Efficacy of the Zero Fatality Corridor Model in Reducing Road Crash Mortality in India

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INTRODUCTION

- 1.19 million people die in road traffic crashes annually, 92% occurring in low- and middle-income countries (LMICs).
- India ranks #1 in the world with over 168,000 Road Crash Fatalities (RCF)in 2022.
- Best-studied examples of road safety initiatives have been in high-income countries:
  - Sweden/USA: Vision Zero
  - Netherlands: Sustainable Safety
  - New Zealand: Safer Journeys
- SaveLIFE Foundation set out to develop the Zero Fatality Corridor (ZFC), a multidisciplinary road safety model based on principles of a Safe System Approach to reduce road traffic mortality in India.



OBJECTIVE

Objective: To identify and address repetitive engineering faults posing risks to road users.

Hypothesis: ZFC implementation will reduce RCF on high-risk roadways and may serve as a reproducible model for India and other LMICs worldwide.

METHODS

- Core ZFC model was developed on the Mumbai-Pune Expressway (MPEW):
  - Strategic partnerships with local stakeholders: Mahindra Auto Group, Govt. of Maharashtra
  - 2012-2014: Data-driven forensic crash analyses
  - 2015: Comprehensive on-site road safety audit
  - 2016: Implementation of targeted solutions
  - Ongoing data collection, impact measurement
  - Replication and scaling
- Crash and fatality data collected through police reports, Government of Maharashtra, Ministry of Road Transport and Highways (MoRTH)
- Segmented linear regression performed using SegReg software.

RESULTS

15 Repetitive Engineering Faults Contributing to 374 Crashes from 2012-2014 Identified and Addressed



Concrete barriers do not effectively absorb kinetic energy in crashes



Absent or narrow shoulders lead to rollovers and rear-end collisions



Poorly marked curves do not adequately indicate for drivers to slow down

Figure 1. Examples of faults identified and solutions

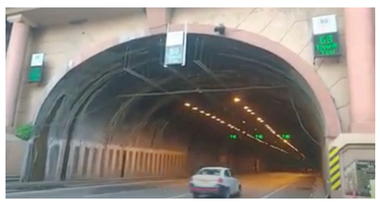
Fault	Count	Recommended Solutions
Narrow/missing shoulder	218.09 km	Build shoulders where absent, convert redundant medians to usable shoulders, install rumble strips to prevent shoulder misuse.
Concrete median/barriers	275 instances	Replace rigid concrete medians and barriers with impact-attenuating barriers or water/sand barrels.
Roadside drop-off	20 instances	Install roadside barriers to prevent run-offs.
Ineffective/damaged signs	162 instances	Replace old signs and install signage with clear pictorial symbols.
Sharp road curvatures	162 instances	Signage for advance warning, chevron markers along the curve, widen roads where possible to accommodate larger vehicles.
Gaps in medians	88 instances	Signage indicating gaps in the median, deceleration lanes to allow vehicles to reduce speed safely and take U-turns without affecting flow of traffic.
Unguarded support pillars	122 instances	Impact attenuators in front of pillars and barriers to direct traffic around support pillars.
Unguarded bridge/barrier	166 instances	Impact attenuating guard rails/wires to cover ends of rigid concrete barriers.
Unguarded overpasses	96 instances	Guard rails/barriers to prevent cars from running off overpasses.
Unsafe merge areas	76 instances	Acceleration and deceleration lanes for merging and exiting traffic.
Visual obstructions	37 instances	Eliminate or trim foliage, remove other objects that obstruct vision on turns.
Roadside trees	21.37 km	Clear out trees in close proximity to the roadway, guard rails/wires to prevent run-off vehicles from striking trees.
Curb stones	67.44 km	Replace with flexible poles or reflective stickers on roadside barriers.
Guardrail end taper	169 instances	Replace tapered guardrail ends with impact-attenuating bumpers.
Hazards in median	14.24 km	Remove hazardous objects from median.

Table 1. Infrastructure gaps identified on driving video audit performed by JPRI Research in 2015 with recommended solutions

New tools developed and implemented as additional needs identified



Patrolling drones monitor traffic and detect stalled/illegally parked vehicles



Vehicle-activated speed signs (VASS) provide feedback for real-time behavior correction



AI cameras detect distracted driving

Road crash fatalities before and after ZFC implementation on MPEW in 2016

Year	# RCF
2008	165
2009	131
2010	104
2011	118
2012	143
2013	129
2014	133
2015	118
2016	151
2017	105
2018	110
2019	92
2020	66
2021	88
2022	92
2023	63

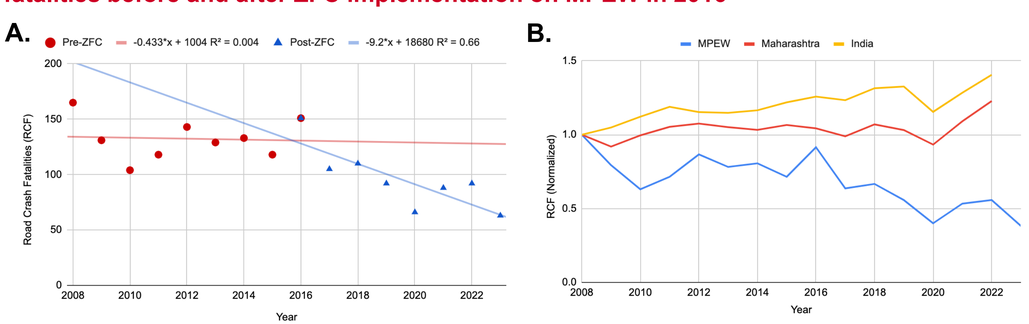


Figure 2. Annual road crash fatalities from 2008 – 2023.
A. MPEW with segmented linear regression model fit using SegReg.
B. MPEW compared with Maharashtra and India, normalized to 2008.

CONCLUSIONS

- Implementation of ZFC on MPEW in 2016 led to a significant and sustained decrease in RCF – **a 58% decrease from pre-ZFC fatality rate.**
- Observed decrease in RCF on MPEW outpaced trend in Maharashtra and India over the same time frame.
- Early success on MPEW has been key in securing funding and support from the Government of India and state governments.
- In 2018, SLF signed a MOU with the Government of India to continue expansion, streamline data sharing, and institutionalize ZFC best practices.

Future Directions:

- 22 ZFCs currently under development across India with plans to expand to 100 stretches.
- Continued data collection and assessment of outcomes across newer ZFCs.
- In 2023, SLF signed an MOU with the State of Assam to develop a Zero Fatality District, encompassing all roadways within the state.

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ACKNOWLEDGEMENTS

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