ZAMBIA ROAD SAFETY TRUST

MOBILITY SOLUTIONS
SUSTAINABLE TRANSPORT
ROAD SAFETY

SAFE SCHOOL CORRIDORS DELIVERY STANDARD

Global Model Framework

A risk-led, costed and measurable system for local authorities to identify, finance, implement, evaluate and maintain safer school routes.

Document	Document 1 of 8 in the Safe School Corridors Delivery Standard set
Version	1.0 · Scientific reference edition · August 2026
Status of the model	A model built from proven components and designed for rigorous testing. It is not yet a proven model. See Section 5.
Prepared by	Zambia Road Safety Trust (ZRST) · RNGO 101/0503/2015 · Lusaka, Zambia
Author	Daniel Mwamba, Founder and Executive Director
Date	August 2026
Intended to support	Global Innovation Fund, Development Innovation Ventures, UN Road Safety Fund, World Bank and GRSF engagement, bilateral donors, and national and municipal adoption
Scientific convention	Vancouver-style numeric citations; controlled before-and-after pilot design; a priori hypotheses and explicit evidence limits.

Contents

1. Executive summary

Local authorities across Zambia and much of Africa already know that children are exposed to serious danger on the walk to school. What they usually lack is one standard system for deciding which routes to fix first, what to build, what it should cost, whether the work actually reduced risk, who maintains it afterwards, and how the next set of routes will be paid for. In practice those decisions are made corridor by corridor, often driven by whichever site is most visible or most politically convenient, and rarely measured afterwards. [1,3,8]

The Safe School Corridors Delivery Standard answers those questions in a single, repeatable process. It moves a council from a readiness check, through a rapid field diagnosis and a transparent risk score, into a costed menu of treatments, municipal-compatible procurement, construction with quality control, and a measured before-and-after evaluation against untreated comparison corridors. It then records the true unit cost and hands the council a toolkit to run the next wave from its own budget. [4-6]

ZRST is the originator and technical custodian of this model. The organisation's role is to design the system, train municipal teams, assure quality and evaluate results independently, then step back. **The council remains the delivery authority and the long-term owner of the assets.** ZRST does not seek to become a permanent contractor sitting between a council and its own roads.

The individual measures here are well evidenced internationally. The complete ZRST system is not yet proven, because no version of it has been run with a comparison group and a full published dataset. This framework is therefore written to be tested, not to be believed. Section 5 states plainly what the evidence currently supports, what it does not, and the threshold we must cross before calling the model proven. [2-7]

The strongest evidence behind the model today is independent. An evaluation by Sweden's national transport research institute, VTI, using a treated school and a matched control school, was published under the EU-funded AfroSAFE programme and quality-checked by the Institute of Transport Economics. It is one controlled, single-site result, not a multi-site proof. This document is the lead volume of an eight-part set; the pilot it describes exists to turn that one controlled result into the generalizable evidence a funder needs. [7]

A disciplined public-sector delivery system that helps a government decide where to act, what to build, what it costs, whether it worked, who maintains it, and how to repeat it at scale. Not another school-zone project, but the operating system that makes school-zone projects consistent, measurable and affordable.

2. The institutional problem this solves

The gap is not awareness and it is not, at root, money. It is the absence of a standard decision system. Ask most councils the following six questions and the answers are inconsistent or missing:

- **Which corridor should be treated first, and on what evidence?**
- **What level of treatment is appropriate for this specific site?**
- **What should it cost, and how do we know we are not overpaying?**
- **Did the work actually change risk, or did we simply build something?**
- **Who is responsible for maintaining it in three years' time?**
- **How will the next twenty corridors be financed?**

When those questions have no standard answer, investment flows to the visible rather than the dangerous, results go unmeasured, assets fall into disrepair, and every new corridor is negotiated from scratch. The model exists to give a council one consistent, transparent and defensible way to answer all six, every time. [4,5]

3. What is new, and what is not

We are deliberate about this because donors and government engineers will test it. Raised crossings, footways, refuge islands, 30 km/h zones, speed humps, school patrols and driver engagement are not innovations. They are proven tools, and we present them as such. [2,3,9,10,13-15]

The innovation is the municipal operating system that selects among those tools with discipline: risk diagnosis, transparent prioritisation, costed treatment matching, municipal-compatible procurement, quality control, comparison-based measurement, unit-cost tracking, maintenance handover, public financing and structured replication. **The value is in the system, not in any one piece of concrete.** [4,5]

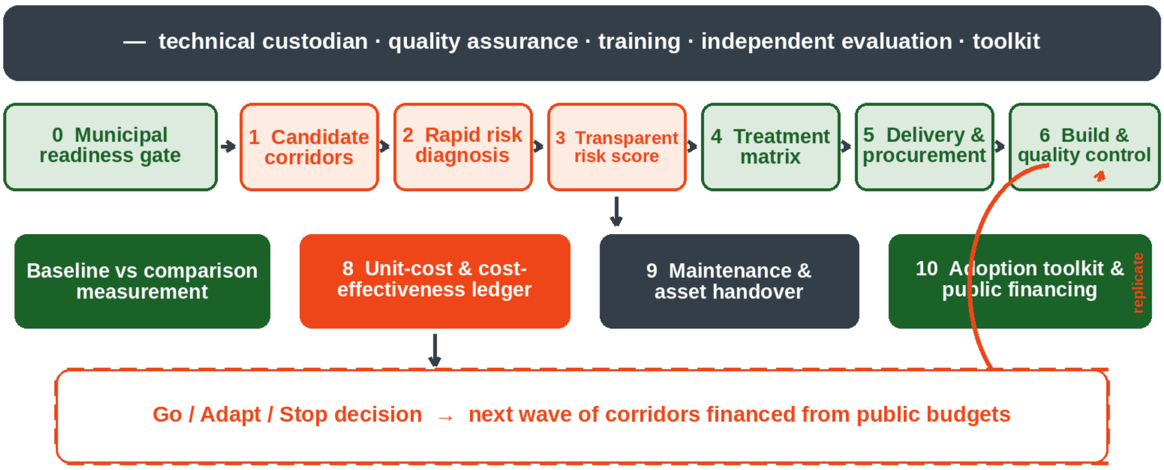


Figure 1. The Safe School Corridors Delivery Standard as a municipal operating system.

Ordinary crossings, signs and patrols are inputs, not the innovation. The innovation is the disciplined system that decides where to act, what to build, what it costs, whether it worked and who maintains it, then finances the next wave.

Figure 1. Conceptual municipal operating system, from readiness assessment to evidence-led replication. The framework is informed by Safe System implementation principles [4,5].

4. The operating system, component by component

The standard is organised into sixteen components. They are summarised below and detailed in the Municipal Implementation Manual (Document 2). The point of listing them is to show that each decision in the chain is defined, assigned and checkable, rather than left to discretion.

#	Component	What it fixes in the current process
0	Municipal readiness gate	Stops the model being dropped into a council that cannot procure, build or maintain. Sets minimum entry conditions.
1	Candidate corridor identification	Replaces ad-hoc site selection with a defined long-list drawn from enrolment, crash records, speed data and community reports.
2	Rapid risk diagnosis	A 24 to 48 hour field protocol per corridor with set forms, sample sizes and quality checks, so sites are assessed the same way.

#	Component	What it fixes in the current process
3	Transparent risk score	One consistent 100-point score that ranks corridors on evidence, not visibility or influence. Published and open to challenge.
4	Modular treatment matrix	Matches a costed package to each risk tier, with contraindications, so treatment fits the site rather than the budget line.
5	Delivery and procurement	A municipal-compatible workflow from concept to handover, with safeguarding and environmental screening built in.
6	Build and quality control	Construction supervision, defect management, stop-work conditions and completion certification.
7	Measurement and comparison	Before-and-after data against untreated comparison corridors, so effect is separated from wider traffic trends.
8	Unit-cost and cost-effectiveness	A standard ledger giving true cost per corridor and per child exposed, including in-kind and maintenance costs.
9	Maintenance and asset handover	Named maintenance responsibility and an asset register, so treatments do not decay unnoticed.
10	Adoption toolkit	Ready templates that let a council run the next wave without permanent external consultants.
11	Blended financing	A path from donor-funded pilot to publicly financed routine delivery.
12	National adoption pathway	How the model becomes a recognised national standard, aligned to road-design manuals.
13	International replication	A universal core with country and city modules, plus quality control for others who adopt it.
14	Inclusive, child-centred design	Meaningful participation by children, girls, and children with disabilities, with safeguarding throughout.
15	ZRST custodian role	Independent evaluator, trainer and toolkit owner, without permanently replacing the council.

5. Evidence and claims discipline

This section exists so that a hostile due-diligence reviewer finds the caveats already stated, rather than having to expose them. We separate five categories of evidence and hold every claim to the weakest honest description. **[4,7]**

Evidence category	How we treat it
1. Established internationally	Safe System principles, 30 km/h zones, raised crossings, footways and speed management are supported by WHO, iRAP, the World Bank and peer-reviewed research. We rely on these and cite them. **[1-6,12,14,15]**
2. Generated by past ZRST work	The strongest item here is an independent VTI before-and-after study with a treated school and a control school, published under AfroSAFE. Other prior ZRST school-zone data are mostly single-site, without comparison and with short follow-up. The controlled study is treated as promising early evidence, the rest as supporting, neither as proof. See the note below and the Evidence and Claims Register (Document 8). **[7]**
3. Untested in this model	The complete end-to-end system, and in particular municipal ownership and public financing at scale, has not been run and measured as a whole. This is the core thing the pilot tests. **[4,7]**
4. Assumptions to test	Unit costs, the speed of municipal procurement, maintenance follow-through and the risk-score weights are assumptions with stated values, to be checked against pilot data. **[4]**
5. Claims we will not make yet	We will not state casualty reductions, cost-effectiveness ratios or a proven national standard until the evaluation supports them. Pilot targets are not results.

Scientific design and analytical framework

The proposed pilot is a controlled before-and-after, quasi-experimental study at corridor level. The design separates implementation outputs from safety outcomes, includes untreated comparison corridors, uses repeated observations, and records effect estimates with uncertainty rather than relying on simple pre-post percentages. [4,7,11]

n element	Scientific specification
f analysis	A defined school corridor, with fixed observation points and documented boundaries.
arison structure	Twelve treatment corridors and four untreated comparison corridors, selected using pre-specified matching criteria.
y outcomes	85th-percentile speed, proportion of vehicles exceeding 30 km/h, and serious pedestrian-vehicle conflict rate.
dary outcomes	Driver yielding, crossing waiting time, perceived safety, route use, implementation fidelity, cost variance and mainter condition.
rement rounds	Baseline, immediate post-build, six-month follow-up and twelve-month follow-up, using the same field definitions an time windows.
is principle	Difference-in-differences or an equivalent repeated-measures model, with effect sizes, confidence intervals, sensitivi tests and transparent missing-data rules.
and ethics	Disaggregate by sex and age and, where ethical and feasible, disability and vulnerability; apply consent, safeguarding privacy controls.

A priori hypotheses

H1. Treatment corridors will show a greater reduction in 85th-percentile speed and speeding prevalence than comparison corridors.

H2. Driver yielding will increase and serious pedestrian-vehicle conflicts and crossing waiting time will decline after treatment.

H3. Any safety effect observed immediately after construction will remain detectable at the twelve-month follow-up.

H4. Wave 2 will show improved implementation fidelity and lower cost variance, without widening safety or participation gaps by sex, age or disability.

One result stands above the rest, and it matters because it is not ours to mark. An independent before-and-after study by VTI, Sweden's national road and transport research institute, evaluated a treated school corridor against a control school in Zambia. It was carried out under the EU-funded AfroSAFE programme, co-authored with ZRST, and quality-checked by the Institute of Transport Economics. Independent authorship and a control school put it ahead of anything ZRST could measure on itself. **[7]**

Alongside it sits ZRST's own before-and-after observation at a treated school, where the mean speed fell from 51.3 to 35.8 km/h. **That figure is honest but limited:** it came from a single site with no comparison group in the internal record, the follow-up was short, and the post-treatment average still sat above the 30 km/h target. It is supporting evidence, not proof of effect. **[7,12,13]**

Read together, these are a promising, controlled, single-site signal, not a generalizable result. **The pilot's twelve-treatment and four-comparison design (Section 8) exists precisely to move from one school to the sample size that can carry a defensible effect.** The full grading of every claim, including these, is the Evidence and Claims Register (Document 8). **[4,7,11]**

Primary Zambia study: Forward et al. (2025), VTI Report 1226A [7].

The threshold to call this a proven model

We will describe the model as proven only when all four conditions are met:

1. a completed pilot with treatment and comparison corridors and a full, published dataset;
2. measured reductions in speeding and pedestrian-vehicle conflict that hold at the 12-month follow-up;
3. at least one council running a second wave from its own budget; and
4. independent verification of the results and the unit costs.

Until then, the honest description is a model built from proven components, under test.

6. Choosing corridors: a transparent risk score

Corridor selection is where most programmes quietly fail, because the most dangerous route and the most visible route are rarely the same. The model scores every candidate corridor on one 100-point scale, built from twelve factors, so that ranking follows evidence and can be published and challenged. **[4,6]**

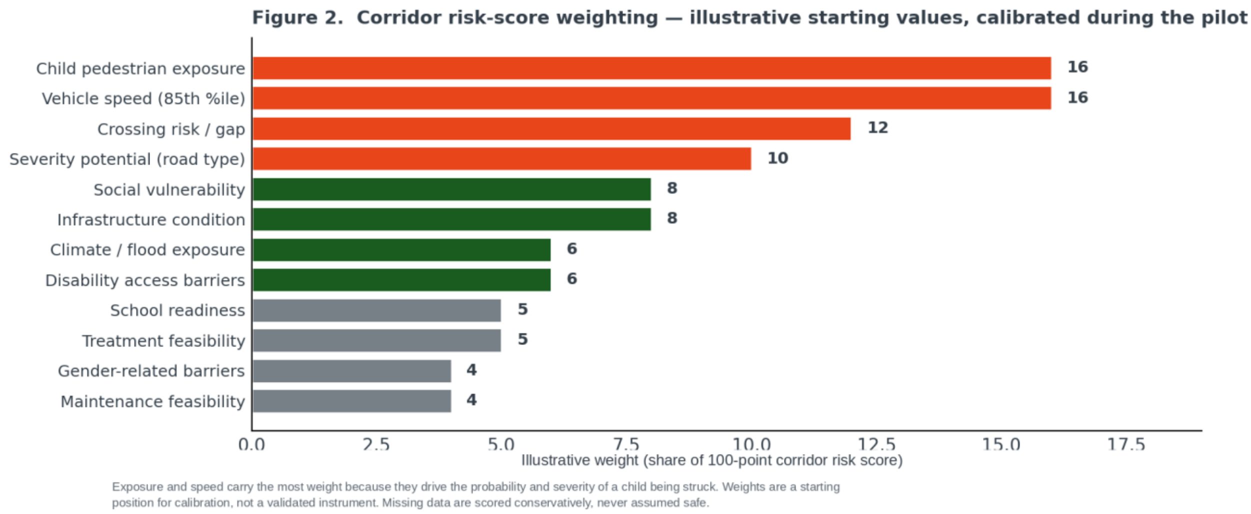


Figure 2. Illustrative initial weights for the corridor risk score. The domains are informed by pedestrian-risk and infrastructure-assessment guidance, but the weights are hypotheses to be calibrated during the pilot [2,3,6].

Three design rules protect the score from capture. **First,** missing data are scored conservatively and never assumed safe. **Second,** scores and the reasoning behind them are published, so a community can see why its corridor ranked where it did. **Third,** there is a defined appeals route, so a school or resident can challenge a score with evidence rather than with influence. **[4,6]**

7. Matching treatment to risk

Each corridor is matched to a standard package sized to its risk tier, drawn from a costed matrix. Full engineering detail, contraindications and design standards sit in Documents 2 and 4. The summary below shows the logic; the costs are illustrative and are replaced by the pilot bill of quantities. **[2,3,6,9,10,14,15]**

Risk tier	Typical corridor profile	Core package	Illustrative unit cost
Low	Lower speeds, short crossing, some existing footway	Markings, signs, minor footway repair, school patrol support	\$3k – \$6k
Medium	Moderate speeds, one crossing point, gaps in footway	Marked crossing, gateway treatment, footway infill, signs	\$7k – \$12k
High	Higher speeds, wide crossing, poor visibility, congestion	Raised crossing, refuge island, kerb build-outs, speed calming	\$12k – \$22k
Critical	Fast multi-lane road, high child volume, known crash history	Raised table, signalised or grade-separated crossing, full frontage works	\$22k+

Every treatment in the matrix carries the same nine attributes: the risk it addresses, site conditions required, contraindications, indicative design standard, cost range, maintenance requirement, expected useful life, responsible authority and monitoring indicator. **That is what lets a municipal engineer defend a choice, and lets an auditor check it.** **[2,3,6]**

BEFORE **AFTER**

Plate 1. Daina Kaimba Primary School, Lusaka, before and after. The left photograph shows the frontage before reconstruction; the right photograph shows the defined paved pedestrian route after intervention. Photographs: Somela Sinkala. Source: VTI Report 1226A [7].

8. Knowing whether it worked

Building something is easy to prove. Reducing risk is not. The model measures a defined set of indicators before and after treatment, and against untreated comparison corridors, so that a fall in speeds can be attributed to the work rather than to a citywide trend or the weather. [4,7,11]

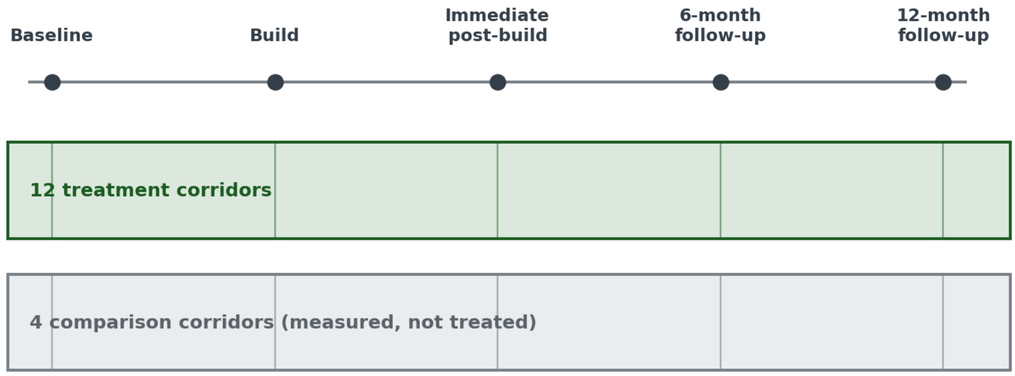


Figure 3. Treatment-and-comparison evaluation design over 24 months.

Measured at each point: 85th-percentile speed, % over 30 km/h, driver yielding, pedestrian-vehicle conflicts, crossing wait, perceived safety.
Comparison corridors separate the treatment effect from wider traffic trends. Crash counts alone are too rare per corridor to rely on.

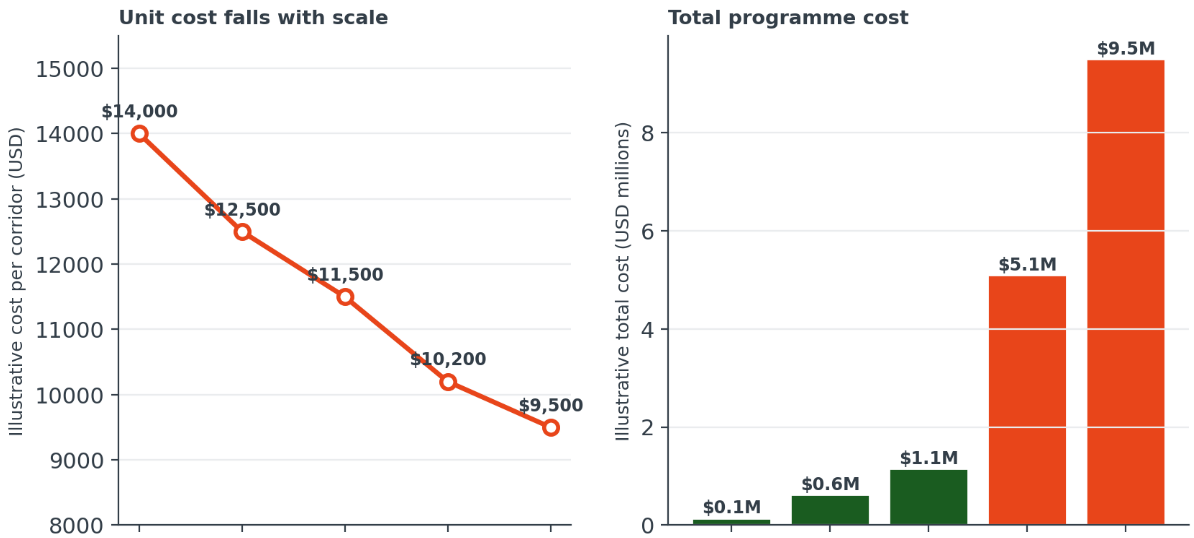
Figure 3. Controlled treatment-and-comparison design across 24 months. Repeated observations support estimation of intervention effects beyond simple before-and-after percentages [4,7,11].

We deliberately do not rely on crash counts alone. A single school corridor rarely records enough crashes in a year to show a reliable statistical change, so waiting for the crash count to move would be both slow and, in the worst sense, a poor use of children as the measure. Instead the primary indicators are 85th-percentile speed, the share of vehicles over 30 km/h, driver yielding, pedestrian-vehicle conflicts, crossing wait times and perceived safety, with attendance and girls' participation tracked where school data allow. The complete research design, sampling rules, ethics and analysis plan are set out in the Pilot and Evaluation Protocol (Document 3). [7,8,11]

9. What it costs and how it scales

The economics matter as much as the engineering, because a model that only works on donor money is not a public-sector system. The illustrative scenarios below show how unit cost is expected to fall as delivery scales, and who should carry the cost at each stage. [4,5]

Figure 4. Illustrative cost and scale scenarios (assumptions stated, not a quotation or a result)



Assumptions: mid-tier treatment package; USD, 2026 prices; excludes land and major drainage works; unit cost declines ≈32% from 10 to 1,000 corridors on procurement and mobilisation efficiencies. Real figures must come from the pilot bill of quantities. Donor funds the pilot corridors; public budgets absorb the recurring cost at scale. Sensitivity range not shown here is ±25%.

Figure 4. Illustrative cost and scale scenarios. All values are planning assumptions for sensitivity analysis, not quotations or observed results.

The financing logic is simple and deliberate. Donor and grant funding pays for the pilot corridors, the evaluation and the toolkit, the parts that create a public good others can reuse. As the model proves out, the recurring cost of routine delivery shifts onto municipal budgets, national road funds, education budgets and, where lawful, parking and traffic-fine revenue, supported by corporate and insurance-sector contributions. The scale scenarios run from 10 to 1,000 corridors so a council and a funder can see the cost of ambition before committing to it. **[4]**

10. Decision discipline: go, adapt or stop

The scale decision is fixed before the pilot begins, not argued afterwards. Thresholds are agreed with the funder and the council in advance, so the choice to expand, revise or halt is made on evidence rather than on optimism or politics. **[4]**

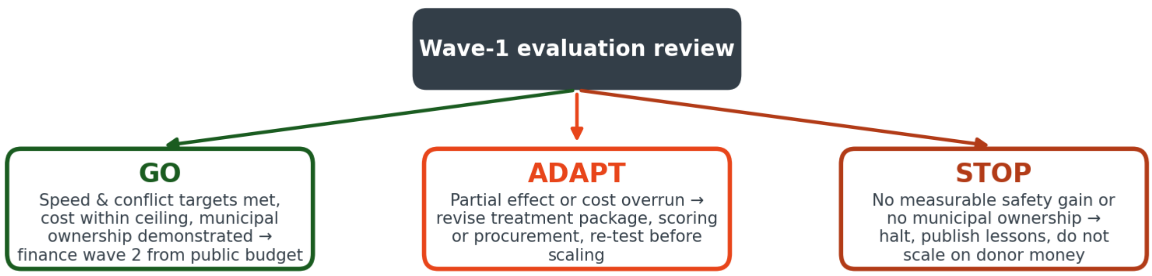


Figure 5. Pre-committed Go / Adapt / Stop thresholds.

Thresholds are agreed with the funder and the local authority before the pilot starts, so the scale decision is evidence-led, not political. "Stop" is a legitimate, honourable outcome that protects public money and ZRST's credibility.

Figure 5. A priori go, adapt or stop decision gates. Pre-specification reduces post-hoc interpretation and protects public resources [4].

I want to be blunt about "stop", because most proposals pretend it will never happen. If the pilot shows no measurable safety gain, or the council will not take ownership, the right move is to halt, publish what we learned, and not scale on borrowed credibility. A model that cannot fail honestly cannot be trusted when it succeeds.

11. Ownership, positioning and intellectual property

The model is designed to be adopted by governments, not fenced off from them. The balance we strike is to keep ZRST's authorship and quality control clear, while making the core method freely usable by any council that will apply it properly. [4,5]

Element	Approach
Core method and principles	Open access. Any government may use the risk-scoring logic, treatment matrix and evaluation design, with attribution to ZRST.
Toolkit, training and certification	Licensed. Implementation materials, training of trainers and quality certification are provided by ZRST or accredited partners, to protect delivery quality.
Name and standard	ZRST retains authorship of the named standard and the right to define what may carry its certification mark. Trademark and copyright are registered.
Government adoption	A council or ministry may adopt the standard into its own manuals and budgets without restriction, provided quality and attribution conditions are met.

On ZRST's own positioning, we apply the same discipline as everywhere else in this document. **ZRST earns the description of an internationally recognised technical partner through evidence, publications, independent evaluations and a real implementation record,** not through promotional language. The institutional-development plan that backs this claim, technical team, advisory board, safeguarding, data governance and quality assurance, is set out in Document 7. [4,7]

12. The pilot at a glance

Parameter	Design
Structure	12 treatment corridors and 4 comparison corridors, delivered in two waves
Duration	24 months, with baseline, immediate post-build, 6-month and 12-month measurement
Setting	Public schools serving low-income communities, one lead local authority
Evidence partner	One independent research partner responsible for verification and analysis
Cost control	A defined treatment-cost ceiling per corridor, tracked against the unit-cost ledger
What it tests	Feasibility, municipal ownership, prioritisation quality, treatment effect, cost predictability, maintenance, equity, safeguarding, community acceptance, financing potential and portability
Decision	Pre-committed go, adapt or stop thresholds at the wave-1 review

13. What we are asking for

This framework is the front door to a fundable pilot, not a request for open-ended support. **The specific ask is investment in a single, rigorously evaluated 24-month pilot in one Zambian city,** with an independent evidence partner, a fixed cost ceiling and published results, so that a working model can be validated once and then adopted and replicated at low marginal cost. The detailed budget, funding pathways and unit economics are in the Investment and Financing Case (Document 5). [4,7,11]

What a funder gets that a normal school-zone grant does not

A transferable public asset. Not one safer school, but a tested system a government can run itself, with the tools, costs and evidence standard already built.

Honest measurement. A comparison group and pre-committed stop rules, so the result means something whether it is positive or not.

14. References

References are numbered in order of first substantive use. Institutional guidance and peer-reviewed studies are separated only by their content, not by perceived prestige; the relevant test is whether each source supports the claim for which it is cited.

[1] World Health Organization. Global status report on road safety 2023. Geneva: World Health Organization; 2023. ISBN 978-92-4-008651-7.

[2] World Health Organization. Speed management: a road safety manual for decision-makers and practitioners. 2nd ed. Geneva: World Health Organization; 2023.

[3] World Health Organization. Pedestrian safety: a road safety manual for decision-makers and practitioners. 2nd ed. Geneva: World Health Organization; 2023. ISBN 978-92-4-007249-7.

[4] International Transport Forum. The Safe System Approach in Action: An Experience-Based Guide for Enhanced Road Safety. Paris: OECD Publishing; 2022. doi:10.1787/ad5d82f0-en.

[5] International Transport Forum. Zero Road Deaths and Serious Injuries: Leading a Paradigm Shift to a Safe System. Paris: OECD Publishing; 2016. doi:10.1787/9789282108055-en.

[6] International Road Assessment Programme. Star Rating for Schools: model, specifications and methodology resources. London: iRAP; current technical resources accessed 3 August 2026.

[7] Forward S, Henriksson P, Silvano AP, Miyoba T, Sinkala S, Mawele S, Mwamba D. Increasing traffic safety at schools in Zambia: a before and after study. VTI Report 1226A. Linköping: Swedish National Road and Transport Research Institute; 2025.

[8] Warsh J, Rothman L, Slater M, Steverango C, Howard A. Are school zones effective? An examination of motor vehicle versus child pedestrian crashes near schools. Injury Prevention. 2009;15(4):226-229. doi:10.1136/ip.2008.020446.

[9] Yeo J, Lee J, Cho J, Kim DK, Jang K. Effects of speed humps on vehicle speed and pedestrian crashes in South Korea. Journal of Safety Research. 2020;75:78-86. doi:10.1016/j.jsr.2020.08.003.

[10] Johansson C, Rosander P, Leden L. Distance between speed humps and pedestrian crossings: does it matter? Accident Analysis & Prevention. 2011;43(5):1846-1851. doi:10.1016/j.aap.2011.04.020.

[11] Howard AW, Batomen B, Zubair S, Cloutier MS, Macpherson AK, Rothman L. Automated speed enforcement reduced vehicle speeds in school zones in Toronto: a prospective quasi-experimental study. Injury Prevention. 2025. doi:10.1136/ip-2024-045561.

[12] Elvik R, Vadeby A, Hels T, van Schagen I. Updated estimates of the relationship between speed and road safety at the aggregate and individual levels. Accident Analysis & Prevention. 2019;123:114-122. doi:10.1016/j.aap.2018.11.014.

[13] Cameron MH, Elvik R. Nilsson's Power Model connecting speed and road trauma: applicability by road type and alternative models for urban roads. Accident Analysis & Prevention. 2010;42(6):1908-1915. doi:10.1016/j.aap.2010.05.012.

[14] Rothman L, Macpherson A, Buliung R, Macarthur C, To T, Larsen K, Howard A. Installation of speed humps and pedestrian-motor vehicle collisions in Toronto, Canada: a quasi-experimental study. BMC Public Health. 2015;15:774. doi:10.1186/s12889-015-2116-4.

[15] Grundy C, Steinbach R, Edwards P, Green J, Armstrong B, Wilkinson P. Effect of 20 mph traffic speed zones on road injuries in London, 1986-2006: controlled interrupted time series analysis. BMJ. 2009;339:b4469. doi:10.1136/bmj.b4469.

Annex. The eight-document set

This Global Model Framework is the first of eight linked documents. The framework carries the argument; the remaining documents carry the operational, evidential and financial detail a reviewer will demand. The set is being produced in sequence.

Doc	Title	Purpose
1	**Global Model Framework**	This document. The architecture, principles and claims discipline.
2	Municipal Implementation Manual	Step-by-step delivery guide for council engineers, planners and schools.
3	Pilot and Evaluation Protocol	Full research, monitoring and evidence plan, including comparison design and ethics.
4	Toolkit and Templates	Every form, checklist, scoring sheet, treatment matrix, costing and reporting template.
5	Investment and Financing Case	Costs, benefits, funding pathways, unit economics and scale scenarios.
6	National Adoption Roadmap	Pathway to Government of Zambia adoption and replication by Zambian councils.
7	International Replication and ZRST Positioning	Taking the model to other countries and the credentials ZRST must build to lead it.
8	Evidence and Claims Register	Every major claim, its source, strength, limitation and what more is needed.

Prepared by the Zambia Road Safety Trust. Figures marked illustrative are planning assumptions, not results.