NALLA LABS · RESEARCH

RESEARCH-LED MOBILITY PROPOSAL

Beyond the Traffic Jam

A Passenger-Centred Approach to Diagnosing, Coordinating and Improving Urban Mobility in Nairobi

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NALLA LABS · NAIROBI, KENYA · NOV 2026

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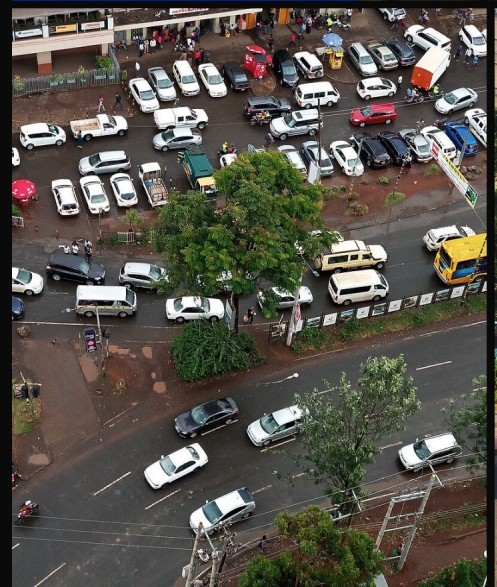
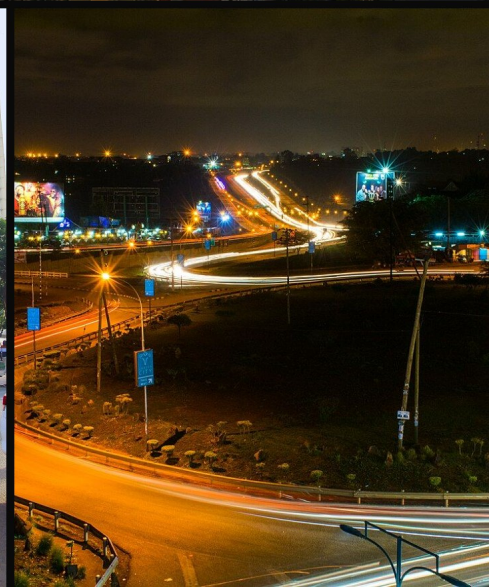






THE PROBLEM, IN PASSENGER TERMS

Every morning and evening, rush hour turns Nairobi into mayhem, and every traveller pays the price

~36 min

to drive 10 km in the 2025 evening peak (26:47 on average)

21.2 km/h

average road speed in 2023, down from 40.0 in 2013

69 %

of 14.1M weekday trips are made on foot or by matatu



☑ THE PROBLEM STATEMENT

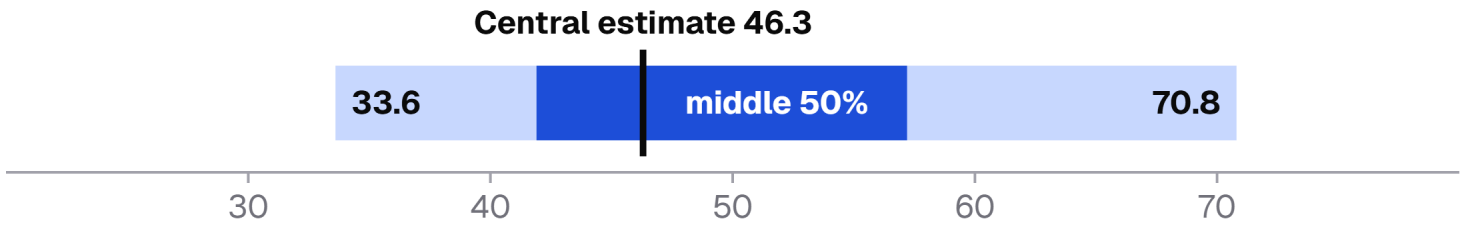
A 10 km drive takes 11 to 18 minutes longer in the morning and evening peaks, and matatu passengers, boda riders and people on foot are caught in the same chaos. No documented system yet shows where that time is lost, who should fix it, or whether anyone did.

Sources: TomTom (2026); JICA Expert Team (2025); Robinson (2026)

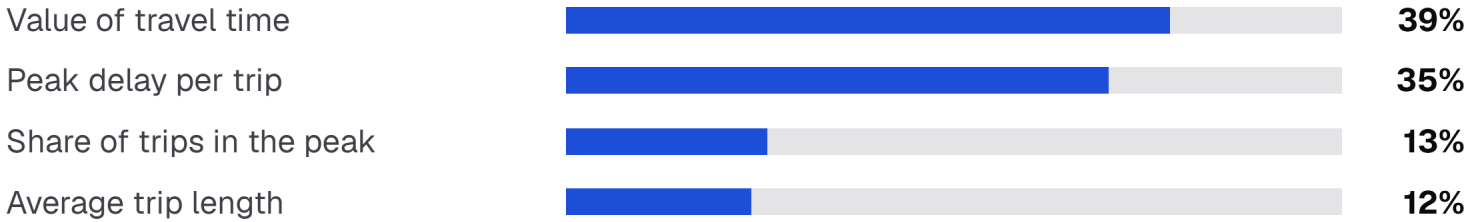
WHAT IT COSTS

Peak delay costs an estimated KSh 46.3 billion a year

MONTE CARLO RANGE · 10,000 DRAWS · KSH BN A YEAR



WHAT DRIVES THE UNCERTAINTY · SHARE OF VARIANCE



46.3 KSh bn

a year, central estimate (75% time, 25% fuel)

33.6–70.8

KSh bn, 90% uncertainty interval

235 million

person-hours lost a year, central case

☐ READ WITH CARE Model-based estimate using secondary data and stated assumptions; not a direct measurement of all social costs.

Source: Robinson (2026), cost model and Monte Carlo; JICA, TomTom, KNBS, EPRA inputs

THE INSIGHT

ILLUSTRATIVE MECHANISM REQUIRING FIELD VALIDATION

Where a queue appears is not always where it starts

01 · POSSIBLE ORIGIN

Delay on the return trip

Matatus heading back to town lose time at junctions on the inbound route.

→

02 · POSSIBLE ORIGIN

Longer round trips

Each vehicle completes fewer cycles, so fewer reach the stage each hour.

→

03 · POSSIBLE ORIGIN

Fewer seats per hour

Seat supply at the stage falls while passengers keep arriving.

→

04 · WHERE IT IS SEEN

A queue at the central stage

The stage looks like the problem, though nothing there has changed.

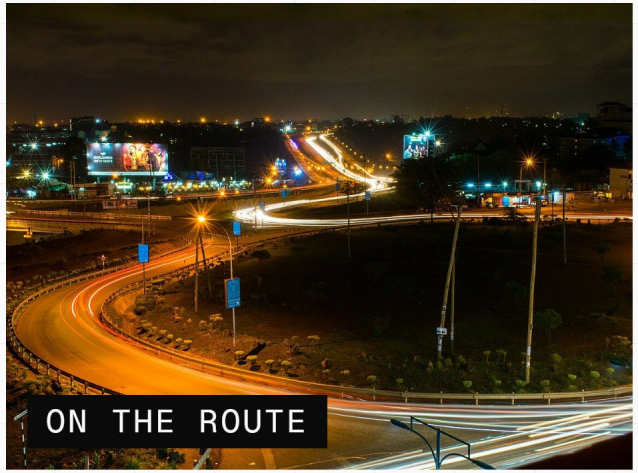
STAGE MODEL · +20 MIN PER RETURN TRIP

313 to 251 seats an hour reach the stage

148 queued after a 3-hour peak

~35 min extra wait, last arrivals

Inputs: 30 matatus, 14 seats, 300 passengers an hour





Source: Robinson (2026), stage seat-supply model, illustrative inputs

A SHIFT IN THINKING

From adding capacity to finding where passengers lose time

	CONVENTIONAL RESPONSE	PROPOSED APPROACH
Measure of success	Vehicle speeds and volumes	**Passenger time and reliability**
Where we look	Where the queue is visible	**Where the delay originates**
First move	Build or install citywide	**Diagnose one route, change one thing**
Accountability	Spread across mandates	**Named owner, action and deadline**
Proof of impact	Inputs delivered	**Measured against comparison sites**
Role of AI	Technology as the solution	**AI only where it beats a baseline**

☐ WHAT THIS IS NOT

Not a case against roads, junction systems or BRT. It adds a way to measure what they achieve for passengers.

Source: Robinson (2026), Discussion and Conclusion

THE FRAMEWORK

Four linked blocks trace delay from institutions to passengers, and back

☐ EXTERNAL INFLUENCES · LOGGED SO THEY ARE NOT MISTAKEN FOR EFFECTS

Weather · roadworks · crashes · seasonal demand · economic activity · fuel prices · school calendar · holidays

BLOCK 1

Institutional and operational factors

Governance and mandates · SACCO dispatch · enforcement · infrastructure and signals · information and data · coordination

→

BLOCK 2

Traffic and public transport mechanisms

Capacity and bottlenecks · headways and bunching · loading and dwell time · queue spillback · incidents · mixed traffic

→

BLOCK 3

Passenger outcomes

Waiting time · journey time · reliability · access and transfers · cost · safety

BLOCK 4

Intervention and evaluation

Diagnosis → one operational change → monitoring → causal evaluation → decision

Feedback loop: passenger outcomes → institutional performance review → changes in operational decisions

Source: Robinson (2026), Figure 1. A framework for measurement, not a tested causal structure.

THE FIRST SITE

Start with one corridor, diagnosed before anything changes

01	02	03	04	05	06
One corridor	One route and stage	One problem	One owner	One change	One evaluation

PHASE 1 · 8-10 WEEKS

Find where time is lost

Interviews and synchronised observation of the stage, vehicles and junctions. No intervention.

GATE TO PROCEED

- ☐ Named site owner
- ☐ SACCO willing to change practice
- ☐ Measured cause, with each share
- ☐ Comparison stage

PHASE 2 · AFTER THE GATE

Change one thing, measure it

Baseline; pre-analysis plan registered; one operational change; difference-in-differences.

GATE TO REPLICATE

- ☐ Effect on waiting and reliability
- ☐ Estimated with uncertainty
- ☐ Results published
- ☐ Credible cost per passenger-hour

Candidate route: Thika Road via Globe and Koja, to be confirmed. Ethics approval first.



Source: Robinson (2026), Method and Table 20

HOW WE WILL KNOW

The pilot is judged by passengers' time, not by activity

PRIMARY · PASSENGER TIME

- [x] Waiting time at the stage
- [x] End-to-end journey-time reliability (buffer-time index)

OPERATIONAL

- [ ] Seats per hour, vehicle return times
- [ ] Loading, dwell and clearance times
- [ ] People moved, walking access, spillover

INSTITUTIONAL

- [ ] Recurring problems with a named owner
- [ ] Time from logging to an owner acting
- [ ] Joint decisions that changed practice

HOW RESULTS ARE READ

Against comparison stages, with a difference-in-differences design registered in advance. No targets are set before the baseline is observed.



Source: Robinson (2026), Pilot Evaluation Design

WHO ACTS

PROPOSED STAKEHOLDER MODEL: ROLES TO BE CONFIRMED THROUGH CONSULTATION

Every recurring problem gets a named owner, an action, a deadline and a measured outcome

THE PRINCIPLE ☑ Named owner ☑ Action ☑ Deadline ☑ Measured outcome

☐ ROAD AUTHORITIES

KURA, KeNHA: signal timing and junction changes

☐ NAIROBI CITY COUNTY

Stages and termini: layout, space, signage

☐ NTSA AND POLICE

Enforcement at junctions, deployment, licensing

☐ SACCOS

Dispatch rules, fleet, marshals, GPS records

☐ TRANSPORT MINISTRY

Convenes the forum; escalation point

☐ NAMATA AND TREASURY

Use the scorecard for planning and funding

☐ STUDY TEAM

Diagnosis, evaluation design, open publication

☐ PASSENGERS, CREWS

Inform discovery; results reported back

SHARED ACCOUNTABILITY LOG

Who was told and when, what was done, time to act, result for passengers. Published quarterly as a public scorecard by institution.

Source: Robinson (2026), Table 16, Figure 23 and Recommendation 7

AI-ASSISTED COORDINATION

AI joins one function at a time, and only when it earns its place

AI MUST OUTPERFORM A SIMPLE BASELINE BEFORE IT IS ADOPTED

PHASE 1

Measure by hand

With the diagnosis and pilot. Simple measurement and a shared log kept by hand.

→

PHASE 2

Train and test

On the data the pilot produces. Detection and diagnosis tools tested against simple baselines.

→

PHASE 3

Software for accountability

Once the forum has used the manual log. Assignment, deadlines and escalation in rule-based software.

→

PHASE 4

National system

Only after results hold at a second site. Linking the Traffic Management Centre, agencies and SACCOs.

☑ DECISION LINE AI recommends and records; named institutions decide and answer for results.

Safeguards: written purpose and data minimisation · impact assessment under the Data Protection Act, 2019 · re-identification testing · published accuracy and false-alarm rates · human override and a decision log · no use to penalise individuals · open standards, no vendor lock-in · public scorecards and a correction channel

Source: Robinson (2026), RQ5, Figure 23, Tables 17 and 18

ACTION PLAN

A staged plan in which each step must earn the next

IMMEDIATE

0–6 months

01 Fund an 8–10 week diagnosis on one route and one stage

02 Proceed only with an owner, a costed change and a registered plan

03 Measure passengers before new junction systems switch on

MEDIUM TERM

6–18 months

04 Test one operational change; measure waits and reliability

05 Start a shared, time-stamped accountability log

06 Expand only after results hold at a second site

LONG TERM

18+ months

07 Build the AI-assisted coordination system in stages

08 Consider congestion pricing later, on Nairobi evidence

09 Replicate the framework in other cities

DECISION GATES

G0 owner, SACCO and measured cause → G1 baseline holds → G2 measured effect → G3 effect holds at a second site. Dates are targets (Dec 2026 to Jun 2028); each phase starts only when the previous gate is met.

Source: Robinson (2026), Conclusion and Recommendations, Figure 25, Table 20

WHAT SUCCESS LOOKS LIKE

INTENDED OUTCOMES, NOT RESULTS

If it works, passengers wait less and problems find owners faster

PASSENGERS	Shorter, more predictable waits and more reliable journeys
OPERATORS	Clearer dispatch, less time lost on return trips
INSTITUTIONS	Problems with named owners; faster time from log to action
PUBLIC SPENDING	Investments judged by measured passenger outcomes
OTHER CITIES	An open, replicable method with a shared minimum dataset

☐ A CREDIBLE NULL RESULT ALSO COUNTS

If delays prove to be mainly demand exceeding road and fleet capacity, that redirects investment, and it will be published.



Source: Robinson (2026), Introduction and Conclusion

THE ASK

LET'S PROVE WHAT WORKS BEFORE WE SCALE.

☐ A SITE OWNER
Named owners for one junction and stage

☐ A SACCO PARTNER
GPS and dispatch data, and one change

☐ DATA ACCESS
Junction and probe data under agreements

☐ FUNDING
For the 8–10 week diagnosis and baseline

☐ A RESEARCH PARTNER
Ethics review and independent evaluation

☐ CRITIQUE AND CONTRIBUTIONS
Test, correct, replicate the open model

☑ FIRST DECISION

Agree one corridor, route and stage, and name the site owner and SACCO partner, so the 8–10 week diagnosis can begin.

"Its effectiveness will be judged not by the sophistication of its models or technology but by whether it produces measurable and equitable improvements in passenger journeys." Robinson (2026)



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