodological precedent to the present one, synthesised ten studies at the intersection of intellectual disability and climate change. They identified heightened disaster-related risks and barriers, systematic absence from government disaster planning and response, and inclusive-education initiatives still "in their infancy." Their conclusion that people with intellectual disability are rarely leaders or collaborators in climate research shifts the normative agenda from inclusion of participants toward inclusion in governance. That distinction carries direct implications for special-education policy and for international climate policy instruments.

Cluster 5 — Multi-hazard educational continuity and emergency preparedness (n = 5). A fifth cluster addresses multi-hazard educational continuity and emergency-preparedness design. Edmonds (2017) reports phase-one design work on the What If? emergency-preparedness resources for children with autism, prompted by evidence from the London 2005 bombings inquest and framed within the wider disability and disaster literature. Later Turkish and Vietnamese intervention studies cite it frequently as design precedent. Two intervention studies from the United States address specific hazard skills. Garcia et al. (2016), using a multiple-baseline single-case design, showed Behavioural Skills Training, combining modelling, rehearsal, and praise, to be effective in teaching fire-evacuation and adult-notification behaviours to young children with autism, with five-week maintenance and generalisation to novel settings. Self et al. (2007), using a group comparison with eight children in a public school, contrasted virtual-reality and integrated visual approaches to teaching fire and tornado safety, and found both effective, with VR the faster of the two. Stenhoff et al. (2020) situate autism-specific distance-education strategies within a broader multi-hazard rationale that covers pandemics, natural disasters, and school closures alike. Fox et al. (2023) provide the corpus's most detailed account of pandemic-era school-transition impacts, drawing on interviews with 14 United Kingdom parents to identify divergent friendship trajectories and to argue for personalised transition support extending beyond the pandemic period.

Alignment with global normative frameworks

Explicit engagement with global normative frameworks is uneven across the corpus. The Sendai Framework for Disaster Risk Reduction 2015–2030 is either cited directly or operationalised implicitly in 14 of 21 studies (66.7 %), most consistently in the earthquake, flood, and tsunami clusters. The United Nations Convention on the Rights of Persons with Disabilities, particularly Articles 11 (situations of risk and humanitarian emergencies) and 24 (education), is invoked directly by seven studies (33.3 %) and supplies the normative backbone of Watfern and Carnemolla's (2025) argument. Sustainable Development Goal 4 on inclusive and equitable quality education is engaged, explicitly or implicitly, in 11 studies. Direct engagement with the UNESCO Greening Education Partnership, by contrast, appears

in only two studies (Friedman et al., 2025; Özergun-Köse & İmer-Çetin, 2025), and no included study cites IPCC AR6 Working Group II at all. That last absence is striking, given that the report is the source of the socially distributed account of vulnerability on which this literature implicitly relies. The uneven pattern is itself a substantive finding. It indicates that the empirical literature on ASD and climate risk is developing in parallel to the global normative architecture that governs it, rather than in conversation with it.

Identified gaps

Five substantive gaps recur across the corpus. First, the field is overwhelmingly reactive rather than anticipatory. Seventeen of twenty-one studies (81.0 %) examine the impacts of past events or immediate-response interventions, and none evaluates long-term adaptive planning or curriculum reform ahead of anticipated hazards. Second, parent- and practitioner-report perspectives dominate. Only the single-case and group-comparison intervention studies and Eroglu et al. (2024) capture direct child-level data, and no study gathers the voices of autistic learners themselves through qualitative or participatory methods. Third, the Turkish earthquake corpus, methodologically rigorous though it is, remains geographically concentrated and cross-sectional. No longitudinal ASD-specific cohort follows children through post-disaster recovery over several years. Fourth, climate-mitigation education, as distinct from climate-adaptation and disaster-response education, is almost entirely absent. Only Özergun-Köse and İmer-Çetin (2025) engage systematically with sustainability content, and no study evaluates the effectiveness of climate-literacy curricula for autistic learners. Fifth, the field contains no systematic policy analysis at national, regional, or global level. No included study assesses how far national special-education policy frameworks or global climate-policy instruments have integrated ASD-specific considerations, despite Watfern and Carnemolla's (2025) call for precisely this work.

Discussion

Principal findings and their policy significance

This scoping review synthesised twenty-one studies mapping the intersection of climate vulnerability, multi-hazard disaster risk, and inclusive education for learners with autism spectrum disorder (ASD). The synthesis yields four findings of direct significance for education-policy makers, curriculum authorities, teacher-preparation institutions, and international governance bodies.

The field is young and concentrated. More than half of the available evidence has appeared in the last three years, and eight of twenty-one studies address a single national context, Türkiye, in response to the 6 February 2023 Kahramanmaraş earthquake sequence. It is also hazard-heavy and mitigation-light. Sixteen studies address acute hazards, one addresses a slow-onset environmental exposure, three engage sustainability education, and one addresses climate discourse; none evaluate climate-literacy curricula for autistic learners. Conceptually, the corpus is strong on vulnerability and

underdeveloped on agency. Convergent evidence documents compounding vulnerabilities and identifies protective factors, but no included study treats autistic learners as agents of climate adaptation or environmental citizenship. Finally, the literature is decoupled from the global normative architecture that governs it. The Sendai Framework is engaged in two-thirds of included studies and the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) in one-third, while the UNESCO Greening Education Partnership figures in only two studies and IPCC AR6 in none. Each finding carries direct policy implications, and the sections that follow translate them into recommendations for the four principal audiences of this journal.

Reorganising the findings through a four-domain policy framework

The findings of the present review can be productively reorganised through the four-domain policy framework advanced by CBM Global (2020), which distinguishes Personal, Programmes, Policy, and Political dimensions of disability-inclusive climate action. At the Personal level, the corpus documents compounded vulnerabilities and coping strategies among individual autistic learners and their families. This is clearest in the Turkish parental interview studies (Kay et al., 2025; Şahin & Kaya, 2025; Şimşek et al., 2026), the Italian longitudinal study (Valenti et al., 2012), and the Indian caregiver study (Vivek et al., 2026). At the Programmes level, the corpus supplies evidence-based instructional programmes for safety-critical skills, including video modelling, digital social stories, Behavioural Skills Training, and immersive VR-ABA (Garcia et al., 2016; Kurt et al., 2024; Self et al., 2007; Trinh et al., 2026; Ulaşman & Sivrikaya, 2025), alongside programme-design work for emergency preparedness resources (Edmonds, 2017; Nakai et al., 2021). At the Policy level the corpus is thin. Only Watfern and Carnemolla (2025) systematically map how neurodivergent populations are incorporated into climate-policy instruments, and they find that few states include disability in climate adaptation policy and none in climate mitigation policy. At the Political level, meaning the participation of autistic learners themselves in climate governance and activism, the corpus is essentially silent. Sandoval et al. (2025) and Stein and Stein (2022) read that silence as a form of eco-ableism in its own right: the treatment of disabled people as unavoidable casualties of climate change rather than as agents of climate response.

This four-domain reading clarifies where the field needs to go next. The Personal and Programmes levels are empirically mature, while the Policy and Political levels are structurally underdeveloped and require targeted investment. It also clarifies a point for policy makers: instructional readiness at the Programmes level is no substitute for institutional inclusion at the Policy and Political levels.

Implications for national education policy makers

The available evidence supports four specific recommendations for national ministries of education and their equivalents.

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First, national special-education curricula should incorporate an explicit climate-vulnerability and multi-hazard-preparedness strand. The evidence base shows unequivocally that autistic learners can acquire, generalise, and maintain safety-critical skills when instruction is delivered through evidence-based practices (Garcia et al., 2016; Kurt et al., 2024; Self et al., 2007; Trinh et al., 2026; Ulaşman & Sivrikaya, 2025). The technical means to prepare autistic learners for earthquake, flood, and fire events already exists. What is missing is systematic curricular integration. In the Turkish context, the review's findings support a formal expansion of the special-education curriculum coordinated by the Ministry of National Education (Millî Eğitim Bakanlığı, MEB) to include a dedicated safety-and-preparedness strand beginning at primary level and continuing through secondary and vocational special-education programmes. The strand should set out learning outcomes at three progression levels of awareness, procedural competence, and generalisation. In line with the evidence base on ASD-appropriate assessment, it should be assessed through direct behavioural observation rather than written examination.

Second, teacher-preparation programmes for special education should require explicit preparation in climate-linked and multi-hazard educational continuity. Kay et al. (2026) document that Turkish special-education teachers were structurally under-prepared for the demands of post-earthquake service delivery, and that emotional exhaustion, restrictive environments, and trauma-triggering conditions substantially impeded recovery. Higher-education coordinating bodies, which in the Turkish context means the Council of Higher Education (Yükseköğretim Kurulu, YÖK) and elsewhere its national equivalents, should therefore require undergraduate and graduate special-education programmes to include a course, or an equivalent embedded strand, on trauma-informed practice, disaster continuity of instruction, and disability-inclusive emergency response. Such a course should be co-designed with the relevant disaster-management authority, AFAD in Türkiye and national civil-protection agencies elsewhere.

Curricular integration alone will not sustain teacher-preparation reform. That requires long-term institutional collaboration between universities and the regional service infrastructure. In Türkiye, the university-based Özel Eğitim Uygulama ve Araştırma Merkezleri (Special Education Application and Research Centers), the faculty-affiliated Özel Eğitim Uygulama Birimleri, and the network of private special-education and rehabilitation centres authorised by the Ministry of Family and Social Services and MEB together form a distributed applied-training system. That system is the natural implementation partner for a climate- and disaster-preparedness strand in special-education teacher education. YÖK and MEB should formalise long-term collaboration agreements between university departments of special education, their affiliated Application and Research Centers, and regional rehabilitation providers, with named institutional sponsorship, dedicated infrastructure, and multi-year budgetary commitments. Protocols of this kind would let pre-service teachers undertake structured practicum rotations in disaster-preparedness planning and post-disaster service continuity. They would also create durable fieldwork

platforms for the intervention research documented here, and would place university expertise inside the operational disaster-response architecture on which autistic learners and their families depend.

Third, national school-level disaster-continuity plans should specify quantitative provisions for autistic learners. Nakai et al.'s (2021) GIS-based analysis offers an initial evidence base for staffing ratios of five professional staff per thirty-three learners with neurodevelopmental disorders, a spatial allocation of 135.9 m² for the corresponding group, and shelter-siting criteria covering altitude, vertical evacuation, and estuary-free evacuation direction. These specifications should be adapted to national contexts and made mandatory in the disaster-continuity plans of schools serving autistic learners. In seismic-risk contexts they belong with earthquake-preparedness regulations, and in flood-risk contexts with hydrometeorological hazard planning.

Fourth, post-disaster response protocols should treat the rapid restoration of specialised educational services as a national priority. Eroglu et al. (2024) showed that the magnitude of post-earthquake regression in autistic learners scaled with the duration of educational interruption, and Şimşek et al. (2026), Kay et al. (2025, 2026), and Şahin and Kaya (2025) triangulate the finding across parent, teacher, and mixed samples. National disaster-response protocols should therefore set maximum acceptable interruption durations for special-education services, mandate priority reconstruction of special-education infrastructure, and provide for interim delivery through teletherapy, mobile educational support, and family-based instructional partnerships in the period between disaster onset and physical service restoration. Kay et al.'s (2025) recommendation that Applied Behaviour Analysis, mobile tools, and teletherapy be built into technology-based disaster-response policy gives this principle operational form.

Implications for curriculum design and integration

Beyond the strand-level recommendation above, three curriculum-design implications follow directly from the evidence base.

What should be taught. The evidence supports three content domains in special-education curricula for autistic learners. The first is procedural safety knowledge: the "drop, cover, and hold on" protocol for earthquakes, evacuation routes for fire and structural collapse, sheltering-in-place for storms and wildfires, and hydration and cooling behaviours for extreme heat. The second is sustainability literacy, covering resource-efficient consumption, waste separation and recycling, and basic environmental-protection behaviours (Özergun-Köse & İmer-Çetin, 2025). The third is climate-linked environmental awareness: recognising air-quality warnings, understanding extreme-weather notifications, and engaging with the concept of climate change itself at an age-appropriate level. These domains map onto the adaptation, mitigation, and citizenship dimensions of climate education recognised by the UNESCO Greening Education Partnership.

How it should be taught. The evidence base identifies a small number of consistently effective instructional approaches, all sharing the underlying architecture of Errorless Teaching Methods: prompt-dense delivery, systematic prompt fading, and progression by mastery criterion. Together these features minimise learner error during acquisition and so protect against the aversive escalation to which many autistic learners are particularly sensitive. Within this umbrella, video modelling is established as effective for earthquake-safety instruction, with maintenance at four weeks and generalisation to novel settings (Kurt et al., 2024). Digital social stories yield equivalent outcomes with maintenance at five weeks (Ulaşman & Sivrikaya, 2025). Behavioural Skills Training, combining modelling, rehearsal, and praise, is effective for fire safety with five-week maintenance (Garcia et al., 2016). Immersive virtual-reality environments combined with Applied Behaviour Analysis show promise for earthquake-preparedness training in special-education settings (Self et al., 2007; Trinh et al., 2026). Curriculum designers should treat these four approaches as the empirically preferred delivery modalities for safety-preparedness content and specify them in national curricular guidance rather than leaving delivery to teacher discretion. Explicit-instruction principles, visual supports, task analysis, and systematic prompting and prompt-fading procedures should be embedded across all four. Their effectiveness depends on delivery fidelity, which means curricular specification has to be paired with systematic training of implementers in the errorless-teaching principles that underwrite the procedures. Pre-service and in-service special-education teachers, paraprofessionals, and parents all fall within that training obligation. Instructional design at the level of the child cannot be separated from capacity-building at the level of the practitioner.

Where it should be delivered. The evidence supports a distributed delivery model in preference to a stand-alone module. Learners acquire safety-preparedness content most reliably when they practise it repeatedly across settings, teachers, and time points, and single-episode disaster drills are not sufficient (Garcia et al., 2016; Self et al., 2007). Curriculum designers should therefore make recurrence intervals, such as quarterly rehearsal cycles, and cross-setting generalisation requirements across classroom, corridor, playground, and transportation contexts mandatory delivery parameters. Sustainability-literacy content admits a wider range of delivery contexts, including science classes, life-skills classes, and outdoor and nature-based learning programmes (Friedman et al., 2025; Galbraith & Lancaster, 2020).

Implications for global education and disability governance

The synthesis carries three implications for the global education- and disability-governance architecture in which national policy is embedded.

First, the UNESCO Greening Education Partnership and its country-level implementation plans should address the inclusion of learners with disabilities, and of neurodivergent learners in particular. The Partnership's Pillar 2 on learning environments is the natural entry point for the school-preparedness recommendations set out above, and Pillar 3 on capacity building of teachers is the entry point for the

teacher-preparation recommendations. That only two included studies engage the Partnership explicitly suggests considerable room for exchange between the special-education research community and the climate-education policy community.

Second, the Sendai Framework mid-term review process, and the eventual successor framework, should incorporate disability-disaggregated indicators for children in education and should recognise the special-education sector as a distinct implementation domain with its own planning and reporting requirements. Watfern and Carnemolla's (2025) finding that few states include people with disability in their climate adaptation policies indicates that voluntary reporting has not been sufficient, and that formal indicator specification is warranted.

Third, UNCRPD State Party reporting under Article 24 on education and Article 11 on situations of risk should be explicitly linked. Under the current pattern of parallel reporting, Article 24 reports engage education policy while Article 11 reports engage disaster response, which mirrors and reinforces the split between response and anticipation found in the empirical corpus. Joint reporting requirements, or at minimum required cross-references between the two Articles, would create an incentive for the integrated policy design that the evidence base supports.

Implications for internationally-funded research programmes

The gaps identified above map onto the priorities of several major internationally-funded research programmes and offer concrete pathways for coordinated cross-national action.

Horizon Europe provides the most direct instrument. Cluster 5 on Climate, Energy and Mobility, and within it Destination 1 on climate sciences and responses for the transformation towards climate neutrality and Destination 2 on cross-sectoral solutions for the climate transition, carry explicit funding streams for research on climate adaptation, resilience, and vulnerable populations. Consortia combining special-education researchers, disability-studies scholars, and climate-adaptation specialists could pursue calls under these Destinations to design and evaluate ASD-inclusive climate-education curricula and disaster-preparedness protocols across several European Union member states. The Horizon Europe Mission on Adaptation to Climate Change, with its 150 or more signatory regions and its stated commitment to leaving no one behind, is a further natural home for disability-inclusive demonstrator projects in regions of high seismic or hydrometeorological risk.

Erasmus+ KA220 on Cooperation Partnerships in School Education offers a complementary pathway focused on curriculum development and teacher preparation. A partnership of universities, special-education schools, and teacher-training institutions drawn from countries with recent disaster exposure, such as Türkiye after Kahramanmaraş in 2023, Italy after L'Aquila in 2009, and Greece after the Thessaly floods in 2023, could develop and pilot standardised safety-preparedness modules for autistic learners using the video-modelling, digital-social-story, and Behavioural Skills Training

approaches synthesised here. The higher-education strand of KA220 would support the parallel task of embedding trauma-informed disaster-continuity content in initial teacher-education curricula for special-education teachers.

COST (European Cooperation in Science and Technology) Actions are well suited to network-building at the pre-Horizon stage. A COST Action on neurodiversity, climate vulnerability, and inclusive education would bring together researchers, policy makers, disability-representative organisations, and civil-protection agencies across signatory countries to consolidate the evidence base, standardise assessment instruments, and prepare the ground for larger Horizon Europe consortia.

Erasmus+ Jean Monnet Modules offer a further pathway with a distinct policy-teaching remit. A Module on European approaches to inclusive climate and disaster-resilience education, taught through university-based special-education programmes in European Union and neighbouring countries, would embed the review's findings in postgraduate curricula and train teacher educators fluent in both European inclusive-education policy and climate-adaptation governance. Marie Skłodowska-Curie Doctoral Networks address the same need one stage earlier, by training researchers who specialise at this intersection. As the present review shows, that specialism is currently scattered across siloed disciplinary literatures and will not consolidate without deliberate cross-disciplinary training pipelines. National and bilateral instruments provide additional routes for context-specific programmes of work, among them TÜBİTAK 1001 and 1003 in Türkiye, NIHR in the United Kingdom, the NIH Fogarty International Center in the United States, and Japan's JSPS Grants-in-Aid.

One concrete example is worth stating. In the Turkish context, a TÜBİTAK 1001 programme on artificial-intelligence-assisted mobile monitoring and emergency-response ecosystems for the parents of preschool autistic children would translate the mobile-tool and teletherapy priority articulated by Kay et al. (2025) into a research-and-development pipeline. Such a programme would integrate wearable-sensor and smartphone-based hazard detection, real-time communication between families, schools, and emergency services, and automated triage of ASD-specific accommodation needs during evacuation and shelter operations. It would couple special-education science to disaster-technology innovation in a way the present corpus does not yet contain. Dissemination requires its own channels, and national interdisciplinary platforms supply them: the National Congress on Early Childhood Intervention (Erken Çocuklukta Müdahale Kongresi) and comparable regional congresses are where internationally funded findings reach Turkish and neighbouring-country practitioners, policy makers, and family organisations. These platforms close the research-to-practice loop that the literature otherwise leaves open.

Beyond the European Research Area, UNESCO Chair programmes on inclusive education and on climate-change education offer institutional homes for coordinated multi-country initiatives, while disability-inclusive adaptation projects under the UN Green Climate Fund (CBM Global, 2020) provide

direct implementation channels. World Bank commitments on inclusive post-disaster reconstruction (Stein & Stein, 2022) open parallel pathways in low- and middle-income countries. Between them, these instruments now supply the funding architecture needed to move the field away from its current response-oriented, single-country pattern and toward the coordinated, anticipatory, multi-national research programme the evidence base calls for.

Strengths and limitations

The review's strengths are a four-database search, blinded reviewer screening in Rayyan with perfect inter-rater agreement ($\kappa = 1.00$) on a randomly selected 20 % double-screened sub-sample, and the a priori mapping of charting variables onto the global normative frameworks central to the review's policy purpose. Several limitations qualify the findings. The search was restricted to English-language sources, and institutional-licensing constraints precluded access to PsycINFO. One full text could not be obtained (Costa, 2013). No formal quality appraisal was carried out, which is consistent with scoping-review methodology but means the synthesis cannot rank the corpus by methodological strength. The corpus itself relies heavily on parent- and practitioner-report perspectives and contains limited direct child-level data, so conclusions about autistic learners' own experience remain indirect.

Directions for future research

Five research priorities follow. The first is longitudinal ASD-specific cohort work following autistic learners through multi-year post-disaster recovery. The second is participatory research that places autistic learners' own accounts at the centre, which would address the near-total absence of learner-level qualitative evidence. The third is systematic design work and effectiveness evaluation for climate-mitigation and climate-literacy curricula, extending the Turkish e-book precedent (Özergun-Köse & İmer-Çetin, 2025). The fourth is policy analysis mapping how far national special-education frameworks have integrated ASD-specific climate and disaster considerations, a gap the present review documents but cannot itself fill. The fifth is replication of the Turkish evidence base in other high-seismic and high-flood settings, together with comparison across governance regimes, which would show how far the Kahramanmaraş findings generalise.

Conclusion

The intersection of climate vulnerability, multi-hazard disaster risk, and inclusive education for learners with ASD is expanding quickly but remains structurally underdeveloped. The available evidence documents compounding vulnerabilities, identifies effective evidence-based practices, and points to the rapid restoration of specialised services as the single most consequential post-disaster protective factor. What it does not yet do is treat autistic learners as agents of climate adaptation and environmental citizenship, and it remains largely decoupled from the global normative architecture that governs it. Closing these gaps requires coordinated action at four levels of education-sector governance.

National curricula need a dedicated safety-and-preparedness strand. Teacher-preparation programmes need to require explicit preparation in disability-inclusive disaster response. National disaster-continuity protocols need quantitative provisions for autistic learners. The global education- and disability-governance architecture needs to link its climate, disaster, and inclusive-education strands formally rather than in parallel. The evidence base is thin, but it is sufficient to inform initial policy design. What happens next is a matter of institutional and scholarly will.

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Table 1. *Characteristics of the Included Studies (N = 21), Ordered by Thematic Cluster*

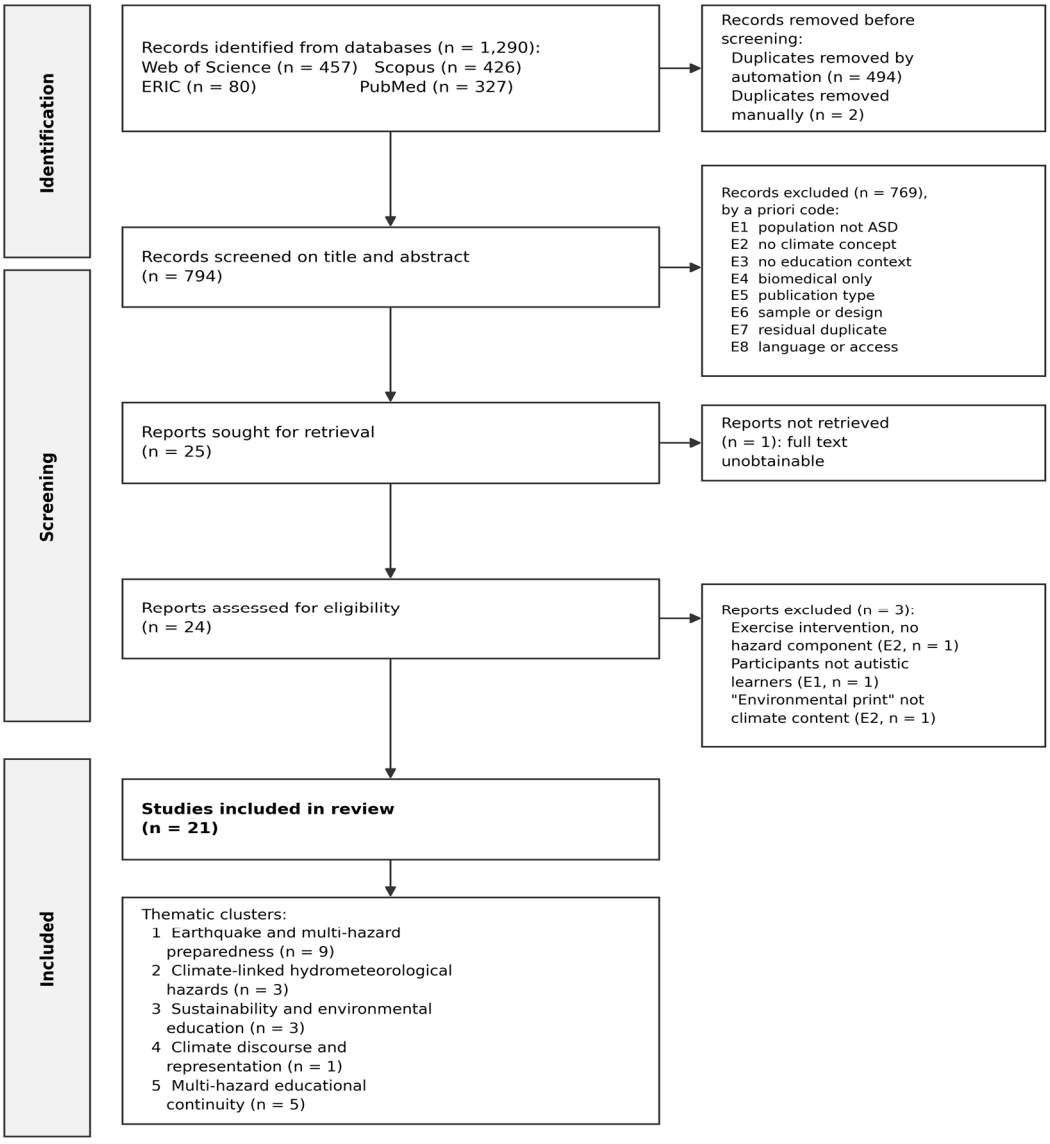
Study	Country / setting	Design	Sample	Hazard or concept	Cluster
Eroglu et al. (2024)	Türkiye (Hatay, Şanlıurfa, Ankara)	Cross-sectional multicentre; parent-report standardised scales	103 children and adolescents with ASD, aged 6–18	Earthquake	1
Kay et al. (2025)	Türkiye (Malatya)	Qualitative; content analysis of semi-structured interviews	22 parents of children with ASD	Earthquake	1
Kay et al. (2026)	Türkiye (Kahramanmaraş, Malatya, Hatay, Adıyaman)	Qualitative; thematic analysis; criterion and snowball sampling	22 special education teachers	Earthquake	1
Kurt et al. (2024)	Türkiye (Eskişehir, Van)	SCED; multiple baseline across participants	3 boys with autism, aged 9–10	Earthquake	1
Şahin & Kaya (2025)	Türkiye (Kahramanmaraş-affected provinces)	Qualitative; phenomenological design	15 parents of 21 children with intellectual disability or	Earthquake	1

			autism		
Şimşek et al. (2026)	Türkiye (İzmir, Diyarbakır)	Qualitative; phenomenological and thematic analysis	Parents of 21 children with ASD in special education centres	Earthquake	1
Trinh et al. (2026)	Vietnam (Hanoi)	Group-comparison experimental; VR/3D simulation with ABA discrete-trial training	Children with ASD	Earthquake	1
Ulaşman & Sivrikaya (2025)	Türkiye (Tuzla, Bolu)	SCED; multiple probe across participants	3 students with ASD in a primary special-education classroom	Earthquake	1
Valenti et al. (2012)	Italy (L'Aquila)	Longitudinal case–control; Vineland scales at baseline, 6 months, 1 year	Children and adolescents with ASD vs. unexposed peers	Earthquake	1
Hash et al. (2025)	United States (WA, NJ, CA, MN, TN)	Prospective multi-cohort environmental epidemiology; ECHO-PATHWAYS	1,166 children (719 for ACE analyses), aged 8–9	Air quality (NO_2) and ACEs	2
Nakai et al. (2021)	Japan (Kochi Prefecture, Pacific coast)	Cross-sectional survey with GIS-based spatial analysis	47 children with neurodevelopmental disorders and caregivers	Tsunami and earthquake	2
Vivek et al. (2026)	India (Chennai, Tamil Nadu)	Exploratory qualitative; thematic analysis of interviews	14 caregivers of children with disabilities, autism included	Flash flood	2
Friedman et al. (2025)	United Kingdom, United States, Canada	Qualitative; reflexive thematic analysis	14 nature-based-learning practitioners	Sustainability and nature-based education	3
Galbraith & Lancaster (2020)	Australia (New South Wales)	Qualitative; Photovoice with thematic analysis	3 parents of children with autism, aged 5–10	Sustainability and nature-based education	3
Özergun-Köse & İmer-Çetin (2025)	Türkiye (Çanakkale)	Qualitative descriptive; content analysis of interviews	10 science and 10 special education teachers	Sustainability education	3
Watfern & Carnemolla (2025)	Australia (authors); global literature scope	Scoping review (PRISMA-ScR) of 10 studies	People with intellectual disability, autism co-occurring	Climate discourse and representation	4
Edmonds (2017)	United Kingdom (London)	Design-based development study; phase-one project report	Children with autism as design target	Multi-hazard emergency preparedness	5
Fox et al. (2023)	United Kingdom	Qualitative; reflexive thematic analysis of interviews	14 parents of autistic children and young people	Pandemic as continuity disruption	5
Garcia et al. (2016)	United States (Florida)	SCED; multiple baseline across children	Young children with autism	Fire safety	5
Self et al. (2007)	United States (Wichita, Kansas)	Group comparison; VR vs. integrated visual model	8 children with ASD in a public school	Fire and tornado safety	5

Stenhoff et al. (2020)	United States (Arizona, North Carolina)	Conceptual practitioner-guidance article; strategy synthesis	Students with ASD and complex needs in rural settings	Multi-hazard educational continuity	5

Note. ASD = autism spectrum disorder; SCED = single-case experimental design; GIS = geographic information system; ABA = applied behaviour analysis; VR = virtual reality; ACE = adverse childhood experience. Clusters: 1 = earthquake and multi-hazard preparedness; 2 = climate-linked hydrometeorological hazards; 3 = sustainability and environmental education; 4 = climate discourse and representation; 5 = multi-hazard educational continuity.

Figure 1. *PRISMA-ScR Flow Diagram of the Study Selection Process*



Note. Adapted from the PRISMA 2020 flow template as extended for scoping reviews (PRISMA-ScR; Tricco et al., 2018). Exclusion codes E1–E8 are defined in the Method section.