

Supplementary Material

Where earmarked road-safety money stops: a comparative performance-audit analysis of three Indian states

Supplementary Material S1. Search, eligibility and coding framework

The CAG portal and indexed web results were searched through 5 July 2026 using “road safety”, “road safety authority”, “road safety fund” and “performance audit”, separately and in combination. An included report had to treat the statewide road-safety system, authority or fund as its principal audit unit and to examine finance together with implementation. Reports on a single highway project, on road construction quality alone, on general transport operations, or on isolated road-safety-audit compliance were excluded because their denominators and accountability chains were materially different. The search identified Tamil Nadu’s statewide system audit, Kerala’s Authority/Fund audit and Karnataka’s Authority audit; the Kerala report’s narrower scope is coded explicitly in every affected domain.

Coding rules applied throughout:

- Every finding required an exact PDF and printed-page reference.
- Quantitative values were transcribed in the units used by the CAG.
- A derived percentage was retained only when numerator and denominator shared the same scope and period.
- Missing expenditure, output or outcome was never recoded to zero.
- “Not in audit scope” was kept distinct from “assessed without a reported gap”.
- State ratios were interpreted within case, because revenue bases and periods differed.
- Government replies did not close a finding unless the report documented completed corrective evidence.

The complete 44-row ledger is distributed as `page_linked_audit_ledger.csv` (see Data availability). Its fields are summarised below.

Field	Definition
Finding identifier	Stable per-observation identifier (e.g. TN01) for one source finding
State and period	State and the exact audit period or interval
Stage	Planning; collection/transfer;

	allocation/sanction; procurement/execution; operational readiness; monitoring/data; outcome/impact; or closure/follow-up
Domain and finding	Source-defined observation with numerator and denominator where reported; no imputation
Amount (₹ crore)	Monetary value recorded only where the audit reported it
Value dimension	Economy, efficiency, effectiveness or equity
Safe System pillar	Governance, roads, speeds, vehicles, road users, post-crash care, data or results
Scope status	Documented gap; assessed without a reported gap; or not in audit scope
Source and page	Source identifier with PDF and printed page

Supplementary Material S2. Conversion-chain definitions

Each stage was assessed against the minimum audit question it should be able to answer.

Stage	Minimum audit question
Planning	Is need quantified, prioritised, costed and assigned?
Collection/transfer	Did the full earmarked amount reach the fund on time?
Allocation/sanction	Did selection follow burden, evidence, capacity and equity?
Procurement/execution	Were inputs purchased economically and delivered on time?
Operational readiness	Are assets staffed, equipped, commissioned and accessible?
Monitoring/data	Can finance, outputs, quality and outcomes be linked?
Outcome/impact	Were intended health results achieved and credibly attributed?
Closure/follow-up	Was corrective action verified using like-for-like evidence?

Supplementary Material S3. Minimum results-linked audit record

The proposed record joins the following field groups under one persistent project identifier, preserved across the transport, police, roads, health, treasury and audit systems.

Field group	Required fields
Need	Burden, target population, geography, equity stratum, counterfactual
Intervention	Safe System pillar, evidence source, alternatives, expected effect
Finance	Revenue source, due date, transfer date, sanction, commitment, payment
Procurement	Tender method, bids, unit price, quality specification, lifecycle cost
Delivery	Milestone, physical output, geotag, completion,

	variation and reason
Commissioning	Staffing, equipment, operating hours, referral link, service start
Performance	Volume, timeliness, quality, access, adverse effects, unit cost
Outcome	Baseline, target, denominator, evaluation design, uncertainty
Audit closure	Finding, responsible officer, due date, evidence, verification status

Non-comparability decisions

- State conversion ratios use each audit’s own earmarked denominator and describe within-case conversion; they are not comparable levels of fiscal effort and the states were not ranked.
- Kerala’s aggregate expenditure was not reported and was retained as missing, not zero; its post-crash readiness lay outside the fund audit and was coded “not in scope”, not “no gap”.
- Counts of documented gaps describe the three included audits only and are not prevalence estimates for Indian states.
- Audit periods, mandates, samples and scopes differed, so the comparison is of mechanisms and evaluability rather than of state performance.
- Government replies were recorded where reported but were not treated as closure without documented corrective evidence.

Reproducibility

The analysis is fully scripted. Running the analysis code validates the finding identifiers, reconciles the state-specific financing funnels, recomputes the derived ratios and the scope-aware stage counts, and regenerates the two 600-dpi figures in PNG and TIFF form. The derived data files distributed with this package — `page_linked_audit_ledger.csv` (44 findings), `financing_conversion_metrics.csv` (state funnel values), `stage_gap_summary.csv` (scope-aware stage counts) and `four_e_evaluability.csv` (economy, efficiency, effectiveness and equity) — reproduce every table and figure. The script and the coded ledger will be deposited in a permanent open repository on acceptance; the CAG reports remain available at their official source URLs.