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Review

MANET studies as experimental artifacts: a PRISMA-guided review of contemporary evaluation orientation, reporting completeness and reproducibility

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ABSTRACT

Experimental evaluation is central to MANET research, yet performance claims are often derived from studies that use heterogeneous and inconsistently reported evaluation setups, limiting cross-study comparability, reproducibility, and interpretability. This paper presents a PRISMA-guided systematic review of MANET evaluation practice published between 1 January 2020 and 12 August 2025, using an evidence-mapping and meta-research synthesis approach. Twenty studies were analyzed using a structured extraction template capturing evaluation orientation, experimental platform, mobility and scenario configuration, baseline selection, metric portfolios, and energy modeling practices. Methodological rigor was assessed using explicit indicators for validation reporting, statistical analysis reporting, and reproducibility support, with a derived rigor score summarizing reporting strength across studies and over time. The results provide study-attributed evidence maps and diagnostic summaries that quantify dominant evaluation orientations, heterogeneity in evaluation stacks, and uneven disclosure of reproducibility-critical details. The paper derives a practitioner-oriented checklist that specifies minimum reporting and evaluation design elements needed to support transparent and comparable MANET experiments. Future research should develop and validate community-aligned reporting and benchmarking standards that reduce evaluation-stack ambiguity and strengthen cross-study synthesis in MANET research.

1. Introduction

Experimental evaluation is the main evidence base in mobile ad hoc network (MANET) research because protocol behavior emerges from mobility, topology dynamics, wireless channel effects, and traffic demand. As a result, many MANET studies rely on simulation and configuration-driven experimentation, where reported outcomes depend on modeling assumptions and parameter settings as much as on protocol logic. This dependence makes cross-study comparison difficult even when papers report the same metrics, because evaluation stacks often differ in simulator configuration, mobility assumptions, traffic specification, scenario settings, and baseline choices. This comparability challenge is established in the MANET simulation literature. Prior work shows that conclusions can change under different mobility models and scenario parameterizations, which weakens the evidential meaning of better performance when setup heterogeneity is not made explicit and controlled [1,2]. Recent MANET simulation studies still illustrate this dependence on evaluation setup, reinforcing that experimental conditions remain a major determinant of reported results in contemporary work [3–5]. This concern extends to the security literature, where recent synthesis highlights that reported, gains are tightly coupled to the assumptions and disclosures embedded in the evaluation stack [6]. Methodological credibility also depends on rigor and reproducibility. In computational and simulation-oriented research, credible evidence requires repeatable experimental design, explicit reporting of evaluation configurations, and principled handling of variability so results can be interpreted and checked across studies [7]. Recent reproducible-research guidance for computational work continues to emphasize transparent methods, complete reporting, and accessible artifacts as practical enablers of verification and synthesis [8].

This study presents a PRISMA-guided, evaluation-centric systematic review of contemporary MANET research published between 1 January 2020 and 12 August 2025. Each included paper is treated as an experimental artifact, and the synthesis audits evaluation orientations, metric portfolios, experimental platforms, baseline practices, reporting completeness, rigor and reproducibility indicators, and energy-model reporting depth. The review follows PRISMA 2020 guidance for study identification, screening, and inclusion to ensure transparency of the selection process. The resulting evidence maps and diagnostic summaries characterize contemporary MANET evaluation practice. They also support practitioner guidance grounded in observed reporting patterns.

1.1 Applications of MANETs

MANETs remain most relevant where connectivity must be formed quickly, operates without fixed infrastructure, and must tolerate mobility, intermittent links, and rapid topology change. In contemporary practice, these conditions appear most often in public-safety communications, autonomous aerial systems, and cyber-physical IoT deployments that must operate at the network edge. In disaster and emergency response, MANET-style networking supports rapid field connectivity for first responders when terrestrial infrastructure is damaged or overloaded, and when communication must be extended by multi-hop relaying in sparse or obstructed environments [9]. Related emergency-network research increasingly integrates ad hoc networking with unmanned aerial vehicles (UAVs) to provide temporary coverage, relay, and situational data collection, especially where ground mobility is constrained [10]. A second major contemporary application space is UAV ad hoc networking, including Flying Ad Hoc Networks (FANETs) and UAV swarms, where communication must track 3D mobility, high link dynamics, and mission-driven coordination. Recent surveys emphasize that FANET communication stacks and routing designs are shaped by altitude, velocity, air-to-air and air-to-ground channel conditions, and strict constraints on payload, energy, and control overhead [11]. In the same direction, recent FANET-focused studies also investigate long-range, low-power technologies such as LoRa to support wide-area aerial sensing and connectivity under energy and payload limits [12].

MANET principles also persist in smart-city mobility ecosystems, especially vehicular ad hoc networking as a MANET-derived setting where communication supports safety messaging, traffic coordination, and edge services under high mobility and variable density. Recent work highlights that smart-city vehicular communication solutions continue to rely on ad hoc multi-hop design choices, but require careful attention to channel access, latency constraints, and routing stability [13]. In IoT and cyber-physical deployments, MANETs appear as infrastructure-light connectivity for mobile sensing, temporary industrial sites, and edge collection where fixed access points are unavailable or undesirable. Contemporary surveys emphasize that MANET-IoT integration is driven by heterogeneity in devices and traffic, and by the need to sustain service under mobility and partial connectivity [14]. A related emerging direction is security- and trust-aware coordination for UAV-enabled sensing and IoT, where ad hoc networking is combined with integrity and authentication mechanisms tailored to UAV mobility and mission dynamics [15]. MANET-style networking remains relevant in health and humanitarian contexts when connectivity must be formed opportunistically among mobile nodes, including mobile clinics, field monitoring, and aerial-assisted health logistics. Recent work frames “flying IoT” as an application pattern where UAV ad hoc networking supports time-sensitive sensing and service delivery with mobility-driven constraints [16].

1.2 Protocol model of MANETs

MANET communication is realized through a layered protocol stack spanning the physical, data link, network, transport, and application layers. At the physical layer, MANET links depend on wireless PHY designs whose behavior is strongly shaped by channel conditions, interference, and contention [17]. In practical MANET evaluation, PHY behavior is often abstracted, yet modern WLAN evolution emphasizes high-efficiency operation under dense access and competing transmissions, which affects how realistic link behavior should be interpreted in MANET-style experimentation. At the data link layer, the MAC sublayer is central because MANET nodes share a broadcast medium and must manage contention, collisions, and fairness. Hidden and exposed terminal effects remain material to ad hoc operation, and MAC coordination assumptions can change observed delay and delivery outcomes even when routing logic is unchanged [18]. As WLAN MAC design evolves toward more scheduled and multi-user access behavior in dense settings, the MAC layer remains a key determinant of evaluation credibility for MANET-like wireless experimentation.

At the network layer, the defining MANET function is multi-hop routing under mobility, where topology knowledge is partial and time-varying. Because routing performance depends on mobility dynamics and link-layer delivery, MANET evaluations must report mobility and traffic assumptions clearly if routing gains are to be interpreted across studies [1]. This need becomes more important when studies compare protocols using similar metrics but different evaluation stacks [19]. At the transport layer, reliability and congestion behavior must be interpreted carefully because packet losses in MANETs can be caused by mobility-driven route failures and MAC contention, not only by congestion. Prior transport research for MANET settings shows that TCP can misinterpret non-congestion losses and respond in ways that degrade throughput and stability unless the design accounts for route dynamics and cross-layer conditions [20,21]. At the application layer, workloads and QoS requirements shape traffic generation, session patterns, and delay sensitivity. Since MANET studies frequently evaluate routing using application-driven traffic, scenario realism depends on whether traffic models and service requirements are explicitly defined and aligned with the intended application setting [2].

1.3 Objectives

- To map how contemporary MANET studies frame evaluation (primary/secondary orientations) and which metric categories are reported under each orientation.
- To diagnose cross-study comparability by auditing evaluation-stack disclosure (e.g., simulator, mobility

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model, traffic/scenario descriptors) and summarizing missingness patterns.

- To audit the presence of validation reporting, statistical analysis reporting, and reproducibility support, and summarize rigor levels across studies and over time.
- To assess claim substantiation by relating baseline diversity to metric breadth at the study level (and interpreting this against evaluation completeness).
- To characterize energy modeling assumptions and reporting depth (not reported / fixed initial energy / simulator model / detailed model) and compare patterns by orientation group.

1.4 Methodology

This study adopts a PRISMA-guided systematic review for study identification and selection, combined with a meta-research and evidence-mapping framework for synthesis. The review does not compare or rank protocol performance values. Instead, it examines evaluation design, reporting completeness, reproducibility support, and the extent to which evaluation evidence substantiates claims. Each included article is treated as an experimental artifact. The methods align with the study objectives by supporting evidence mapping of evaluation ecosystems, cross-study comparability assessment, rigor and reproducibility diagnostics, claim-substantiation analysis, and energy modeling synthesis.

Google Scholar was used as a discovery interface to identify candidate studies across publishers. It was used only for record identification. Full texts were retrieved directly from journal or publisher platforms to ensure authoritative versions. The search window covered studies published from 1 January 2020 to 12 August 2025.

Studies were included if they:

- Focused on Mobile Ad Hoc Networks (MANETs).
- Proposed, modified, or evaluated a MANET protocol, mechanism, or algorithm.
- Reported empirical evaluation using simulation, emulation, or testbed experimentation.

Studies were excluded if they:

- Focused primarily on WSNs, IoT, or SDN without a MANET context.
- Were theoretical or analytical with no experimental evaluation.
- Were surveys, tutorials, editorials, or non-peer-reviewed content.
- Focused exclusively on MANET security attacks or defenses, which are addressed in Ref. [6].

Study selection followed PRISMA stages of identification, screening, eligibility assessment, and inclusion. A total of 33 records were identified. After duplicate removal, 27 records remained. Titles, abstracts, and conclusions were screened, leading to 7 exclusions due to irrelevance or lack of evaluation content. Twenty full-text articles were assessed for eligibility. All satisfied the inclusion criteria. The final synthesis therefore included 20 studies. These values are reflected in Figure 1.

A structured extraction template was developed to capture bibliographic metadata and evaluate descriptors. To reduce synonym fragmentation and ensure stable aggregation, categorical fields were constrained using controlled vocabularies implemented as predefined dropdown lists in the dataset workbook. This design supported consistent coding across studies and consistent generation of figures.

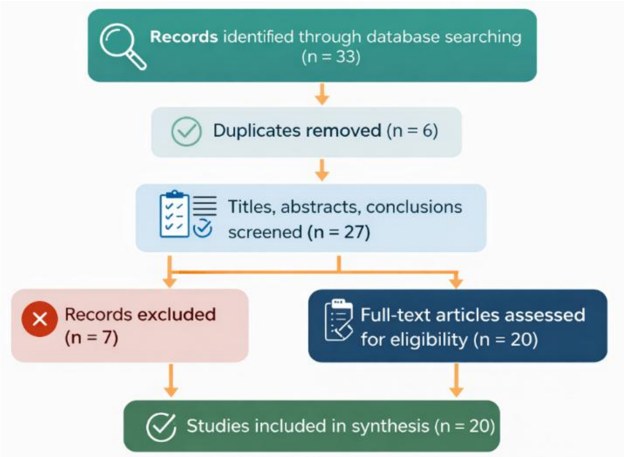

Figure 1. The PRISMA flow diagram

Extracted dimensions included evaluation orientation, experimental platform, mobility model, propagation and MAC assumptions, traffic specification, scenario parameters, baseline protocols, metric portfolios, energy modeling approach, and reporting indicators for validation, statistical analysis, and reproducibility. Several evaluation attributes were multi-label by design. Evaluation orientation was coded as primary and secondary where applicable. Evaluation orientations were analyst-coded from each study's title, problem framing, and evaluation design reported in the manuscript. Metric portfolios were recorded as multi-label lists using a consistent delimiter. Metrics were harmonized to a canonical metric vocabulary to enable cross-study comparison. Rare metrics were retained under an explicit "Other (specify)" category to avoid information loss.

Cross-study comparability was assessed by checking whether key evaluation descriptors were explicitly reported. These descriptors included simulator, mobility model, radio and MAC assumptions, traffic specification, scenario parameters, baselines, metric portfolio, and statistical reporting. Reporting completeness was quantified as a normalized completeness ratio per study. This ratio was used to compare evaluation stacks and identify systematic reporting gaps. Metric breadth was computed as the count of distinct metrics reported per study after harmonization to the canonical metric vocabulary. Baseline diversity was computed as the number of distinct baseline protocols reported per study. Energy modeling was coded into four mutually exclusive categories: not reported, fixed initial energy, simulator-provided energy model, or detailed energy model.

Methodological rigor was operationalized using three binary indicators: Validation_Reported, Statistical_Analysis_Reported, and Reproducibility_Reported. A Rigor_Score was computed for each study as the normalized sum of these indicators.

Two reviewers independently applied the eligibility rules and coded the three rigor indicators for all 20 included studies. Inter-rater reliability was assessed using Cohen's kappa on the rigor indicators. Out of 60 binary coding decisions, 57 were concordant and 3 were discordant. This yielded an observed agreement of 95.0% and a Cohen's κ of 0.663, indicating substantial agreement. Disagreements were resolved through structured discussion and consensus before final analysis.

Synthesis followed an evidence-mapping and diagnostic approach aligned with the study objectives. Visualizations were generated directly from the finalized dataset. They were used to analyze evaluation orientation patterns, platform and mobility reporting practices, energy modeling approaches, baseline diversity relative to metric breadth, rigor matrices, and temporal trends in reporting completeness. Figures were produced from the adjudicated dataset to ensure consistency between extracted evidence and reported results.

This methodology combines PRISMA-guided selection with evidence mapping of evaluation design, reporting completeness, and claim substantiation patterns in MANET research. It provides a structured basis for interpreting performance claims in light of evaluation comparability and reporting rigor.

2. Results

2.1 Objective 1: Evaluation orientations and metric portfolios

Table 1 reports the primary evaluation orientation, where each study is assigned one dominant orientation. Figure 2 complements Table 1 by separating primary and secondary orientation assignments. Under the primary classification, performance comparison appears in 14 studies, energy efficiency analysis appears in 4 studies, scalability analysis appears in 1 study, and methodological evaluation appears in 1 study. When secondary tags are included, performance comparison increases to 17 total assignments, energy efficiency analysis increases to 12, QoS or QoE analysis appears in 4, scalability analysis increases to 4, and mobility sensitivity analysis appears in 2.

Table 1. Evaluation orientation and study attribution

Evaluation orientation	(Article_Number) Study	Count
Performance comparison	1 [22] , 2 [23], 3 [24], 5 [25], 7 [26], 8 [27], 9 [28], 10 [29], 11 [30], 13 [31], 15 [32], 16 [33], 18 [34], 20 [35]	14
Energy efficiency analysis	12 [36], 14 [37], 17 [38], 19 [39]	4
Scalability analysis	6 [40]	1
Methodological evaluation	4 [41]	1

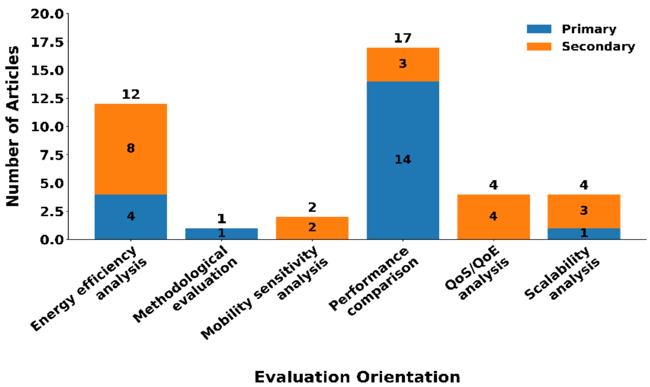

Figure 2. Primary and secondary evaluation orientation counts across included MANET studies. Stacked bar chart showing the number of studies classified under each evaluation orientation as a primary tag and as a secondary tag. Numbers on the bars are study counts; totals reflect primary + secondary assignments.

Figure 3 shows that metric usage varied across orientations. Metrics related to packet delivery, throughput, and delay appeared most frequently. Energy-related metrics were reported in energy efficiency-oriented studies and in several performance comparison studies. Overhead and control metrics appeared in fewer studies. Quality-of-service metrics such as jitter and packet loss were reported in a small subset of studies. To improve clarity in Figure 2, metrics and orientations were standardized using controlled vocabularies. Table 2 and Table 3 list these codes.

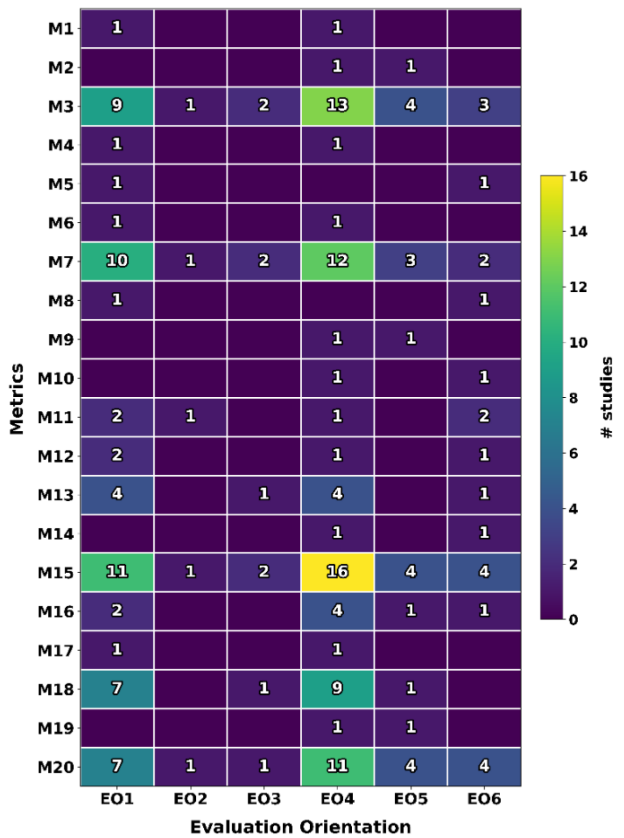

Figure 3. Metric categories by evaluation orientation. Heatmap showing the number of studies reporting each metric category under each evaluation orientation. Cell values represent study counts.

Figure 4 summarizes evaluation-orientation assignments by evaluation platform type. Counts are aggregated over primary and secondary orientation tags, so totals reflect orientation assignments rather than unique studies. Simulation accounts for 36 orientation assignments, while hybrid evaluations account for 4 assignments. Under simulation, performance comparison contributes 16 assignments, energy efficiency analysis contributes 11, scalability analysis contributes 4, QoS or QoE analysis contributes 3, and mobility sensitivity analysis contributes 2. Under hybrid evaluation, one assignment appears in each of performance comparison, energy efficiency analysis, QoS or QoE analysis, and methodological evaluation.

2.2 Objective 2: Evaluation-stack reporting completeness and comparability diagnostics

Figure 5 summarizes reporting completeness across key evaluation fields for each included study. Across the 20 studies, simulator type was reported in 17 studies, while 3 did not report the simulator. Mobility model was reported in 12 studies, while 8 did not report the mobility model.

Table 2. Metric codes used in the evaluation analysis

Metric Code	Metric
M1	Alive Nodes Count
M2	Attack Detection Rate
M3	Average End-to-End Delay (AE2ED)
M4	Average Routing Delay
M5	Control Packet Overhead (CPO)
M6	Convergence Rate (Iterations)
M7	Energy Consumption
M8	Environmental Impact/ Energy Savings
M9	False Positive Rate
M10	Goodput
M11	Jitter
M12	Load Balancing Efficiency
M13	Network Lifetime
M14	Network Resilience
M15	Packet Delivery Ratio (PDR)
M16	Packet Loss Rate
M17	Residual Energy
M18	Routing Overhead
M19	Security Strength Ratio
M20	Throughput

Table 3. Evaluation orientation codes

Orientation Code	Evaluation Orientation
E01	Performance Comparison
E02	Energy Efficiency Analysis
E03	QoS or QoE Analysis
E04	Scalability Analysis
E05	Mobility Sensitivity Analysis
E06	Methodological Evaluation

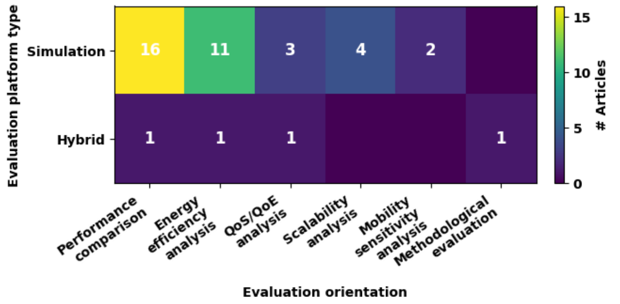

Figure 4. Evaluation orientation by evaluation platform type. Heatmap of platform-orientation co-occurrence. Cell values are the number of orientation assignments per platform, aggregated across primary and secondary orientation tags.

Figure 5 also shows field-level reporting variation across traffic, routing, and measurement descriptors, with completeness displayed per study and as aggregate percentages. Figure 6 reports simulator and mobility-model disclosure and their joint usage. Random Waypoint was the only explicitly reported mobility model in the figure's joint map. The joint distribution includes 7 studies using NS-3 with Random Waypoint and 3 using NS-2 with Random Waypoint. Missingness is shown separately: the mobility model was not reported in 40% of studies and the simulator was not reported in 15%. A further 5% used a simulator categorized as "other."

2.3 Objective 3: Methodological rigor and reproducibility audit

Figure 7 reports three methodological rigor indicators across the 20 included studies: validation, statistical analysis, and reproducibility support. Validation was reported in all 20 studies. Statistical analysis was reported in 1 study. Reproducibility support was reported in 17 studies, while 3 studies did not report sufficient information to support reproducibility.

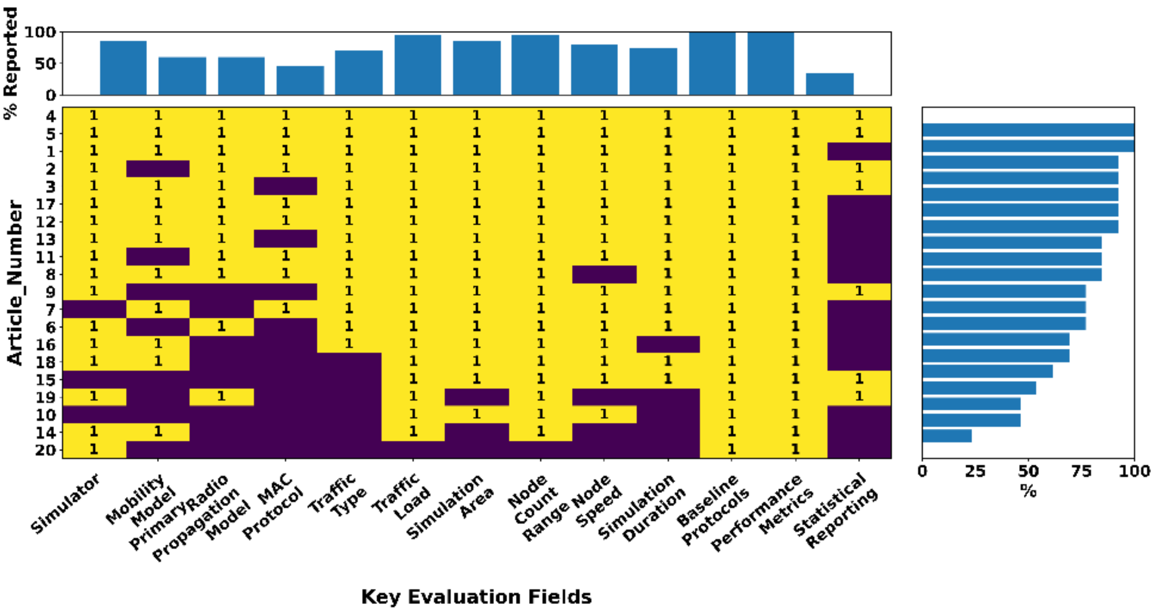

Figure 5. Evaluation reporting completeness matrix (N=20). Binary matrix of key evaluation-field reporting per study with aggregate reporting percentages.

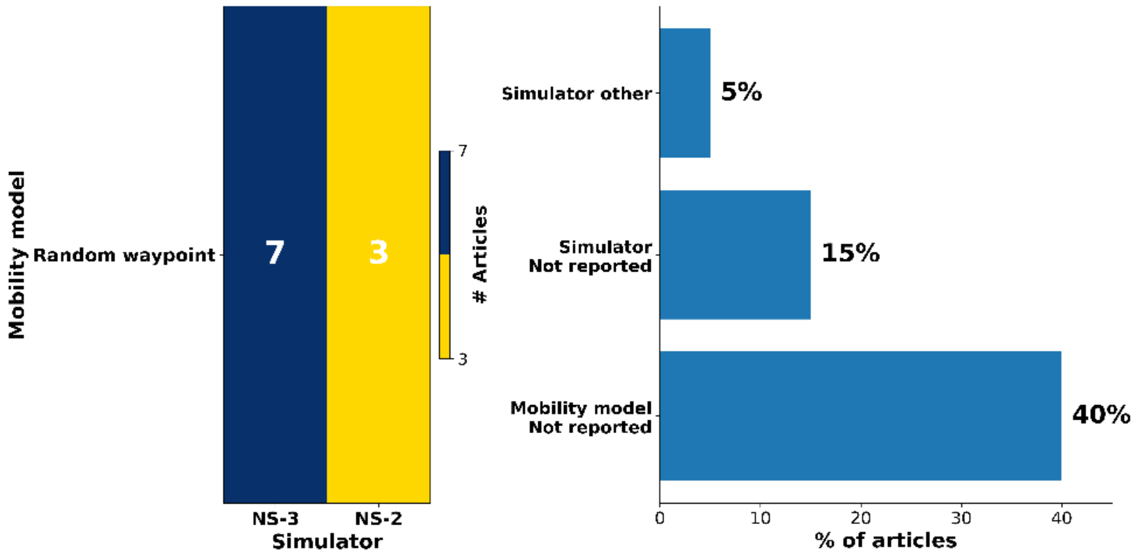

Figure 6. Simulator and mobility-model reporting summary (N = 20). Joint simulator-mobility counts for studies reporting both, with separate percentages for unreported and "other" simulator cases.

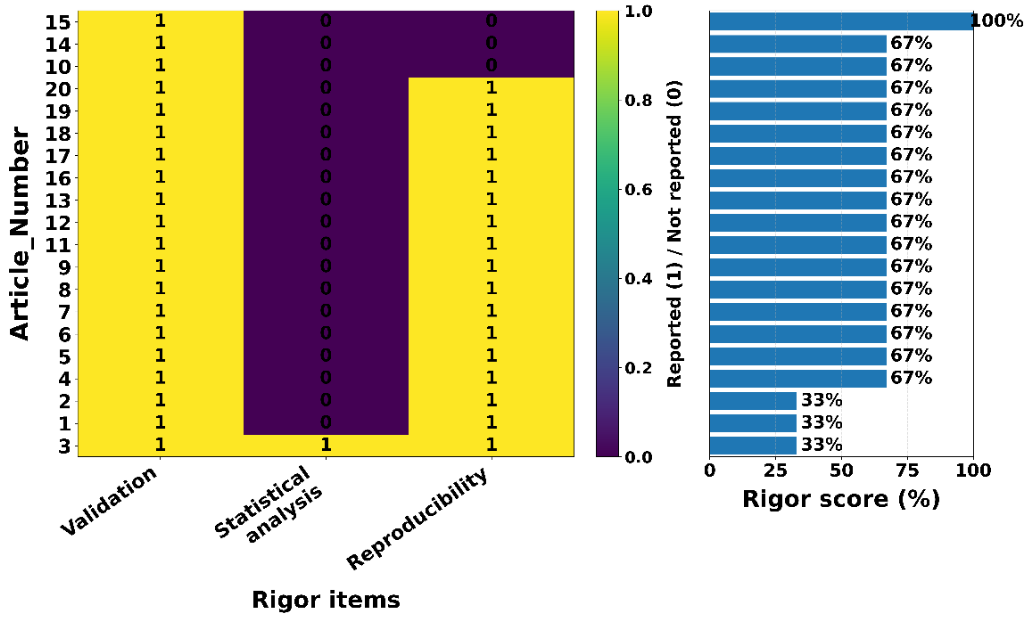

Figure 7. Rigor indicator matrix and per-study rigor score. Binary reporting of validation, statistical analysis, and reproducibility support (1 = reported; 0 = not reported). Per-study rigor score is computed as the proportion of reported indicators out of three, expressed as a percentage (33%, 67%, 100%).

Rigor scores were computed for each study as the proportion of reported indicators out of three; observed scores ranged from 33% to 100%. The resulting rigor-score distribution was 3 studies at 33%, 16 studies at 67%, and 1 study at 100%. Figure 8 summarizes mean rigor scores by publication year. Mean rigor values were 0.67 in 2020, 0.67 in 2021, and 0.67 in 2022. The mean score declined to 0.56 in 2023 and remained at 0.56 in 2024. The mean rigor score increased to 0.67 in 2025.

2.4 Objective 4: Claim substantiation through baselines and metric breadth

Baseline diversity and metric breadth varied across the 20 studies (Figure 9). Baseline counts ranged from 1 to 9, with most studies using 2–5 baselines (18/20 studies). Metric breadth ranged from 3 to 10 distinct metrics, and most studies reported 3–6 metrics (17/20 studies). One study reported the maximum baseline diversity (9 baselines) and the widest metric breadth (10 metrics). The single-baseline study reported 3 metrics.

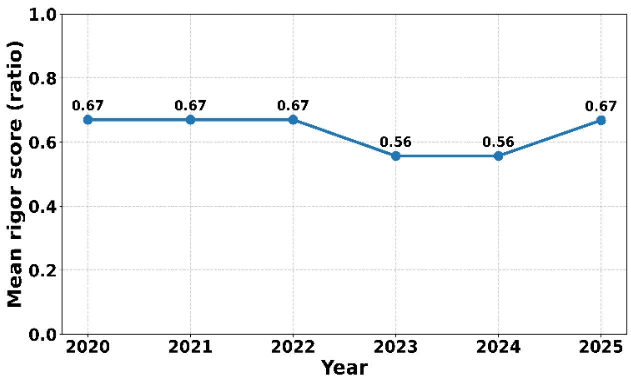

Figure 8. Mean rigor score over time. Mean rigor score by publication year, computed from validation, statistical analysis, and reproducibility indicators.

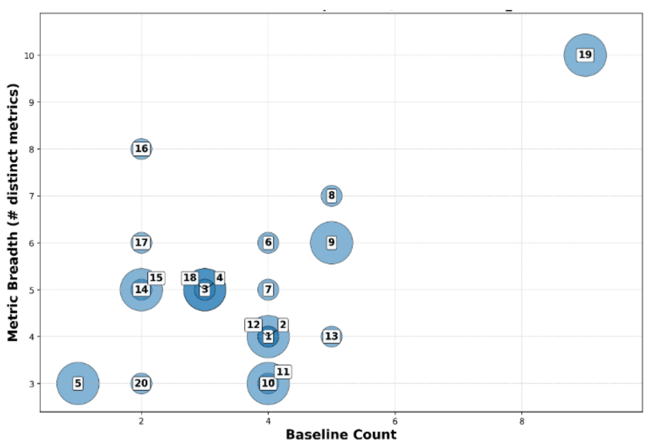

Figure 9. Baseline diversity versus metric breadth. Bubble plot of baseline count versus number of distinct metrics per study. Bubble size represents evaluation completeness. Labels indicate Article_Number identifiers.

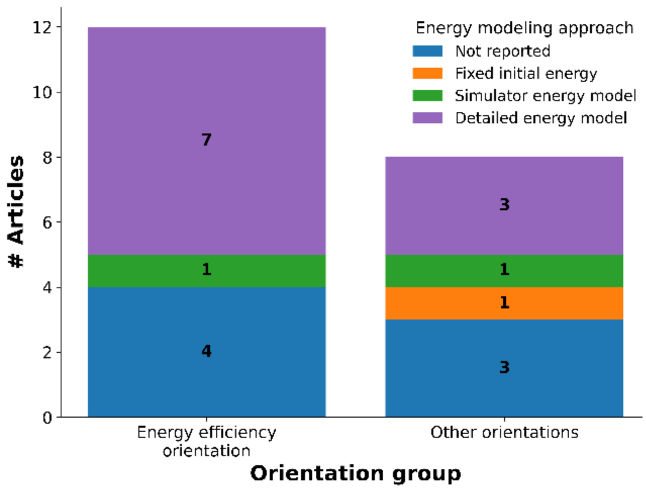

Figure 10. Energy modeling approaches by evaluation orientation group. Study counts by energy-model category for energy-efficiency-oriented studies (n = 12) and other orientations (n = 8)

2.5 Objective 5: Energy modeling assumptions and reporting depth

Energy modeling was coded into four categories: not reported, fixed initial energy, simulator energy model, and detailed energy model (Figure 10). The energy-efficiency orientation group includes 12 studies, of which 7 reported a detailed energy model, 1 used a simulator energy model, 0 used fixed initial energy, and 4 did not report the energy model. The other-orientations group includes 8 studies, of which 3 reported a detailed energy model, 1 used a simulator energy model, 1 used fixed initial energy, and 3 did not report the energy model. Across all 20 studies, detailed energy models were reported in 10 studies, simulator energy models in 2, fixed initial energy in 1, and energy modeling was not reported in 7.

3. Discussion

3.1 Objective 1: Evaluation orientations and metric portfolios

Objective 1 indicates that contemporary MANET evaluation practice is organized around a small set of recurring evaluation intents, with many papers embedding secondary evaluation emphases inside designs that are primarily framed as performance comparisons. This structuring matter because it shapes how evidence is interpreted, since secondary intent is often expressed through added metrics rather than through a distinct evaluation design that is tailored to that intent. The metric distribution by orientation reinforces that evaluation intent in this literature is frequently operationalized through metric choice and reporting, not through systematically differentiated experimental regimes. The platform summary further shows that these evaluation ecosystems are produced predominantly through simulation, with limited hybridization, which influences which evaluation dimensions are easiest to claim and most difficult to substantiate.

3.2 Objective 2: Evaluation-stack reporting completeness and comparability diagnostics

Objective 2 shows that cross study interpretability is limited less by the availability of metrics and more by incomplete disclosure of evaluation stack descriptors that determine what those metrics mean. Even when two studies report the same headline outcomes, differences or omissions in mobility modeling, radio propagation assumptions, MAC configuration, scenario settings, and traffic specification can prevent meaningful comparison. The simulator and mobility summary also suggests that comparability is shaped by patterned concentration in a small set of simulator mobility combinations, which can create an implicit default evaluation culture while leaving other combinations under explored. In combination, the completeness matrix and simulator mobility mapping support a clear conclusion: comparability in MANET research cannot be inferred from shared metrics alone, because the evaluation stack is the unit that governs interpretation.

3.3 Objective 3: Methodological rigor and reproducibility audit

Objective 3 highlights a consistent separation between validation reporting and the practices that enable uncertainty characterization and independent re execution. The evidence indicates that validation is a near universal reporting norm, while statistical treatment is rare and reproducibility support is uneven. This pattern suggests that credibility in this literature is most often signaled through repeated simulation or multi scenario evaluation rather than through formal inference. The year level variation in mean rigor further implies that improvements in methodological disclosure are not steady across time and may depend on venue norms, author practice, and reporting expectations rather than on chronological maturation alone. A practical implication is that reviewers and readers should treat validation claims as a necessary baseline and use reproducibility disclosure and statistical treatment as the differentiators that determine whether performance differences can be trusted as robust.

3.4 Objective 4: Claim substantiation through baselines and metric breadth

Objective 4 clarifies that claim substantiation depends on the comparative context provided by baselines as much as on the breadth of outcomes reported through metrics. The baseline versus metric breadth structure shows that studies can be rich in reported outcomes while remaining narrow in comparative positioning, or can expand baselines without expanding measurement breadth. This separation is important because strong claims require both a defensible comparison set and a metric portfolio that captures relevant trade-offs. The inclusion of evaluation completeness in the same visualization makes the implication sharper: baseline and metric choices are most persuasive when they co-occur with high disclosure of the evaluation stack that produced them. Without that disclosure, baseline diversity and metric breadth can still support narrative claims, but they support weaker scientific comparability.

3.5 Objective 5: Energy modeling assumptions and reporting depth

Objective 5 shows that energy related evaluation outcomes are common, but the modeling depth that supports those outcomes is uneven across the evidence base. This matter because energy metrics are not purely observational in simulation; they are functions of the assumed model, its parameters, and the level of disclosure provided to interpret it. When energy modeling is not reported or is limited to simulator defaults or fixed initial energy, the interpretive scope of energy efficiency claims becomes narrower and less portable across studies. The orientation group comparison further indicates that energy efficiency framing does not guarantee energy model disclosure at a level that supports replication or cross study synthesis. Energy therefore remains a high impact evaluation dimension where reporting discipline directly determines evidential value.

3.6 Integrated implications across objectives

Across Objectives 1 through 5, a coherent methodological picture emerges. The literature shows a stable core evaluation culture defined by dominant evaluation intents, simulation centered execution, and recurring metric families, while cross study comparability is constrained by incomplete or uneven disclosure of evaluation stack elements. Rigor is shaped by near universal validation reporting but limited statistical treatment and uneven reproducibility support, and claim substantiation varies in how baselines, metrics, and reporting completeness are combined. The key insight is that MANET performance results are often easy to compute but harder to interpret across papers, because interpretation is controlled by evaluation stack transparency, not by metrics alone.

3.7 Practitioner-oriented evaluation checklist

Based on the synthesized evidence, this checklist is derived for researchers and practitioners to design evaluations that are transparent, comparable, and reviewable.

- State the evaluation intent clearly and align scenarios and metrics to that intent.
- Report minimum evaluation stack descriptors, including simulator, mobility model, traffic specification, and scenario settings.
- Report radio propagation and MAC assumptions whenever simulation is used.
- Justify baseline selection and report baseline counts and baseline rationale.
- Balance metric breadth with baseline diversity so comparative claims have adequate context.
- Provide reproducibility support, including parameter values, configuration files, and run conditions where possible.
- When reporting energy outcomes, disclose the energy model category and key assumptions that govern energy computation.

4. Conclusion

This study presented a PRISMA-guided, evaluation-focused systematic review of contemporary MANET research published between 1 January 2020 and 12 August 2025. The review treated each study as an experimental artifact and examined how MANET evaluations are designed, reported, and used to substantiate claims. The synthesis shows that evaluation practice is concentrated around performance comparison and a narrow set of frequently used delivery and delay metrics. At the same time, evaluation stacks vary across simulators, mobility models, scenario settings, baseline choices, and energy-model assumptions, and key reporting elements are not consistently disclosed. The rigor audit further indicates that validation is commonly reported, while statistical analysis and reproducibility-supporting detail are uneven across studies, which constrains the interpretability and transferability of reported findings. By integrating study-attributed evidence maps, comparability diagnostics, rigor auditing, and energy-model reporting assessment, this review provides a structured account of how MANET experimental evidence is produced and where comparability breaks down. The practitioner-facing checklist derived from the results offers concrete guidance for designing transparent and comparable MANET evaluations and for supporting reviewer assessment of experimental soundness. Future research should develop and validate community-aligned reporting standards that reduce evaluation-stack ambiguity and strengthen cross-study synthesis in MANET research.

Ethical issue

The authors are aware of and comply with best practices in publication ethics, specifically regarding authorship (avoidance of guest authorship), dual submission, manipulation of figures, competing interests, and compliance with research ethics policies. The authors adhere to publication requirements that the submitted work is original and has not been published elsewhere.

Data availability statement

The manuscript contains all the data. However, more data will be available upon request from the authors.

Conflict of interest

The authors declare no potential conflict of interest.

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