

“Methodological landscapes in tourism crisis management: A systematic mapping review of research designs, 2007–2025”

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METHODOLOGICAL LANDSCAPES IN TOURISM CRISIS MANAGEMENT: A SYSTEMATIC MAPPING REVIEW OF RESEARCH DESIGNS, 2007–2025

Abstract

This study systematically reviews methodological approaches in tourism crisis management research, examining 374 peer-reviewed articles indexed in Scopus and published between 2007 and 2025. Following PRISMA guidelines, 411 records were identified through a structured Scopus search, and 37 were excluded during screening (15 not substantively addressing crisis management in tourism and 22 falling outside the 2007–2025 window), yielding a final sample of 374 articles. Each article was classified along two dimensions: crisis type (COVID-19/health, war/political/terrorism, natural disaster, financial/economic, or general) and research methodology (paradigm, specific methods, analytical techniques). Classification drew on titles, abstracts, and author keywords rather than full texts; findings should be interpreted accordingly. Because the search string required at least one methodology-related term, the corpus represents the methodology-signaling segment of the literature, and reported shares should be read within that scope. The findings reveal a corpus dominated by qualitative research (56.4% of articles), led by interviews (34.2%) and surveys (21.7%). COVID-19 and health-related crises account for 57.2% of the corpus, confirming a strong post-2020 concentration. Experimental designs appear in 0.8% of articles and longitudinal designs in 2.7%. In comparison, mixed methods research remains at 5.9%, indicating persistent gaps in designs best suited to causal inference and to tracking crises over time. The study contributes a five-category crisis typology, an evidence-based diagnostic of methodological strengths and gaps, and a research agenda for methodological diversification. Practically, stronger and more diverse methodologies improve the evidence base for tourism organizations, destination authorities, and public administrators making decisions under uncertainty.

Keywords

systematic mapping review, research methodology,
crisis management, tourism, COVID-19, organizational
resilience, decision-making

JEL Classification

L83, M10, D81, Z32

INTRODUCTION

The tourism and hospitality sector is among the economic sectors most exposed to external shocks (Hall, 2010; Laws & Prideaux, 2005). Natural disasters, terrorist attacks, financial crises, and pandemics have all hit the industry, and their frequency has risen over the past two decades. COVID-19, which froze international travel for an extended period, exposed the sector's fragility and pushed crisis management to the center of tourism research (Gössling et al., 2021; Sigala, 2020). Publication volume has grown sharply since, with more than four-fifths of all work in the field appearing after 2020.

Method choices matter for what management knowledge a field can build. Research designs, data sources, and analytical techniques together set the limits of what questions can be asked and what answers can be defended (Creswell & Plano Clark, 2018). A field that leans on

one type of method develops particular strengths and blind spots: interviews yield rich case insight but limited generalizability, while quantitative analysis supports testing and prediction but can miss process dynamics.

Crisis research has particular reasons to take methodology seriously. Crises play out through distinct phases (Faulkner, 2001; Ritchie, 2004), and different designs see different parts of that arc; crises are tied to context, so generalizability hinges on the variety of settings studied; and since tourism operators, DMOs, and public bodies act on this evidence, the strength of the field's methods feeds directly into the strength of its advice. Yet while the substantive findings of tourism crisis research have been reviewed repeatedly, the way this research is actually conducted (the paradigms, designs, and analytical techniques on which its conclusions rest) has not been examined systematically. This gap in the field's methodological self-knowledge constitutes the scientific problem this study addresses.

1. LITERATURE REVIEW

Tourism crisis management theory developed through a series of foundational contributions in the early 2000s. Faulkner's (2001) six-phase disaster management framework has been widely adopted and adapted since, and Ritchie (2004) extended it with a strategic management view spanning planning, implementation, and evaluation; both stressed proactive rather than reactive approaches. Coombs's (2019) situational crisis communication theory centered communication in how stakeholder perceptions form, Laws and Prideaux (2005) built a crisis typology around origin, scope, and predictability, and Hall (2010) argued that the diversity of disruptions facing tourism demands equally diverse analytical approaches, a point that directly motivates this study.

The crises studied have widened over two decades: early work focused on natural disasters and terrorism (Estêvão & Costa, 2020; Laws & Prideaux, 2005); health crises entered the agenda through SARS, Ebola (Novelli et al., 2018), and H1N1, but stayed modest in volume; and financial crises drew only periodic attention after 2008. COVID-19 then reshaped the field, generating a surge of research and shifting its thematic and methodological balance (Aldao et al., 2021; Gössling et al., 2021; Sigala, 2020). Climate change is expected to widen this agenda further (Peeters et al., 2024).

The growing literature has prompted a wave of review and synthesis studies. Ritchie and Jiang (2019) synthesized 142 papers on tourism risk, crisis, and disaster management from 1960 to 2018, finding gaps in theoretical foundations,

framework testing, and methodological diversity, though their focus was thematic. Jiang et al. (2019) added a bibliometric visualization of the field's intellectual structures. After COVID-19, Utkarsh and Sigala (2021) reviewed 177 first-year pandemic papers, showing a concentration on impact assessment and recovery. Wut et al. (2021) analyzed 512 articles across 36 years (1985–2020), proposing a Theory-Context-Method framework and flagging generalizability, sampling limitations, and overreliance on certain data-collection instruments as weaknesses in prior work. Bhatt et al. (2022) mapped 440 COVID-19 tourism sustainability records. Leta and Chan (2021) set out future research directions for hospitality, Casal-Ribeiro et al. (2023) ran a meta-analysis of 14 crisis management frameworks from 2000–2022, and Khardani and Schmude (2024) reviewed 15 tourism crisis management models, identifying stakeholders and structural elements across them. Most recently, Biswas et al. (2025) reviewed 396 papers on tourism crisis through an integrated framework.

Positioning this study precisely within the family of review types requires distinguishing among them (Grant & Booth, 2009; Munn et al., 2018). A systematic review synthesizes substantive findings in response to a defined question using explicit, reproducible search and screening procedures. A scoping review maps the breadth of an emerging area without necessarily appraising individual studies in depth. A bibliometric review analyzes publication and citation metadata to reveal intellectual structures and thematic clusters. A meta-analysis, in the strict statistical sense, pools effect sizes across comparable empirical studies. The present study belongs to a further type: a system-

atic mapping review of methodology, which applies systematic search and screening procedures but classifies studies by their research designs and analytical techniques rather than pooling their findings. In this respect, it differs conceptually and methodologically from Casal-Ribeiro et al. (2023). Their meta-analysis aggregates the structural elements of 14 crisis management frameworks; the unit of analysis is the framework and the object of interest is conceptual content. In contrast, our study's unit of analysis is the individual empirical article, the object of interest is method, and the output is a mapped distribution of research designs across crisis types and time rather than a consolidated framework.

Useful as these reviews are, they share a limit: they focus on what is studied rather than how it is studied. Methodological observations appear only as side notes; none maps methods systematically across crisis types. This leaves a gap, since the robustness and usefulness of a field's findings rest on the quality and diversity of its methods.

Tourism research spans qualitative, quantitative, and mixed paradigms (J.W. Creswell & J.D. Creswell, 2018). Qualitative methods offer rich, context-bound, process-oriented understanding; quantitative methods support hypothesis testing and statistical generalization; and mixed methods combine both, with strong complementary potential but real technical demands (Creswell & Plano Clark, 2018). Methodological balance has drawn growing attention. Truong et al. (2020) found mixed methods work substantial in absolute terms, but a small share of total output across eight major journals (1998–2019). Huang et al. (2025) confirmed these patterns in a review of 328 mixed methods papers. Finally, Molina-Azorín and Font (2016) called explicitly for greater pluralism given the complexity of tourism phenomena. Recent methodological evidence sharpens these concerns: Dolnicar et al. (2024) document survey dominance and rare experimentation in quantitative tourism research, and Yıldırım et al. (2025) report persistent gaps in the methodological reporting of qualitative studies.

Method choice carries extra weight in crisis research. Crises are dynamic, context-embedded, and often unpredictable, which creates practical barriers to some designs (Mair et al., 2016). Thus,

pre-post experiments need baselines that may not exist, longitudinal panels need sustained contact with respondents who may be displaced, and real-time data collection raises ethical and logistical issues. These constraints help explain current patterns, but they also point to the need for methodological creativity.

This study fills that gap. Drawing on 374 peer-reviewed articles indexed in Scopus between 2007 and 2025, it offers the first cross-crisis systematic mapping review of the research paradigms, methods, and analytical techniques used in tourism crisis management research, sitting alongside existing content-focused reviews (Casal-Ribeiro et al., 2023; Leta & Chan, 2021; Ritchie & Jiang, 2019). Moreover, it tracks how methodological choices vary across crisis types and time periods. Four research questions guide the analysis:

RQ1: What are the dominant research paradigms and methodological approaches in tourism crisis management research?

RQ2: How do methodological choices vary across different crisis types (health/pandemic, war/political, natural disaster, financial, and general)?

RQ3: How have methodological approaches evolved over time, particularly before and after the onset of the COVID-19 pandemic?

RQ4: What methodological gaps exist in the current literature, and what directions should future research pursue to strengthen the field's evidence base?

Our study introduces a five-category crisis typology that moves past extant binary splits such as natural versus human-made (Hall, 2010; Laws & Prideaux, 2005) and provides an evidence-based diagnostic of the field's methodological strengths and gaps. In addition, it sets out a research agenda tying method choices to the specific features of different crisis contexts, answering long-standing calls for methodological pluralism (Huang et al., 2025; Molina-Azorín & Font, 2016; Truong et al., 2020). The contribution sits at the intersection of management methodology and evidence-informed decision-making (Tranfield et al., 2003).

2. METHOD

The study uses a systematic mapping review design following the PRISMA 2020 guidelines (Page et al., 2021). It focuses on methodological characteristics rather than effect sizes, classifying articles by paradigm, methods, crisis type, and period; no statistical pooling of findings is undertaken, which distinguishes the design from a meta-analysis in the strict sense (Grant & Booth, 2009). The approach follows the evidence-informed management knowledge framework of Tranfield et al. (2003). The analysis ran in four phases: database selection and search; screening against eligibility criteria; classification along crisis-type and methodological dimensions; and descriptive, temporal, and cross-tabulated analysis.

2.1. Data source and search strategy

Scopus served as the primary data source; its coverage of social science, business, and tourism journals exceeds Web of Science in the social sciences (Mongeon & Paul-Hus, 2016) and includes the field's leading outlets.

The following search string was developed iteratively to balance comprehensiveness against precision:

TITLE-ABS-KEY("crisis management") AND TITLE-ABS-KEY(tourism) AND (TITLE-ABS-KEY(method) OR TITLE-ABS-KEY(survey) OR TITLE-ABS-KEY("case study") OR TITLE-ABS-KEY(interview*) OR TITLE-ABS-KEY(SEM) OR TITLE-ABS-KEY(regression) OR TITLE-ABS-KEY(qualitative) OR TITLE-ABS-KEY(quantitative) OR TITLE-ABS-KEY("mixed method*))*

The search was refined using the following filters: publication years restricted to 2007 through 2025; source type limited to journals; document types limited to articles and reviews; subject areas restricted to Business, Management and Accounting, Social Sciences, Economics, Econometrics and Finance, and Multidisciplinary; and language limited to English. The inclusion of methodology-related search terms was a deliberate design choice intended to improve the likelihood that identified articles would contain sufficient methodological in-

formation for classification. This choice has a direct consequence for scope: because every record had to match at least one methodology-related term in its title, abstract, or author keywords, the corpus does not represent the full population of tourism crisis management research but its methodology-signaling segment. The study therefore maps methodological reporting within this filtered corpus, and the shares reported below should be read in that scope. This initial search yielded 411 records.

Two properties of the filter bound its influence. First, the block includes the generic term "method*", which matches broad phrasing such as "methods" or "methodology" rather than any specific technique: 68 of the 411 identified records matched the block only through this generic term, and a further 11 matched no block term in their titles or abstracts at all, entering through author keywords alone. Roughly one fifth of the identified records (19.2%) thus entered the corpus without naming any specific method. Second, the direction of the remaining bias is knowable: methods that appear in the search block (interviews, surveys, case studies, SEM, regression) can only be over-represented relative to the unfiltered literature, while methods absent from the block (for example, netnography, Delphi panels, content analysis, bibliometric approaches) can only be under-represented. Because the filter is applied uniformly across all years, within-corpus temporal comparisons are less affected than absolute prevalence estimates. As a direct check, the query was re-run in July 2026 with and without the methodology block under otherwise identical filters. The unrestricted query returned 571 records against 361 for the full query on the same date, so the methodology block captures 63.2% of the crisis management and tourism literature indexed under these filters. As the selection logic predicts, the share of included articles with no methodology keywords in their abstracts (21.1%) is lower than the 36.8% share excluded by the block. Because Scopus coverage dates and source classifications are updated continuously, counts from re-run queries differ from the archived export on which the published corpus rests; the comparison therefore uses two counts taken on the same day.

2.2. Screening and selection

Because a single database was used and records were exported in one batch, no duplicate re-

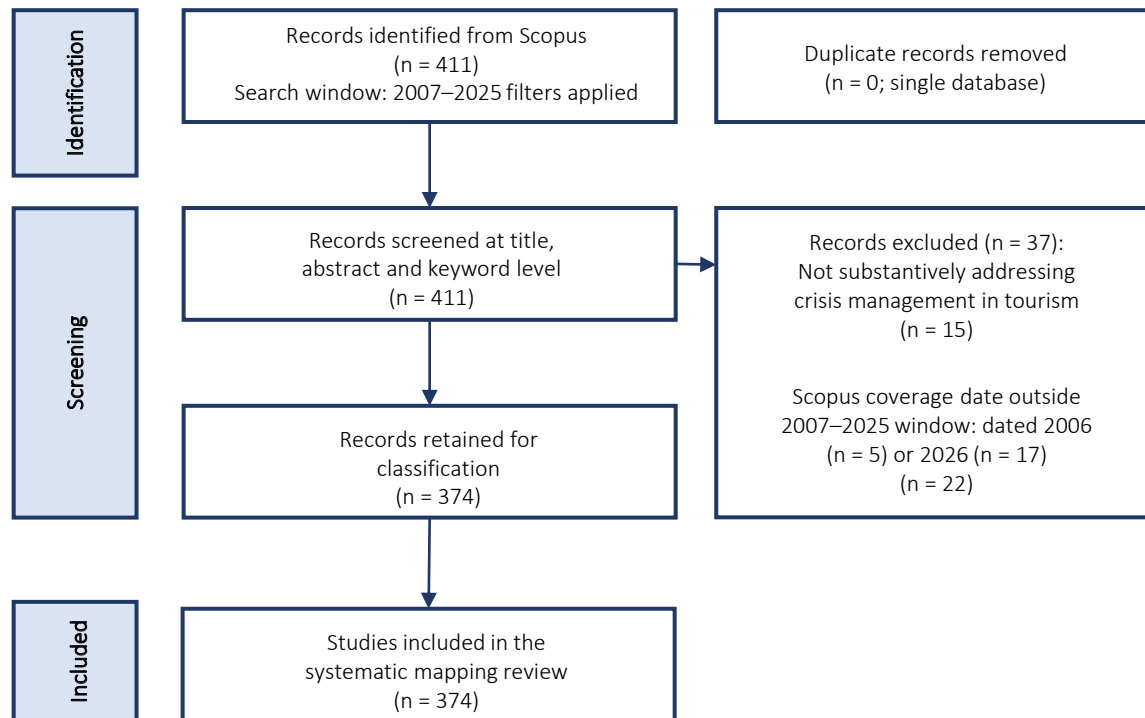


Figure 1. PRISMA flow diagram of the study selection process

cords required removal. All 411 records then underwent screening at the title, abstract, and keyword level, at which stage 37 records were excluded on two grounds. First, 15 records did not substantively address crisis management in tourism (for example, medical tourism without a crisis dimension, traffic safety analyses, leadership studies without crisis framing, and bibliometric reviews of unrelated fields). Second, 22 records carried Scopus coverage dates outside the 2007–2025 study window: 5 records dated 2006 and 17 early-access records dated 2026. This is an artefact of how Scopus assigns coverage dates. The year filter operates on the coverage date current at query time, but coverage dates near the boundaries of a filtered window can differ from final publication dates. Most commonly, articles accepted toward the end of the window and initially indexed as early-access are re-assigned to the following year's volume (the 17 records dated 2026), while a small number of items published at the very start of the window carry the preceding year's coverage date (the 5 records dated 2006). These 22 records were excluded to keep the corpus strictly aligned with the stated 2007–2025 publication window. No separate full-text eligibility stage was applied,

as classification was performed at the level of titles, abstracts, and author keywords. The final analytical sample therefore comprised $411 - 15 - 22 = 374$ articles. The full PRISMA flow diagram is shown in Figure 1.

2.3. Classification scheme

Each article was classified along two primary dimensions: crisis type and methodology. Coding proceeded in three steps. In the first step, a structured keyword dictionary was applied to the title, abstract, and author keywords of each article. The keyword lists for each category were developed from three sources:

- (a) standard terminology appearing in published reviews of tourism crisis research (Casal-Ribeiro et al., 2023; Leta & Chan, 2021; Ritchie & Jiang, 2019);
- (b) methodological terminology drawn from J.W. Creswell and J.D. Creswell (2018) and Creswell and Plano Clark (2018); and
- (c) inductive additions identified during a pilot coding of 30 randomly selected articles.

In the second step, automated keyword matching was performed using Python scripts, with each article assigned to all applicable crisis-type and method categories. In the third step, every article assignment was subjected to manual verification by the authors, with particular attention to ambiguous or multi-category cases. Articles with no identifiable methodology keyword in the abstract were coded as “not specified” rather than assigned by inference, in order to preserve an accurate picture of methodological reporting practices. All classification was thus based exclusively on titles, abstracts, and author keywords; full texts were not coded, and all findings reported below describe methodological reporting at the abstract level rather than the full methodological content of the underlying studies.

Articles were assigned to one or more of five crisis categories:

1. COVID-19/Health/Pandemic (COVID-19, SARS, MERS, Ebola, Zika, and other infectious disease outbreaks);
2. War/Political/Terrorism (armed conflicts, political instability, sanctions, terrorism, civil unrest, annexation);
3. Natural Disaster (earthquakes, tsunamis, floods, volcanic eruptions, wildfires, climate-related and environmental crises);
4. Financial/Economic Crisis (recessions, downturns, currency crises, financial market disruptions); and
5. General/Non-specific (crisis management theory, resilience frameworks, and preparedness strategies without a specific crisis focus).

Multiple assignments were permitted because 28 articles address more than one crisis type. This five-category typology extends the binary natural-versus-human-made distinctions of earlier work (Hall, 2010).

Articles were classified at four methodological levels (J.W. Creswell & J.D. Creswell, 2018):

- (a) research paradigm (qualitative, quantitative, mixed methods, or not specified);

- (b) research design (for example, case study, experiment, panel or time-series design, systematic or literature review, ethnography, phenomenology, netnography);
- (c) data collection method (for example, interviews, surveys and questionnaires, observation, Delphi panels); and
- (d) analytical technique (for example, regression, SEM/PLS, bibliometric, content, thematic or sentiment analysis, ANOVA, simulation).

Because abstracts often name a design without its analysis, or an instrument without its design, the three lower tiers were coded independently and non-exclusively, and Table 4 and Figure 7 report them grouped by tier. Paradigm assignment rested first on explicit abstract statements; where these were absent, it was inferred from the methods reported, and otherwise coded as not specified. As with crisis types, paradigm and method assignment was non-exclusive: where an abstract signaled more than one applicable category (for example, both qualitative and quantitative terminology without an explicit mixed methods design), the article was counted in each applicable category. Counts in the results tables may therefore sum to more than the corresponding column totals, and this is noted beneath each affected table.

2.4. Reliability and analysis

Initial classification used a single coder with manual verification, with three safeguards: the keyword dictionary was finalized before full-corpus coding and applied uniformly; a recoding audit on a 10% random subsample resolved discrepancies by revising the rule rather than the individual assignment; and the scheme is fully transparent (Appendices A and B). In response to review, an independent second-coding exercise was added. A random subsample of 80 records (a 20% target of the corpus plus spares, drawn with a fixed seed documented in Appendix C) was coded by the second author, blind to the original assignments, using titles and abstracts and the published dictionary. Agreement is computed per category as Cohen’s kappa on binary presence/absence judgments, the appropriate formulation for non-exclusive coding, alongside percentage agreement (computation script in Appendix C). The exercise

identified two matching defects in the original keyword classification: substring false positives inflating the War/Political/Terrorism category (for example, “towards” matching “war”) and under-matching of several phrase-based method categories (for example, variant spellings of structural equation modeling). The matching rules were corrected (Appendix A), the corpus classification was regenerated in full, and every changed assignment was manually verified by the first author through record-level review of screening decisions, crisis assignments, and method use. Corrected counts are reported throughout, and per-record classifications are provided in the openly archived research dataset (Akhmetbayeva, 2026). Against the verified classifications, agreement with the independent second coder (78 of the 80 subsample records fall within the final corpus) was substantial for crisis type (mean Cohen’s kappa = 0.75 across the five categories; $\kappa = 0.91$ for COVID-19/Health and $\kappa = 0.82$ for War/Political/Terrorism; per-category agreement 92-97%) and moderate for research paradigm (mean $\kappa = 0.40$). The paradigm divergence concentrates in records whose abstracts name no explicit method keywords but permit inference from softer cues, a pattern consistent with the reporting-conventions interpretation.

Descriptive analysis mapped frequencies, temporal trends, and cross-tabulations of crisis types and methods. A pre-COVID (2007–2019) versus post-COVID (2020–2025) comparison flagged pandemic-driven shifts. All analyses ran in Python (pandas, matplotlib). No inferential tests or effect-size pooling were applied, for two reasons. First, the aim of the

study is descriptive mapping rather than hypothesis testing, consistent with its positioning as a systematic mapping review. Second, category assignment is non-exclusive, so articles may contribute to several cells of the same cross-tabulation, and the resulting counts violate the independence assumptions of standard categorical tests such as chi-square. Temporal and cross-crisis comparisons should therefore be read as descriptive patterns rather than statistically tested differences.

3. RESULTS

3.1. Publication trends and outlets

The final sample of 374 articles spans 2007 to 2025 (Figure 2). The pre-COVID period produced only 65 articles (17.4%); the post-COVID period produced 309 (82.6%). The peak year was 2022 (68 articles), followed by 2024 (63) and 2025 (62). The pattern matches the broader growth in COVID-19 tourism scholarship documented by Bhatt et al. (2022) and Utkarsh and Sigala (2021).

Articles appeared in a wide range of outlets. The five most frequent journals were Sustainability ($n = 23$, 6.1%), Tourism Management ($n = 18$, 4.8%), Current Issues in Tourism ($n = 15$, 4.0%), the International Journal of Contemporary Hospitality Management ($n = 14$, 3.7%), and Worldwide Hospitality and Tourism Themes ($n = 11$, 2.9%). The full top-15 distribution is in Table 1. The mix spans tourism-specific journals, hospitality out-

Table 1. Top 15 publication outlets

Rank	Journal	n	%
1	Sustainability	23	6.1
2	Tourism Management	18	4.8
3	Current Issues in Tourism	15	4.0
4	International Journal of Contemporary Hospitality Management	14	3.7
5	Worldwide Hospitality and Tourism Themes	11	2.9
6	Journal of Travel Research	8	2.1
7	Tourism Review	8	2.1
8	GeoJournal of Tourism and Geosites	7	1.9
9	Journal of Travel & Tourism Marketing	7	1.9
10	Journal of Contingencies and Crisis Management	7	1.9
11	International Journal of Tourism Research	7	1.9
12	Journal of Sustainable Tourism	6	1.6
13	Tourism and Hospitality Research	6	1.6
14	Tourism Economics	5	1.3
15	Tourism Management Perspectives	5	1.3

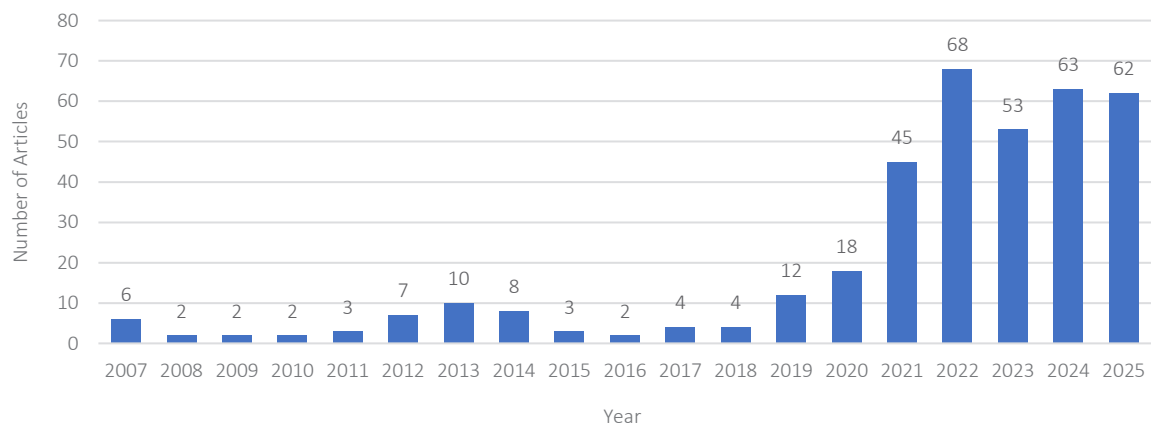


Figure 2. Publication trend by year (2007–2025)

lets, sustainability publications, and crisis-specific journals such as the *Journal of Contingencies and Crisis Management*.

3.2. Crisis type distribution

Figure 3 shows the distribution of articles across the five crisis categories. COVID-19 and health crises dominate the corpus ($n = 214$, 57.2%). The general category ranks second ($n = 100$, 26.7%), followed by natural disasters ($n = 42$, 11.2%), war, political instability, and terrorism ($n = 28$, 7.5%), and financial/economic crises ($n = 20$, 5.3%). Percentages sum to more

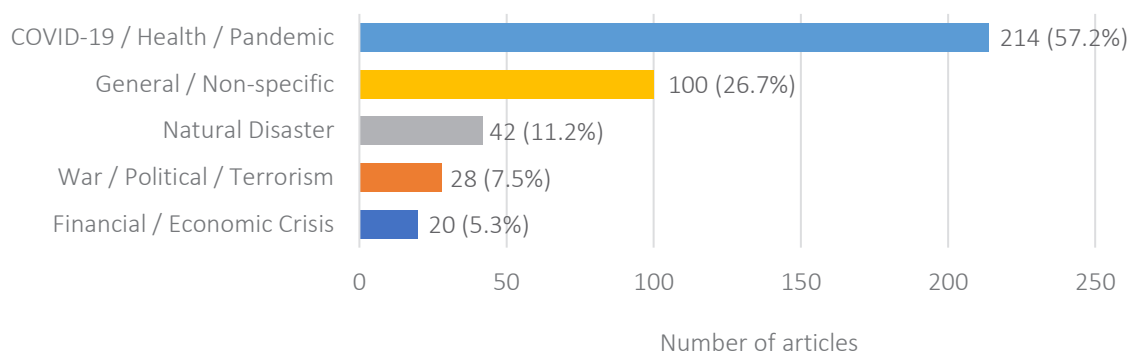
than 100% because 28 articles address multiple crisis types. Table 2 shows the full distribution.

Crisis-type composition tracks real-world events (Figure 4). Before 2020, general crisis management frameworks accounted for the largest share of a small literature (35 of 65 articles), with financial and economic crises (11), war, political, and terrorism studies (10), and natural disasters (9) each represented in modest numbers. Health and pandemic studies then surged from a single pre-2020 article to become the dominant category within one year and have stayed there through 2025. Natural

Table 2. Distribution of articles by crisis type (N = 374)

Crisis type	n	% of N
COVID-19 / Health / Pandemic	214	57.2
General / Non-specific	100	26.7
Natural Disaster	42	11.2
War / Political / Terrorism	28	7.5
Financial / Economic Crisis	20	5.3

Note: Articles may address multiple crisis types; percentages therefore sum to more than 100%.



Note: Categories are non-exclusive (N = 374); 28 articles address multiple crisis types.

Figure 3. Crisis type distribution

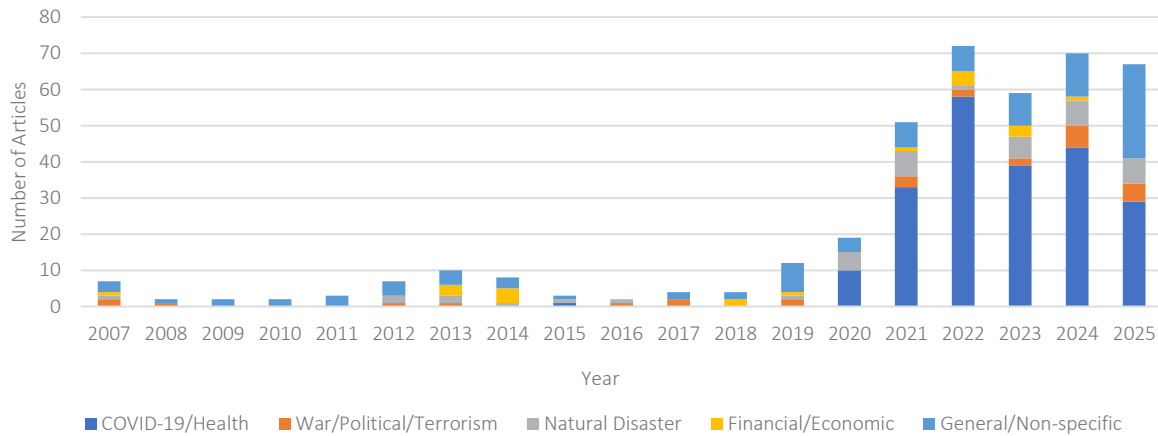


Figure 4. Crisis types over time

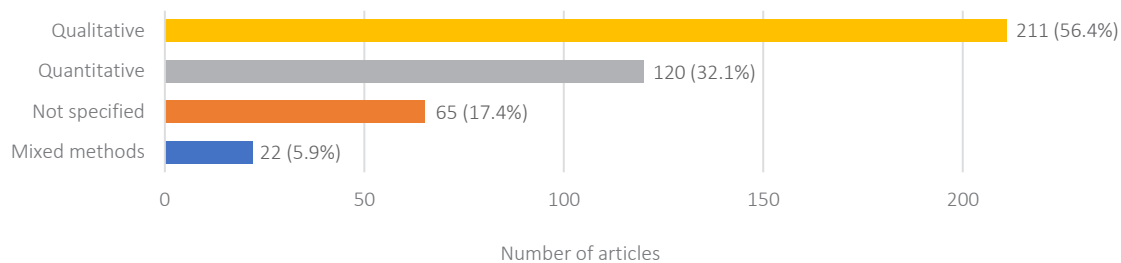
disaster research has grown modestly since 2021 (Estêvão & Costa, 2020), while financial and economic crisis research remains the smallest category throughout, signaling a thematic gap.

3.3. Research paradigms

Research paradigms show a clear qualitative tilt (Figure 5). Qualitative signals are most prevalent ($n = 211$, 56.4%), followed by quantitative ($n = 120$, 32.1%). Explicit mixed methods designs account for

only 22 articles (5.9%), matching the broader patterns in Truong et al. (2020). A further 65 articles (17.4%) did not signal their paradigm in the abstract, pointing to either underreporting or a high share of conceptual, commentary, and review-type contributions. Assignment is non-exclusive, so abstracts signaling both paradigms without an explicit mixed methods label are counted in each (Table 3).

Paradigm composition is broadly stable across periods (Figure 6, Table 3), with three movements



Note: Paradigm assignment is non-exclusive ($N = 374$); dual-signal articles are counted in each applicable paradigm.

Figure 5. Research paradigm distribution

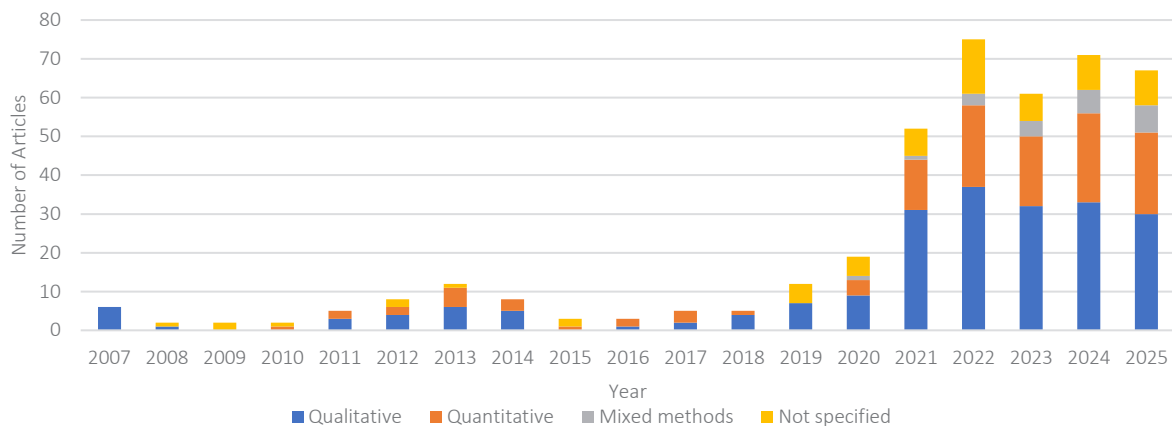


Figure 6. Evolution of research paradigms over time

Table 3. Research paradigm distribution: Pre-COVID versus post-COVID

Paradigm	Pre-COVID (n)	Pre (%)	Post-COVID (n)	Post (%)	Total (n)	Total (%)
Qualitative	39	60.0	172	55.7	211	56.4
Quantitative	20	30.8	100	32.4	120	32.1
Mixed methods	0	0.0	22	7.1	22	5.9
Not specified	14	21.5	51	16.5	65	17.4
Total articles	65	–	309	–	374	–

Note: Paradigm assignment was non-exclusive: where an abstract signaled more than one paradigm without an explicit mixed methods design, the article was counted in each applicable category. Column entries may therefore sum to more than the column totals, and percentages may sum to more than 100. Percentages are computed on the column totals (pre-COVID $n = 65$; post-COVID $n = 309$; total $N = 374$).

worth noting. The qualitative share is slightly lower after 2020 (60.0% to 55.7%) and the quantitative share slightly higher (30.8% to 32.4%). Explicit mixed methods designs, absent from the pre-COVID corpus, emerge after 2020 (0.0% to 7.1%), a pattern of gradual integration that Huang et al. (2025) also document. And the share of abstracts with no paradigm signal falls (21.5% to 16.5%), consistent with a gradual strengthening of methodological reporting conventions (Sigala, 2020).

3.4. Distribution of research methods

Figure 7 and Table 4 report specific methods grouped into the three tiers defined in Section 2.3. Data collection is dominated by interviews ($n = 128$, 34.2% of N) and surveys and questionnaires

($n = 81$, 21.7%), with observation ($n = 12$) and Delphi panels ($n = 3$) far behind. Among research designs, case studies lead by a wide margin ($n = 64$, 17.1%), followed by systematic or literature reviews ($n = 24$, 6.4%) and panel or time-series designs ($n = 10$, 2.7%); experimental designs remain rare ($n = 3$, 0.8%). Among analytical techniques, SEM and PLS are most common ($n = 30$, 8.0%), just ahead of regression ($n = 28$, 7.5%), with content analysis ($n = 16$), thematic analysis ($n = 11$), and bibliometric analysis ($n = 11$) forming a middle band and sentiment or text mining ($n = 4$), ANOVA ($n = 1$), and simulation ($n = 1$) a long tail. Emerging digital approaches (netnography, $n = 3$; sentiment analysis or text mining, $n = 4$) have entered the field but stay peripheral. A further 79 articles (21.1%) had no identifiable methodology keywords in their ab-

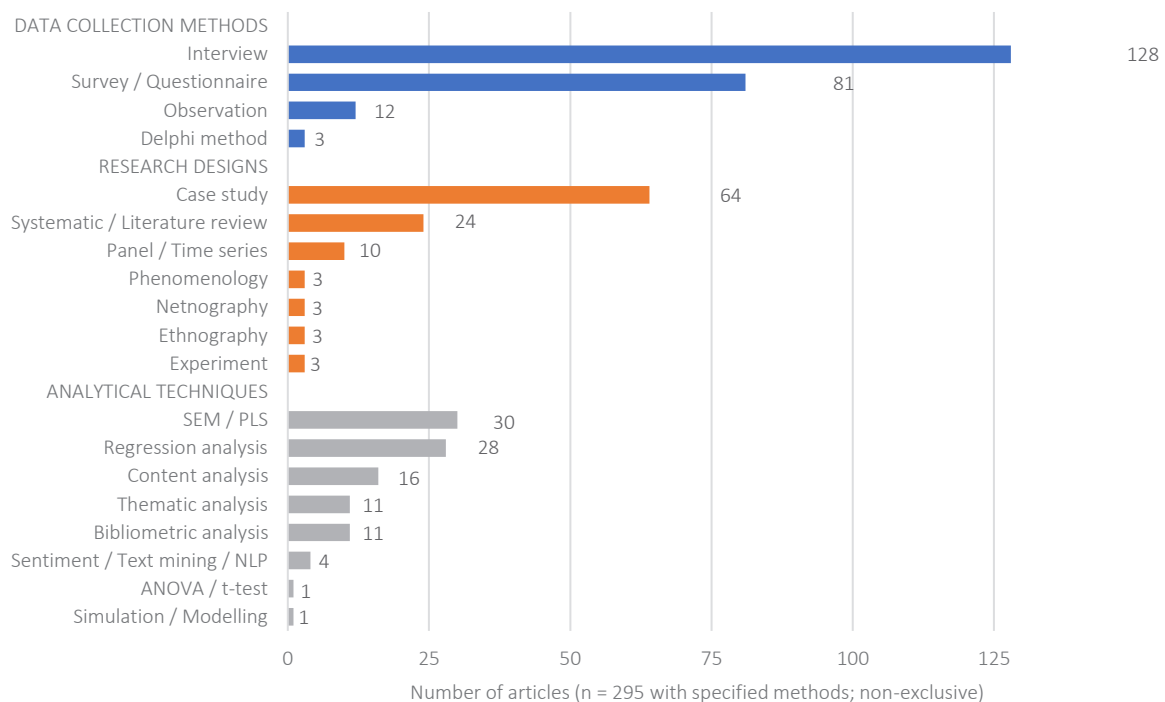


Figure 7. Research methods by tier: Data collection methods, research designs, and analytical techniques

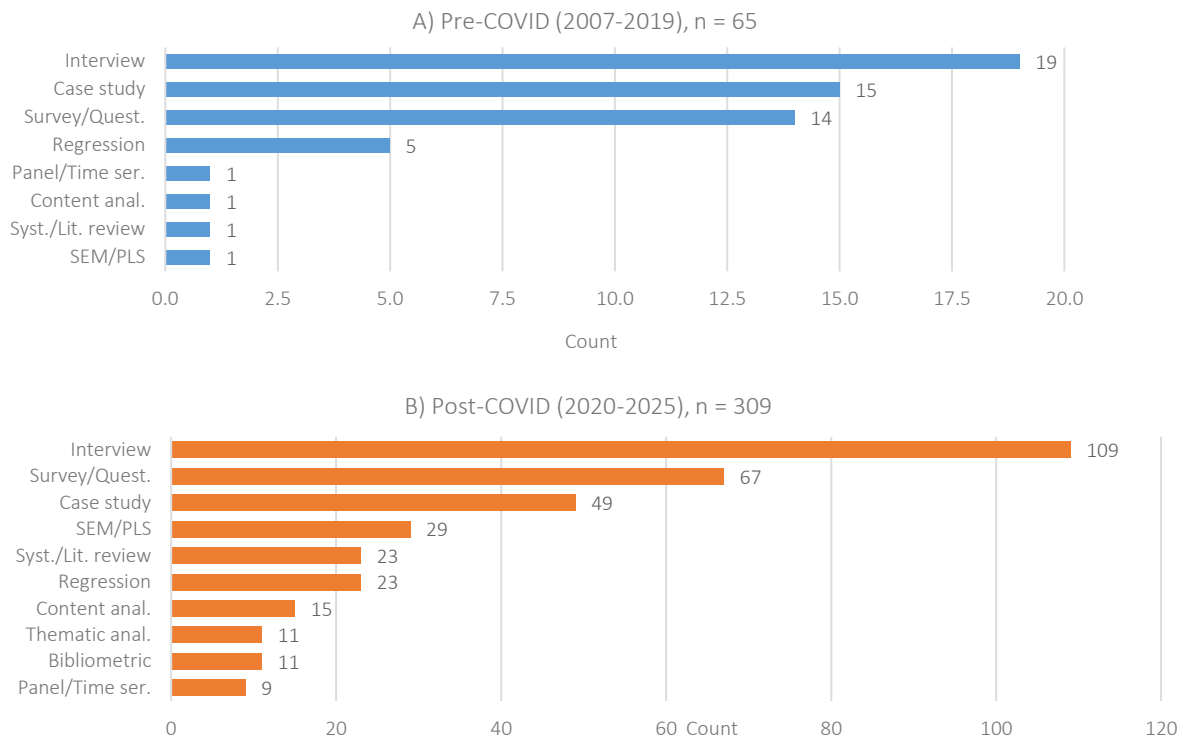
Table 4. Research designs, data collection methods, and analytical techniques (N = 374)

Method tier and category	n	% of total (N = 374)	% of specified
Data collection methods			
Interview	128	34.2	43.4
Survey / Questionnaire	81	21.7	27.5
Observation	12	3.2	4.1
Delphi method	3	0.8	1.0
Research designs			
Case study	64	17.1	21.7
Systematic / Literature review	24	6.4	8.1
Panel / Time series	10	2.7	3.4
Phenomenology	3	0.8	1.0
Experiment	3	0.8	1.0
Netnography	3	0.8	1.0
Ethnography	3	0.8	1.0
Analytical techniques			
SEM / PLS	30	8.0	10.2
Regression analysis	28	7.5	9.5
Content analysis	16	4.3	5.4
Thematic analysis	11	2.9	3.7
Bibliometric analysis	11	2.9	3.7
Sentiment / Text mining / NLP	4	1.1	1.4
ANOVA / t-test	1	0.3	0.3
Simulation / Modelling	1	0.3	0.3
Not specified in abstract	79	21.1	n/a

Note: Articles may employ multiple methods; counts are non-exclusive.

stracts. Because the tiers are coded independently, an article can contribute to several tiers at once, and tier totals are not additive.

Figure 8 contrasts the methodological profiles of the pre-COVID (2007–2019; $n = 65$) and post-COVID (2020–2025; $n = 309$) periods. The rank

**Figure 8.** Pre-COVID versus post-COVID comparison of research methods

order of the leading methods is stable across periods, with interviews and surveys leading both. Interviews hold a similar share in both periods, while case studies and SEM/PLS grow in absolute and relative terms after 2020. Review-type designs (systematic and literature reviews, bibliometric analysis) are largely a post-COVID phenomenon, reflecting the synthesis wave that followed the pandemic surge. Advanced causal designs remain rare in both periods.

3.5. Distribution of research methods across crisis types

Table 5 cross-tabulates the ten most frequent methods against the five crisis types, exposing systematic differences in how different crisis contexts are studied. COVID-19 and health research shows the greatest methodological diversity (17 distinct methods), reflecting both its large sample size and the breadth of questions the pandemic generated. Interviews dominate across categories, with their share highest in natural disaster research (42.9%), where deep stakeholder engagement carries weight, and in financial/economic research (40.0%); Chowdhury et al. (2019) offer an influential example in their post-disaster study of New Zealand tourism organizations. Case studies are also concentrated in natural disaster research (23.8%), consistent with the localized, bounded nature of these events (Estêvão & Costa, 2020).

Surveys are most common in the general category (27.0%). SEM and PLS appear across the corpus ($n = 30$), concentrated in pandemic ($n = 16$) and general crisis studies ($n = 13$), with only a single SEM

study predating 2020. Financial crisis research, despite the rich economic data available, still leans on stakeholder accounts, with interviews in 40.0% of its articles, though survey- and model-based work is present (surveys, $n = 6$; SEM/PLS, $n = 2$).

4. DISCUSSION

Before interpreting the patterns above, one caveat applies throughout this section: all findings describe how methodology is reported at the level of titles, abstracts, and author keywords, not the full methodological content of the underlying studies. Conclusions about the field's actual practices are therefore drawn cautiously and are flagged as such where the distinction matters. Equally, because no inferential tests were applied (Section 2.4), all temporal and cross-crisis contrasts below are descriptive; and since the pre-COVID base is small ($n = 65$), percentage comparisons across periods should be read with corresponding caution.

The finding that qualitative research accounts for 56.4% of the corpus is both a strength and a constraint. Crises are situated phenomena that resist standardized measurement (Faulkner, 2001), and the qualitative orientation has produced a rich body of knowledge about how tourism stakeholders experience, interpret, and respond to crises at the individual, organizational, and destination levels.

At the same time, this dominance raises concerns about the field's capacity for theory testing and statistical generalization. With interviews in 34.2% of articles and surveys in 21.7%, the tool-

Table 5. Research methods by crisis type (top 10 methods)

Method	COVID-19	War	Natural disaster	Financial	General
Interview	79	8	18	8	26
Survey / Questionnaire	41	7	8	6	27
Case study	37	7	10	2	15
SEM / PLS	16	1	2	2	13
Regression analysis	12	2	5	2	8
Systematic / Literature review	14	0	3	2	7
Content analysis	12	2	3	0	1
Thematic analysis	8	0	1	0	3
Bibliometric analysis	7	0	1	0	4
Panel / Time series	5	1	3	0	1

Note: Counts are non-exclusive across both methods and crisis types; articles addressing multiple crisis types contribute to each applicable column. Rows span the three method tiers defined in Section 2.3.

kit is concentrated around two instruments; interview-based studies capture retrospective accounts but can miss the behavioral patterns and causal mechanisms that quantitative or mixed methods identify, a concern Wut et al. (2021) also raised.

The scarcity of causal and longitudinal designs is the clearest gap. Experimental designs appear in only 0.8% of the corpus and panel or time-series designs in 2.7%, even though crisis management theories make numerous testable claims about preparedness, response strategies, communication, and recovery outcomes. The deficit is striking given that the exogenous, unanticipated nature of many crises creates conditions that approximate natural experiments (Mair et al., 2016). SEM and PLS, by contrast, are better represented than earlier assessments of the field suggested (8.0% of the corpus), indicating that structured model testing has a firmer foothold than the near-absence of experiments would imply; the binding constraint is longitudinal and causal design, not statistical technique.

The scarcity of longitudinal research deserves special note. In this review, longitudinal designs were operationally identified through the keywords “longitudinal,” “panel,” and “time series” appearing in titles, abstracts, or author keywords; the 2.7% figure therefore captures studies that explicitly signal such designs at the abstract level, and panel or time-series studies that describe their design only in the full text would not be captured. Even allowing for this undercounting, the pattern is consistent: crises are temporal phenomena, yet most studies in this corpus report cross-sectional designs that capture a single moment. Tracking organizations, destinations, or tourists across crisis phases would open up analysis of recovery trajectories, the effectiveness of preparedness investments, and the processes through which resilience is built or eroded over time. Chowdhury et al. (2019) and Mair et al. (2016) showed the value of such approaches in post-disaster contexts, and recent work such as Akhmetbayeva and Spankulova (2026) illustrates the structured, hypothesis-driven investigation the field needs alongside its strong qualitative base.

The contrast between the pre- and post-COVID corpus is stark in descriptive terms: output

grew 4.8-fold, the most dramatic expansion in the field’s history, and the surge brought methodological innovations including bibliometric analysis, netnography and digital ethnography, and sentiment analysis of pandemic-era social media (Aldao et al., 2021; Gössling et al., 2021).

Yet the pandemic period is better described as consolidation than transformation. The paradigm mix moved only modestly (qualitative 60.0% to 55.7%; quantitative 30.8% to 32.4%), while two genuine developments stand out in the corrected data: explicit mixed methods designs, absent before 2020, emerged after it (7.1% of post-COVID articles), and the share of abstracts without paradigm signals fell (21.5% to 16.5%). COVID-19’s nature as an exogenous, well-documented event created unusual openings for natural experiments, difference-in-differences analyses, and interrupted time series that remain underexploited in this corpus. The growth of mixed methods from zero to a modest base suggests diversification is underway but incremental (Truong et al., 2020).

Crisis type matters for method choice. Natural disaster research shows the heaviest use of interviews (42.9%) alongside substantial case-study work (23.8%), consistent with the localized, bounded nature of these events (Estêvão & Costa, 2020). Financial and economic crisis research, though limited in volume ($n = 20$), likewise relies primarily on interviews (40.0%), suggesting researchers approach economic disruptions through stakeholder experience even where econometric data are available. The general category has the most balanced profile, with surveys (27.0%) and interviews (26.0%) nearly even, reflecting these studies’ framework-development orientation (Ritchie, 2004). The COVID-19/health category’s diversity (17 distinct methods) reflects the scale of pandemic research and the range of disciplinary perspectives it attracted (Kaushal & Srivastava, 2021; Sigala, 2020).

The finding that 21.1% of articles have no identifiable methodology keywords in their abstracts raises questions about reporting practices. This figure reflects a limitation of abstract reporting conventions rather than evidence that the un-

derlying studies lack a methodology: many articles describe their methods clearly in the full text but omit them from the abstract, and the independent second coder was frequently able to infer a paradigm from softer cues in exactly these records (Section 2.4). Given that the search itself required a methodology-related term, the corresponding share in the wider, unfiltered literature is likely higher still. Absence from the abstract complicates systematic reviews and evidence synthesis (Wut et al., 2021), and stronger editorial standards, such as structured abstracts with explicit methodology sections, would make future reviews more precise.

The findings carry implications for researchers, editors, and practitioners. For researchers, method choice should be treated as a strategic decision aligned with both the research question and the crisis context, and Table 5 turns contextual gaps into concrete opportunities. Several priorities follow. The field needs more experimental and quasi-experimental designs: the exogenous, unanticipated nature of many crises approximates natural experiments and supports stronger causal inference (Mair et al., 2016), and COVID-19 in particular opened a rare window that interrupted time series and difference-in-differences designs are well placed to exploit. Longitudinal panel studies that track firms, destinations, or tourists across crisis phases are urgently needed, for the reasons set out above (Chowdhury et al., 2019). Mixed methods work, at 5.9%, remains substantially underused (Huang et al., 2025; Molina-Azorín & Font, 2016; Truong et al., 2020). Computational and digital methods deserve wider adoption, as social media, mobility, and booking data now support real-time crisis monitoring at scale. Financial and economic crisis research is a priority context for diversification, since it remains the smallest category (5.3% of the corpus) despite the rich quantitative data such crises generate. Finally, the concentration on COVID-19 (57.2% of the corpus) risks pandemic-centric knowledge that may not transfer to other disruptions (Novelli et al., 2018).

For managers, DMOs, and public bodies, the findings temper the confidence with which specific recommendations can be drawn from the

literature: the scarcity of experimental, longitudinal, and mixed methods evidence limits causal claims about what works under which conditions. Decision-makers should treat current evidence as directional rather than definitive, and researchers writing for practitioners should be explicit about the methodological basis of their advice.

4.1. Limitations

Several limitations should be noted. The analysis relies on coding of titles, abstracts, and author keywords, which may undercount methodological features that appear only in full text; full-text analysis would allow finer assessment but was not feasible here. Using Scopus as the sole database, while justified by its broad social science coverage (Mongeon & Paul-Hus, 2016), excludes studies indexed only in Web of Science, Google Scholar, or regional databases; multi-database searches are a priority for future reviews. A further selection constraint arises from the search string itself: the required methodology-term block means the corpus captures the methodology-signaling segment of the literature, so methods named in the block can only be over-represented and methods absent from it under-represented relative to the unfiltered literature (Section 2.1), with absolute prevalence estimates affected more than within-corpus temporal comparisons. The comparison query reported in Section 2.1 indicates that the filtered corpus captures 63.2% of the unfiltered literature; extending the mapping to the records excluded by the methodology block is a priority for future verification. Future reviews should adopt multi-coder protocols and report kappa or percentage agreement. Keyword-based classification, even with manual review, may misclassify articles using atypical terminology, and the inductive keyword dictionary reflects the present team's decisions rather than an externally validated taxonomy. Finally, because the aim was descriptive mapping and category assignment was non-exclusive, no inferential statistical tests were applied; observed temporal and cross-crisis differences should therefore be interpreted as descriptive patterns rather than statistically confirmed effects.

CONCLUSION

This study aimed to map the research designs, data collection methods, and analytical techniques used in tourism crisis management research; to that end, we conducted a systematic mapping review of 374 Scopus-indexed articles published between 2007 and 2025. Three results stand out. Qualitative approaches dominate the corpus (56.4%), carried by interviews (34.2%) and surveys (21.7%), while experimental designs (0.8%) and longitudinal designs (2.7%) remain scarce. COVID-19 and health crises account for 57.2% of the corpus, and methodological composition varies systematically across the five crisis types.

Three conclusions follow directly from these findings. First, the mapped evidence base rests predominantly on cross-sectional, interview- and survey-based designs, which limits the field's capacity for theory testing and causal inference. Second, methodological diversification, particularly longitudinal, experimental, mixed methods, and computational designs, is the field's clearest development need. Third, because stronger and more diverse methods improve the quality of the evidence on which tourism organizations, destination authorities, and public administrators draw, the practical utility of this diagnostic is indirect but real. As tourism faces an expanding array of crises, the rigor and diversity of the methods used to study them will shape the field's capacity to produce knowledge that is both theoretically sound and practically useful.

AUTHOR CONTRIBUTIONS

Conceptualization: Aisha Akhmetbayeva, Lazat Spankulova.

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Investigation: Aisha Akhmetbayeva, Lazat Spankulova.

Methodology: Aisha Akhmetbayeva.

Project administration: Lazat Spankulova.

Resources: Aisha Akhmetbayeva, Lazat Spankulova.

Software: Aisha Akhmetbayeva.

Validation: Lazat Spankulova.

Visualization: Aisha Akhmetbayeva.

Writing – original draft: Aisha Akhmetbayeva.

Writing – review & editing: Aisha Akhmetbayeva, Lazat Spankulova.

DATA AVAILABILITY STATEMENT

The research dataset underlying this study (the corpus of 411 identified records with per-record verified classifications, in machine-readable form) is openly available at Zenodo (Akhmetbayeva, 2026). The classification dictionary (Appendix A), the Python classification script (Appendix B), and the second-coding protocol with the agreement computation script and results (Appendix C) are provided as appendices to this article.

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APPENDIX A. Classification dictionary

Keywords were matched case-insensitively against the title, abstract, and author keywords of each record. Terms marked (w) were matched as whole words to avoid false positives (for example, “war” does not match “toward” or “aware”); all other terms were matched as stems or phrases. Categories within every tier are non-exclusive.

Tier and category	Keywords
Crisis type: COVID-19 / Health / Pandemic	covid (w), coronavirus, sars (w), pandemic, epidemic, ebola (w), zika (w), health crisis, health emergency, quarantine, lockdown, outbreak, infectious disease, public health, mers (w), influenza, h1n1 (w)
Crisis type: War / Political / Terrorism	war/wars/warfare (w), terroris-, armed conflict, political instability, political crisis, sanction(s) (w), civil unrest, annexation, geopolitic-, military (w), invasion (w), coup (w)
Crisis type: Natural Disaster	earthquake, tsunami, flood-, volcan-, wildfire, hurricane, typhoon, natural disaster, climate change, drought, landslide, cyclone, bushfire
Crisis type: Financial / Economic	financial crisis, economic crisis, recession (w), economic downturn, currency crisis, debt crisis, inflation crisis, monetary crisis
Crisis type: General / Non-specific	assigned when no category above matched
Paradigm: Qualitative	qualitative, interview(s) (w), case stud-, ethnograph-, netnograph-, phenomenolog-, grounded theory, thematic analysis, focus group, content analysis, narrative (w)
Paradigm: Quantitative	quantitative, survey(s) (w), questionnaire, regression, structural equation, sem (w), pls (w), panel data, time series, econometric, anova (w), t-test (w), experiment(s) (w)
Paradigm: Mixed methods	mixed method / mixed-method
Paradigm: Not specified	assigned when no paradigm keyword matched
Research design	case study; experiment; panel data / time series / longitudinal; systematic review / literature review; phenomenology; netnography; ethnography
Data collection method	interview; survey / questionnaire; observation; delphi
Analytical technique	regression; bibliometric; structural equation / PLS-SEM; sentiment analysis / text mining / natural language processing / topic model; anova / t-test; thematic analysis; simulation; content analysis

APPENDIX B. Python classification script

The script below reproduces the automated first-pass classification from the dictionary in Appendix A. The published tables rest on this pass followed by manual verification of every assignment.

```
"""
```

```
Coding script for: Methodological landscapes in tourism crisis management:
A systematic mapping review of research designs, 2007-2025 (MA18681).
```

```
Reproduces the automated first-pass classification from the corpus workbook
(MA18681_Supplementary_Materials.xlsx, sheet Corpus_Records). The published
tables rest on this automated pass followed by manual verification of every
assignment; final verified codes are held in the (verified) columns of the
same sheet.
```

```
Usage:
```

```
python coding_script.py MA18681_Supplementary_Materials.xlsx
```

```
Requires: openpyxl (pip install openpyxl)
```

```
"""
```

```
import re
import sys
from collections import Counter
```

```
from openpyxl import load_workbook
```

```
# -----
# Classification dictionary (mirrors sheet Keyword_Dictionary)
# -----
```

```
CRISIS = {
    'COVID-19/Health': [r'\bcovid', r'\coronavirus', r'\bsars\b', r'\pandemic', r'\epidemic',
                        r'\bebola\b', r'\bzika\b', r'\health crisis', r'\health emergency',
```

```

        r'quarantine', r'lockdown', r'outbreak', r'infectious disease',
        r'public health', r'\bmers\b', r'influenza', r'\bh1n1\b'],
'War/Political/Terrorism': [r'\bwars?\b', r'\bwarfare\b', r'terroris', r'armed conflict',
        r'political instability', r'political crisis', r'\bsanctions?\b',
        r'civil unrest', r'annexation', r'geopolitic', r'\bmilitary\b',
        r'\binvasion\b', r'\bcoup\b'],
'Natural Disaster': [r'earthquake', r'tsunami', r'\bflood', r'volcan', r'wildfire',
        r'hurricane', r'typhoon', r'natural disaster', r'climate change',
        r'\bdrought', r'landslide', r'cyclone', r'bushfire'],
'Financial/Economic': [r'financial crisis', r'economic crisis', r'\brecession\b',
        r'economic downturn', r'currency crisis', r'debt crisis',
        r'inflation crisis', r'monetary crisis'],
}
DESIGN = {
    'Case study': [r'case stud'],
    'Experiment': [r'\bexperiments?\b'],
    'Panel/Time series': [r'panel data', r'time[ -]series', r'longitudinal'],
    'Systematic/Literature review': [r'systematic review', r'literature review',
        r'systematic literature'],
    'Phenomenology': [r'phenomenolog'],
    'Netnography': [r'netnograph'],
    'Ethnography': [r'\bethnograph'],
}
COLLECTION = {
    'Interview': [r'\binterviews?\b'],
    'Survey/Questionnaire': [r'\bsurveys?\b', r'questionnaire'],
    'Observation': [r'\bobobservation'],
    'Delphi': [r'\bdelphi\b'],
}
TECHNIQUE = {
    'Regression': [r'\bregression'],
    'Bibliometric': [r'bibliometric'],
    'SEM/PLS': [r'structural equation', r'pls-sem', r'\bsem\b', r'partial least squares'],
    'Sentiment/Text mining': [r'sentiment analysis', r'text mining',
        r'natural language processing', r'topic model'],
    'ANOVA/t-test': [r'\banova\b', r'\bt-tests?\b'],
    'Thematic analysis': [r'thematic analysis'],
    'Simulation/Modelling': [r'\bsimulation'],
    'Content analysis': [r'content analysis'],
}
QUAL = [r'qualitative', r'\binterviews?\b', r'case stud', r'ethnograph', r'netnograph',
        r'phenomenolog', r'grounded theory', r'thematic analysis', r'focus group',
        r'content analysis', r'\bnarrative\b']
QUANT = [r'quantitative', r'\bsurveys?\b', r'questionnaire', r'\bregression',
        r'structural equation', r'\bsem\b', r'\bpls\b', r'panel data', r'time[ -]series',
        r'econometric', r'\banova\b', r'\bt-tests?\b', r'\bexperiments?\b']
MIXED = [r'mixed[ -]method']

def flags(text, dct):
    t = text.lower()
    return [cat for cat, pats in dct.items() if any(re.search(p, t) for p in pats)]

def paradigm(text):
    t = text.lower()
    q = any(re.search(p, t) for p in QUAL)
    n = any(re.search(p, t) for p in QUANT)
    m = any(re.search(p, t) for p in MIXED)
    if m:
        return ['Mixed methods']
    if q and n:
        return ['Qualitative', 'Quantitative'] # dual signal, non-exclusive
    if q:
        return ['Qualitative']
    if n:
        return ['Quantitative']
    return ['Not specified']

def main(path):
    wb = load_workbook(path)
    ws = wb['Corpus_Records']
    counts = {'crisis': Counter(), 'design': Counter(),
        'collection': Counter(), 'technique': Counter(), 'paradigm': Counter()}
    n = 0

```

```

for row in ws.iter_rows(min_row=2, values_only=True):
    num, year, title = row[0], row[1], row[2]
    if num is None:
        continue
    if not (year and 2007 <= int(year) <= 2025):
        continue # boundary-year records are excluded from the corpus
    n += 1
    text = str(title) # abstracts not redistributed; see README
    for key, dct in (('crisis', CRISIS), ('design', DESIGN),
                    ('collection', COLLECTION), ('technique', TECHNIQUE)):
        for cat in flags(text, dct):
            counts[key][cat] += 1
    for cat in paradigm(text):
        counts['paradigm'][cat] += 1
print(f'records in window: {n}')
for key, ctr in counts.items():
    print(f'\n{key.upper()} (title-only counts; full replication requires `
        f'title+abstract+keywords:'))
    for cat, c in ctr.most_common():
        print(f'    {cat}: {c}')

if __name__ == '__main__':
    main(sys.argv[1] if len(sys.argv) > 1 else 'MA18681_Supplementary_Materials.xlsx')

```

APPENDIX C. Second-coding protocol and inter-rater agreement computation

Protocol. A subsample of 80 records was drawn from the 2007–2025 window of the archived export with a fixed random seed (20260707): 75 records form the 20% target subsample of the corpus ($N = 374$) and 5 serve as spares in case a drawn record falls outside the final included set. The second author coded each record independently, blind to the original assignments, using only titles and abstracts together with the dictionary in Appendix A, assigning one or more paradigm labels and one or more crisis-type labels per record. Agreement with the original verified classifications is computed per category as Cohen's kappa on binary presence/absence judgements together with percentage agreement, using the script below.

Subsample record numbers (archived export): 22, 28, 29, 34, 36, 43, 44, 49, 55, 69, 76, 79, 84, 87, 98, 101, 105, 107, 122, 123, 125, 126, 133, 141, 145, 146, 148, 151, 168, 170, 171, 173, 174, 176, 194, 196, 197, 199, 200, 203, 204, 210, 211, 214, 217, 221, 225, 226, 228, 231, 232, 233, 234, 237, 238, 252, 253, 261, 270, 277, 284, 298, 302, 309, 332, 333, 334, 335, 350, 353, 361, 367, 371, 373, 378, 390, 391, 393, 396, 405.

Results. Of the 80 subsample records, 78 fall within the final included corpus. Crisis type: mean Cohen's kappa = 0.75 (COVID-19/Health 0.91; War/Political/Terrorism 0.82; Natural Disaster 0.78; General/Non-specific 0.78; Financial/Economic 0.47), per-category agreement 92–97%. Research paradigm: mean kappa = 0.40 (Quantitative 0.67; Qualitative 0.55; Mixed methods 0.39; Not specified 0.00), per-category agreement 78–87%.

Computation script:

```

"""
Inter-rater agreement calculator for MA18681.

Computes per-category Cohen's kappa and percentage agreement between the
original verified codes and the independent second coder, treating each
category as a binary presence/absence judgement (appropriate because coding
is non-exclusive: an article may carry several paradigms or crisis types).

```

Before running:

1. The second coder completes MA18681_SecondCoder_Subsample.xlsx (sheet 'Subsample', columns D and E).
2. The original verified codes are pasted into

MA18681_Supplementary_Materials.xlsx (sheet 'Corpus_Records',
columns 'Paradigm (verified)' and 'Crisis type (verified)').

Usage:

```
python kappa_calc.py MA18681_Supplementary_Materials.xlsx MA18681_SecondCoder_Subsample.xlsx
```

Requires: openpyxl

```
"""
```

```
import sys
```

```
from openpyxl import load_workbook
```

```
PARADIGM_CATS = ['Qualitative', 'Quantitative', 'Mixed methods', 'Not specified']
```

```
CRISIS_CATS = ['COVID-19/Health', 'War/Political/Terrorism', 'Natural Disaster',  
              'Financial/Economic', 'General/Non-specific']
```

```
def norm(cell):
```

```
    if cell is None:
```

```
        return set()
```

```
    return {p.strip().lower() for p in str(cell).replace(',', ';').split(';') if p.strip()}
```

```
def has(labels, cat):
```

```
    c = cat.lower()
```

```
    head = c.split('/')[0]
```

```
    return any(c in l or l in c or head in l for l in labels)
```

```
def kappa(pairs):
```

```
    """pairs: list of (bool, bool). Returns (kappa, percent_agreement)."""
```

```
    n = len(pairs)
```

```
    if n == 0:
```

```
        return float('nan'), float('nan')
```

```
    all = sum(1 for x, y in pairs if x and y)
```

```
    a00 = sum(1 for x, y in pairs if not x and not y)
```

```
    po = (all + a00) / n
```

```
    plx = sum(1 for x, _ in pairs if x) / n
```

```
    ply = sum(1 for _, y in pairs if y) / n
```

```
    pe = plx * ply + (1 - plx) * (1 - ply)
```

```
    if pe == 1:
```

```
        return float('nan'), po * 100 # no variation; kappa undefined
```

```
    return (po - pe) / (1 - pe), po * 100
```

```
def main(supp_path, coder_path):
```

```
    supp = load_workbook(supp_path) ['Corpus_Records']
```

```
    head = [c.value for c in supp[1]]
```

```
    i_num = head.index('No.')
```

```
    i_par = head.index('Paradigm (verified)')
```

```
    i_cri = head.index('Crisis type (verified)')
```

```
    original = {}
```

```
    for row in supp.iter_rows(min_row=2, values_only=True):
```

```
        if row[i_num] is not None:
```

```
            original[int(row[i_num])] = (norm(row[i_par]), norm(row[i_cri]))
```

```
    coder = load_workbook(coder_path) ['Subsample']
```

```
    pairs_par = {c: [] for c in PARADIGM_CATS}
```

```
    pairs_cri = {c: [] for c in CRISIS_CATS}
```

```
    used = skipped = 0
```

```
    for row in coder.iter_rows(min_row=2, values_only=True):
```

```
        num, par2, cri2 = row[0], row[3], row[4]
```

```
        if num is None or (par2 is None and cri2 is None):
```

```
            continue
```

```
        num = int(num)
```

```
        if num not in original or not any(original[num]):
```

```
            skipped += 1
```

```
            continue
```

```
        used += 1
```

```
        par1, cri1 = original[num]
```

```
        for cat in PARADIGM_CATS:
```

```
            pairs_par[cat].append((has(par1, cat), has(norm(par2), cat)))
```

```
        for cat in CRISIS_CATS:
```

```
            pairs_cri[cat].append((has(cri1, cat), has(norm(cri2), cat)))
```

```
    print(f'records compared: {used} (skipped, no verified original: {skipped})')
```

```
for title, pairs in (('PARADIGM', pairs_par), ('CRISIS TYPE', pairs_cri)):
    print(f'\n{title}:')
    ks = []
    for cat, pp in pairs.items():
        k, po = kappa(pp)
        ks.append(k)
        print(f' {cat:28s} kappa = {k:5.2f}   agreement = {po:5.1f}%')
    valid = [k for k in ks if k == k]
    if valid:
        print(f'   Mean kappa across categories: {sum(valid)/len(valid):.2f}')

if __name__ == '__main__':
    a = sys.argv[1] if len(sys.argv) > 1 else 'MA18681_Supplementary_Materials.xlsx'
    b = sys.argv[2] if len(sys.argv) > 2 else 'MA18681_SecondCoder_Subsample.xlsx'
    main(a, b)
```