



CAREC Road Safety and Sustainable Mobility Course

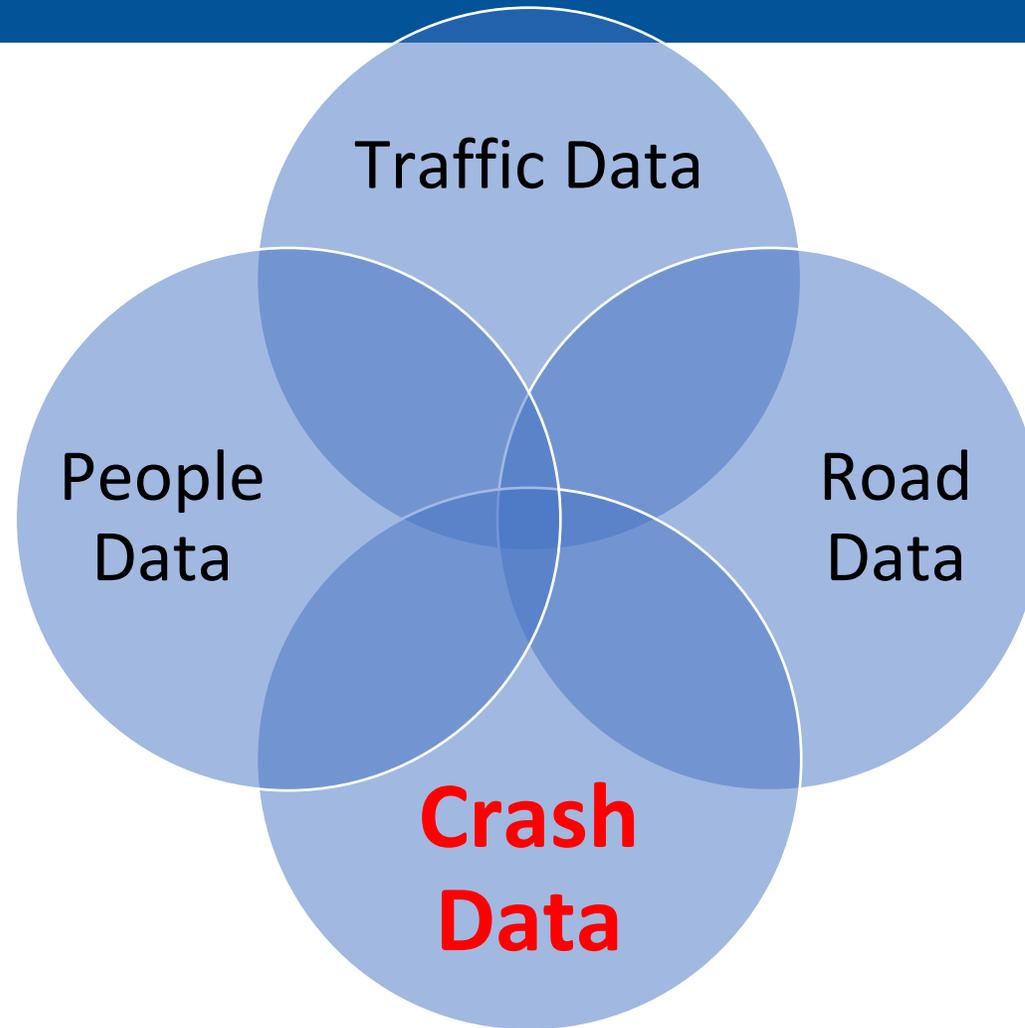
February 2024

Data systems to inform road safety management and implementation

PART 1: CRASH DATA

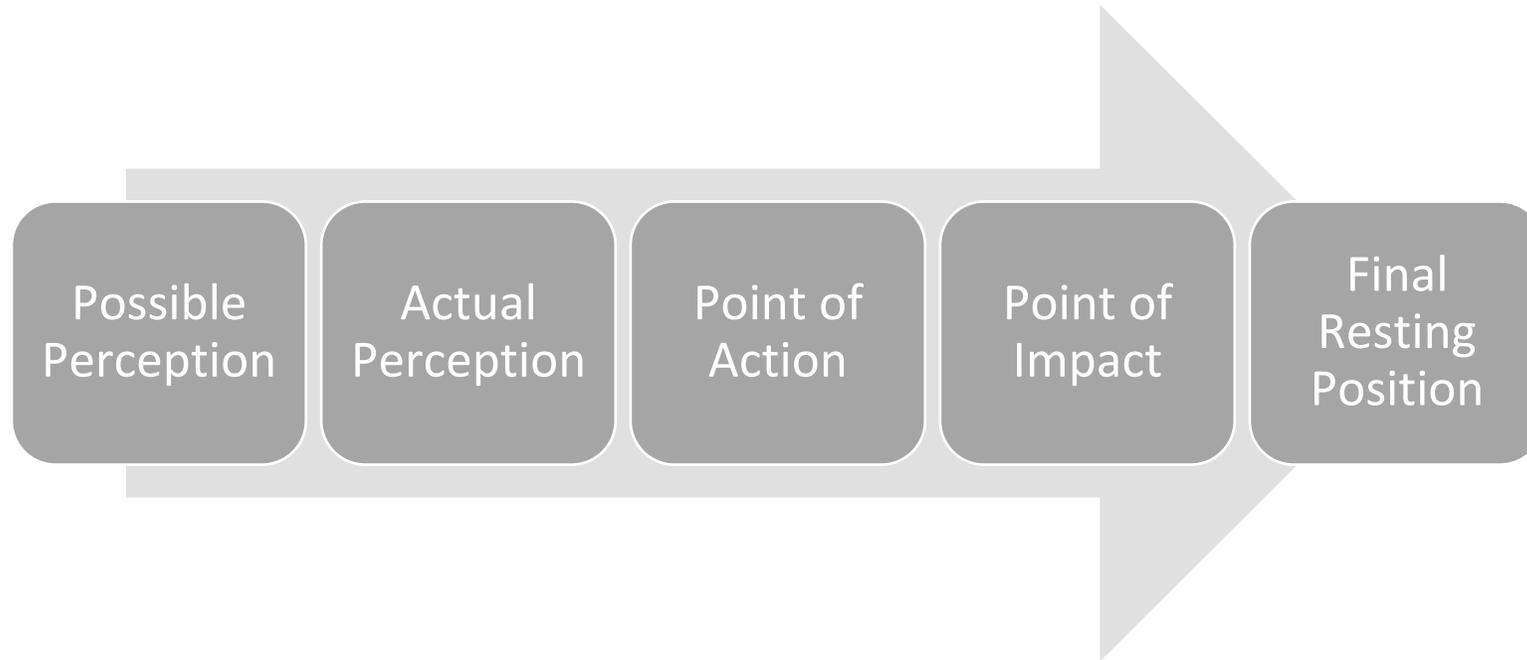
Dave Shelton, ADB

Road safety data

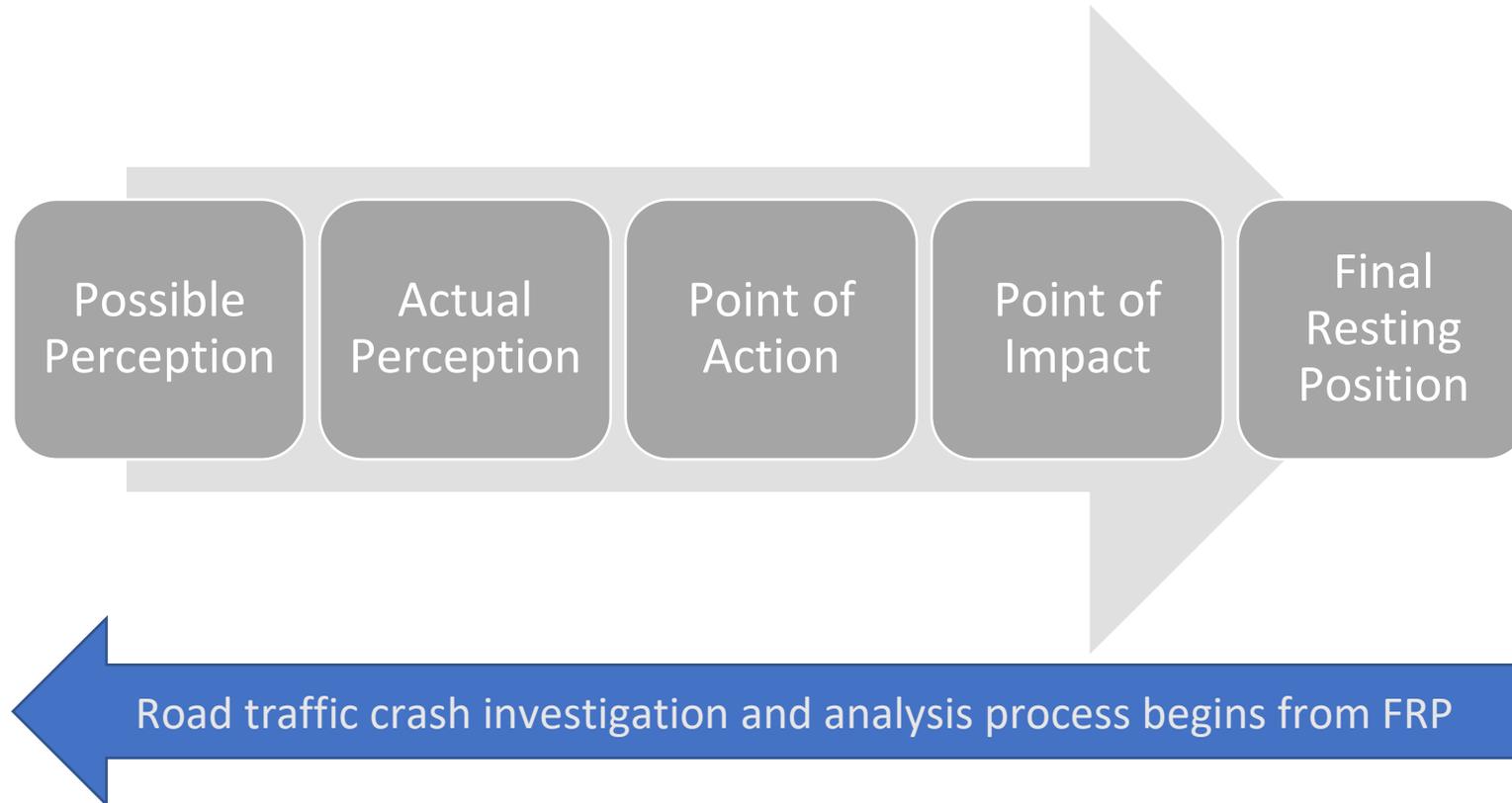


Source: Modified from US FHWA 2017

5 Phases of a crash

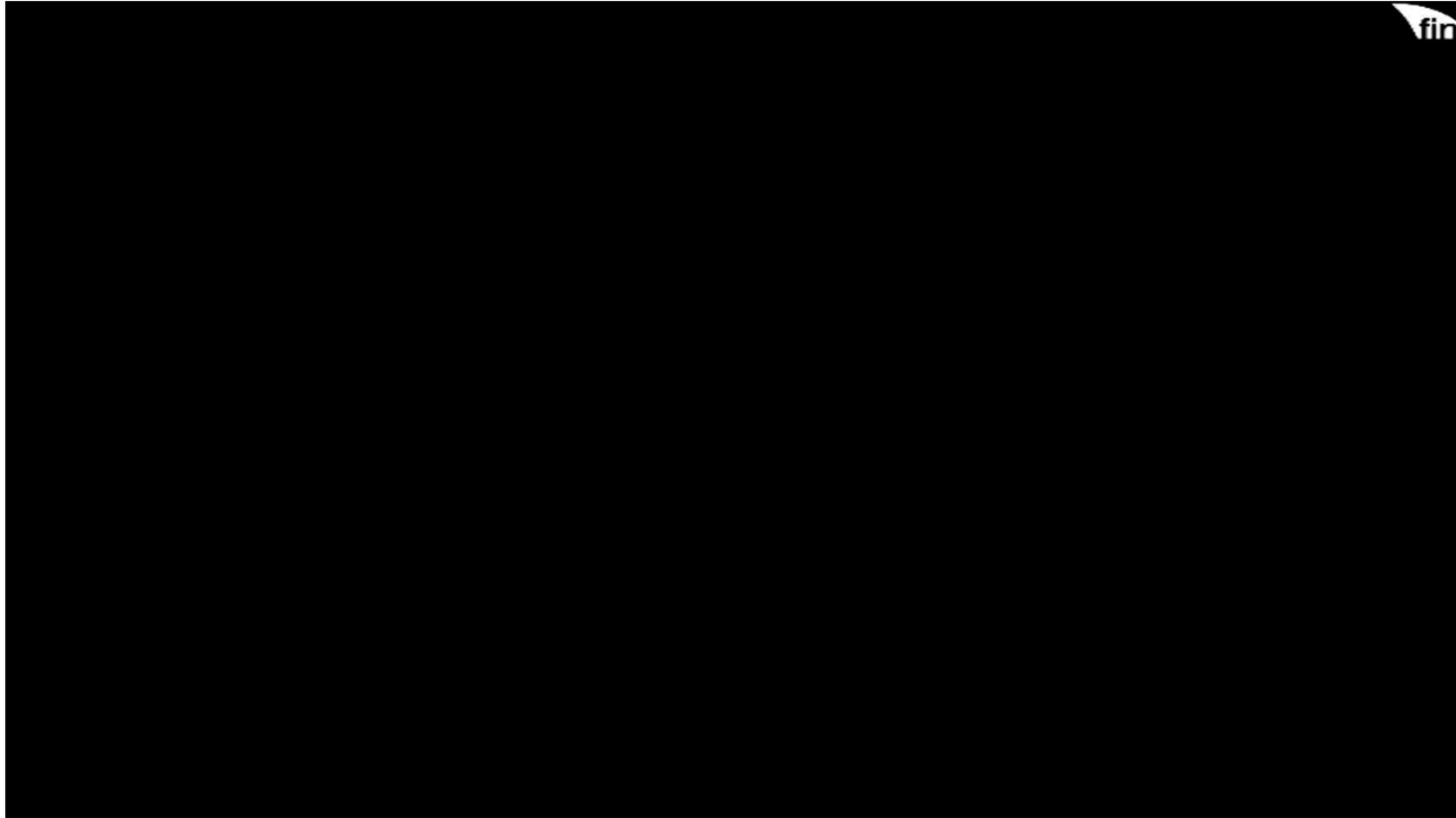


5 Phases of a crash



Source: JP Research India

Crash investigation – *Creative visualization*



Source: TAC Australia

Crash phases



Point of Actual Perception

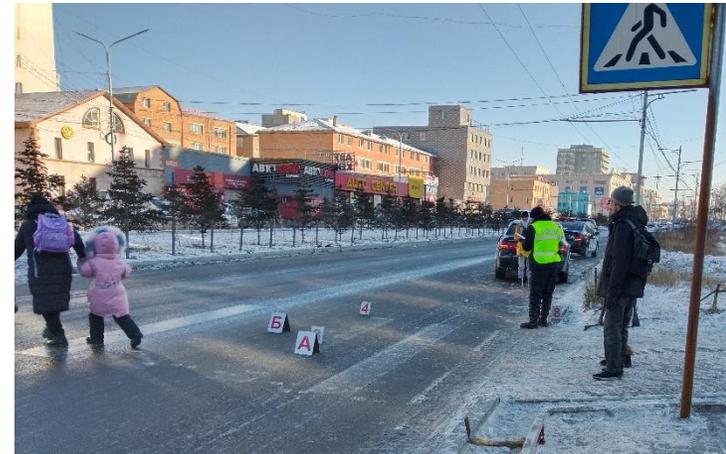
Point of Action

Point of Impact

Final Resting Position

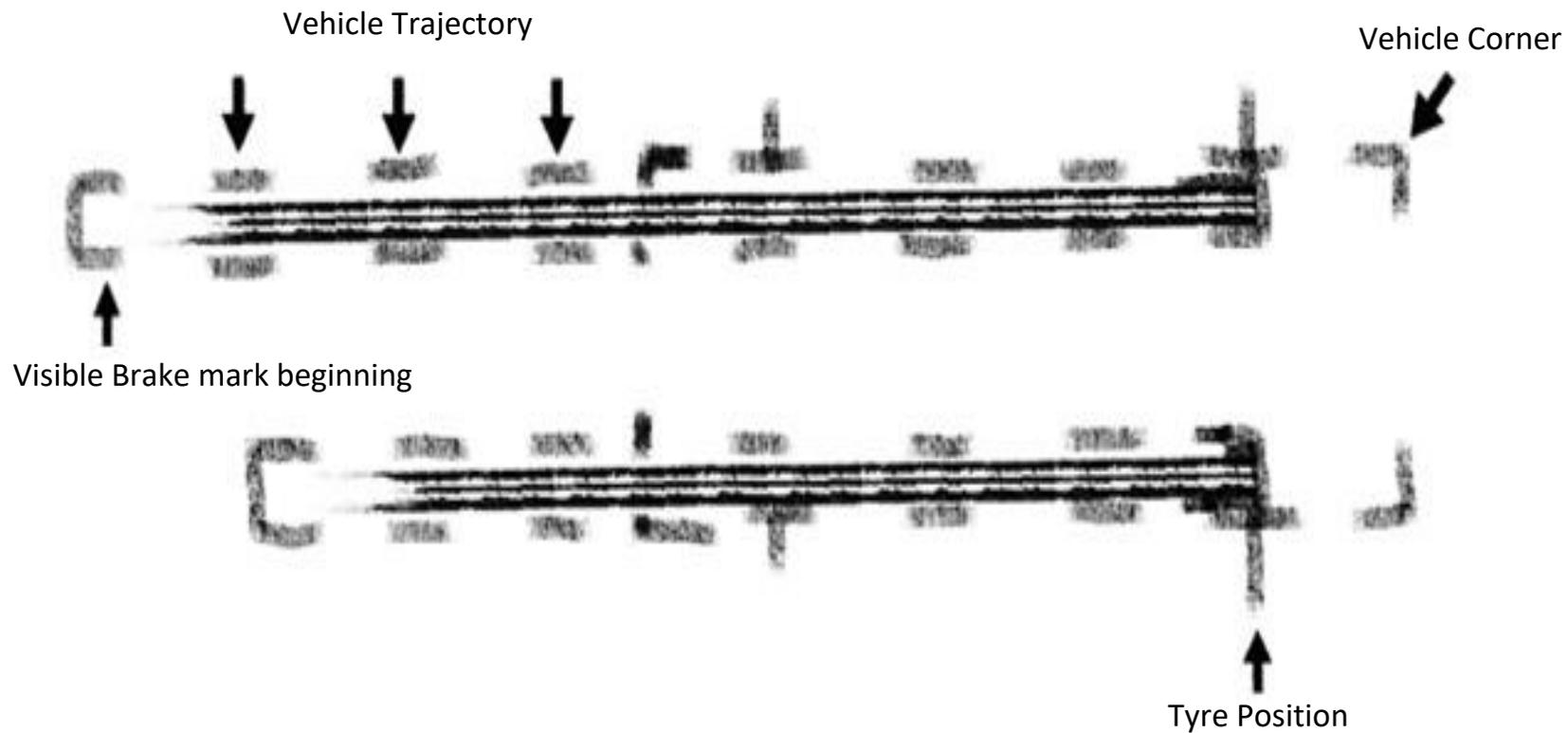
Source: TAC Australia

Crash investigation



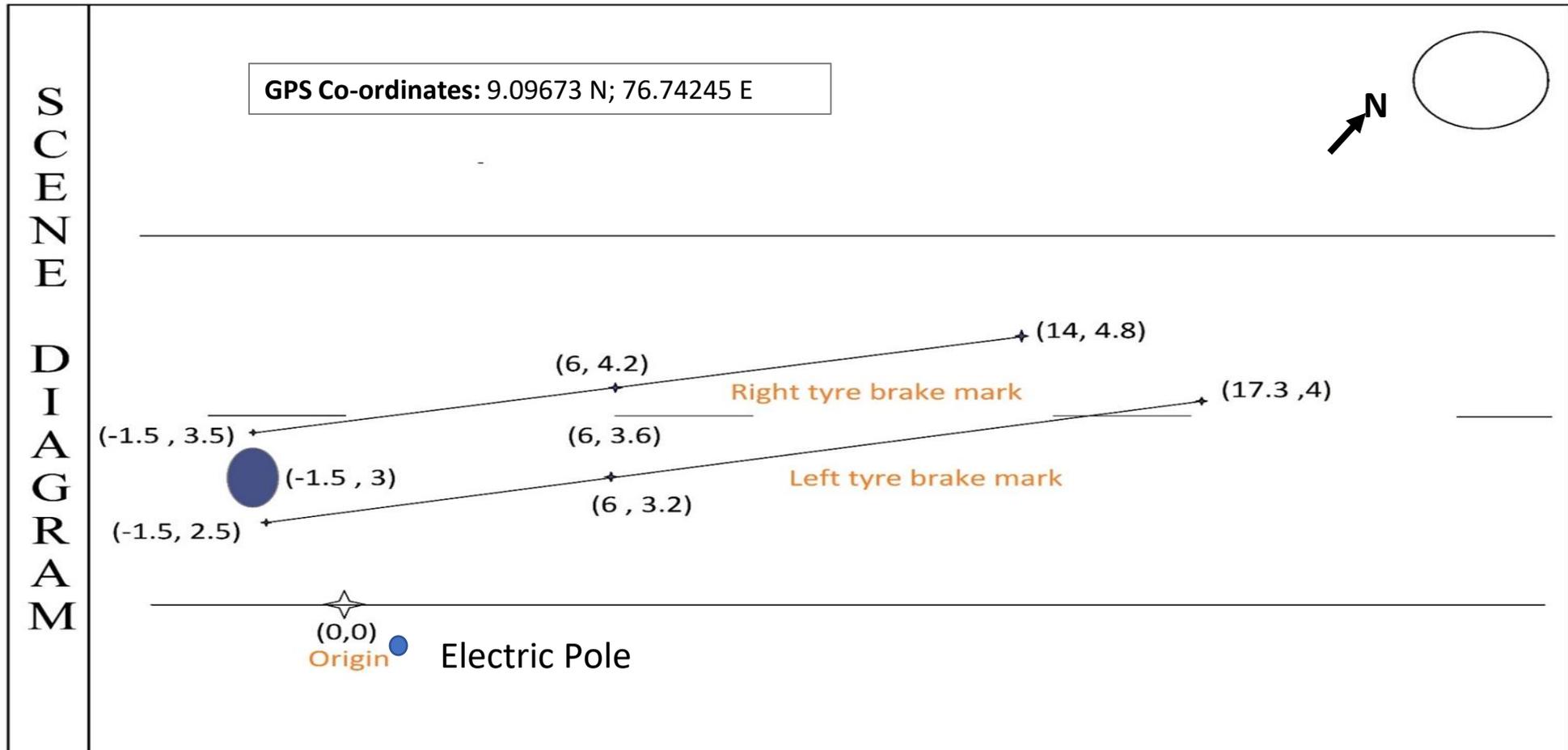
On-site crash investigation being conducted in a professional and scientific manner in Ulaanbaatar, Mongolia (-35 °C)

Crash scene examination - *marking evidence*



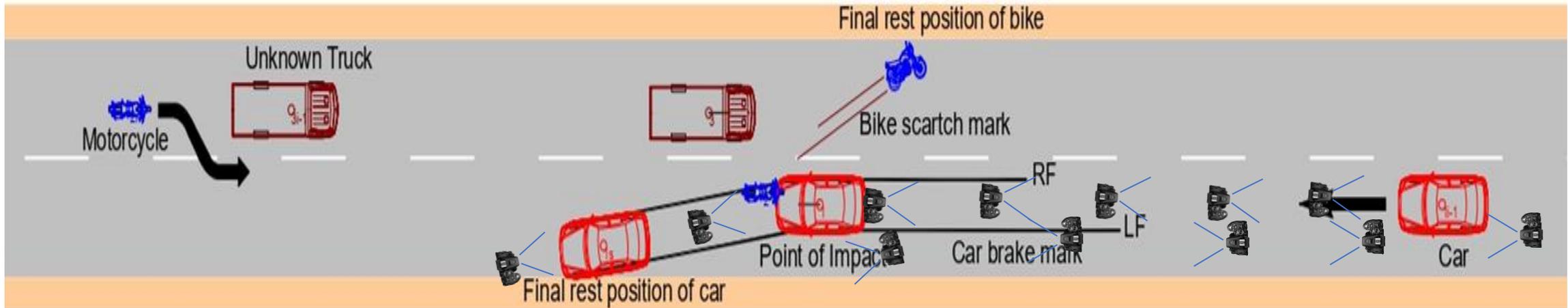
Source: JP Research India

Crash scene examination – *to scale scene diagram*



Source: JP Research India

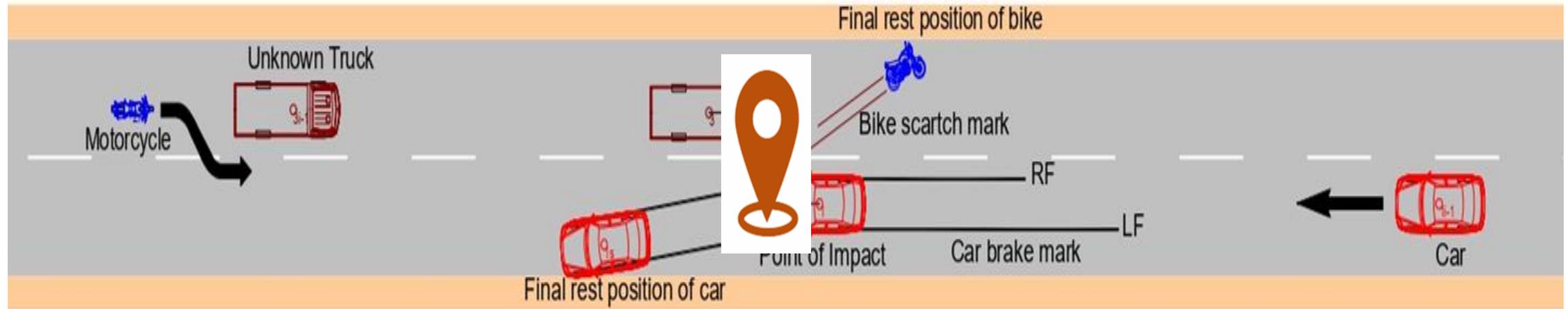
Crash scene examination – *photography sequence*



- For each vehicle, start from Final Resting Position and walk towards Point of Perception.
- Then turn around and walk back to the Final Resting Position.
- Keep the camera approximately at vehicle driver's point of view.

Source: JP Research India

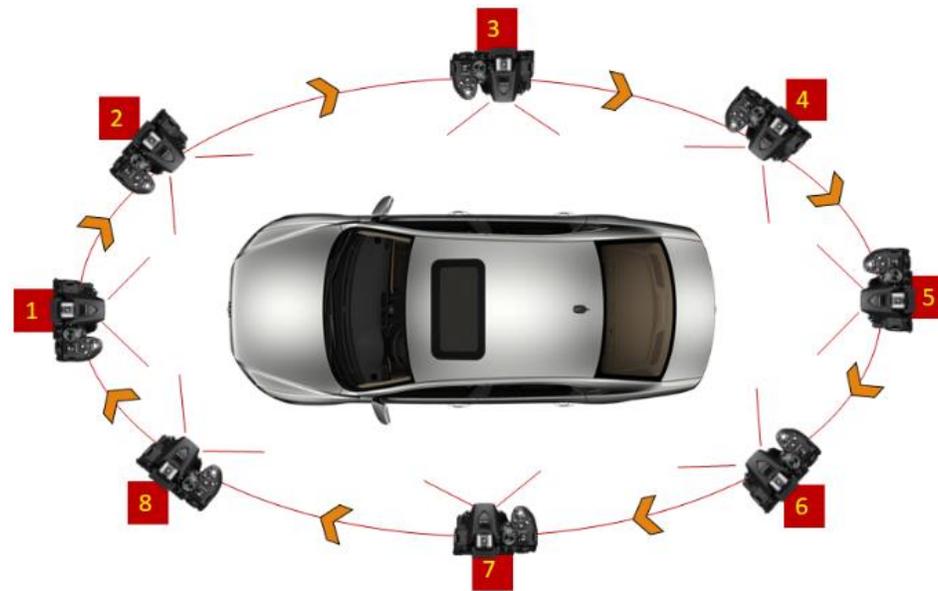
Crash scene examination – *GPS coordinates at POI*



Source: JP Research India

Crash scene examination – *vehicle photography*

- Essential pictures required for all crash involved vehicles are exterior 8-angle pictures.
- Picture at every 45 degree of a vehicle in a clockwise direction starting from the front end of the vehicle.

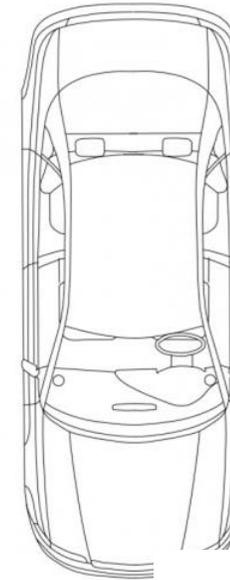


Source: JP Research India

Identification of collision angle at POI

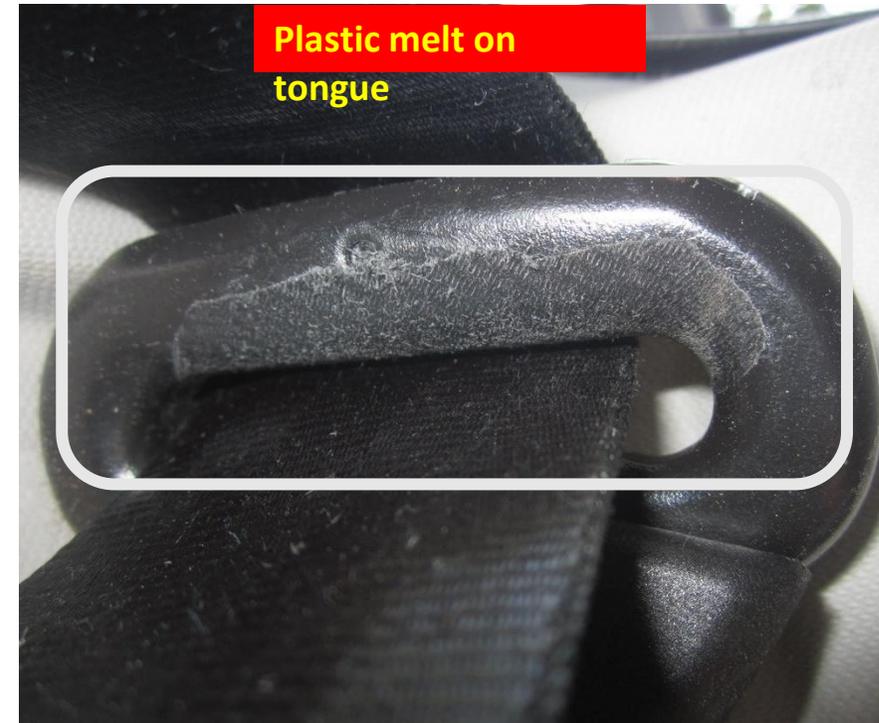


Impact damage matching



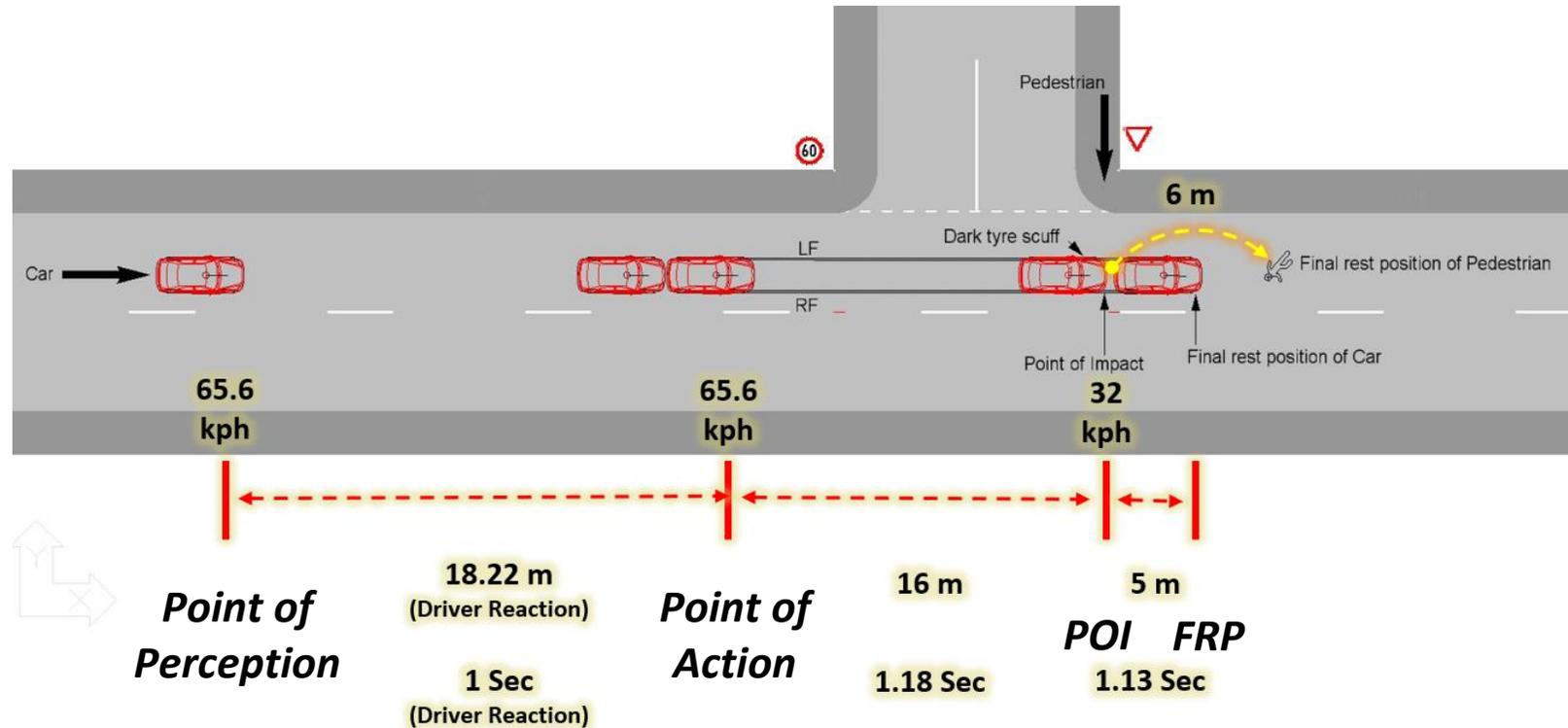
Source: JP Research India

Seatbelt Inspection



Source: JP Research India

Crash reconstruction



Using physics to determine the speed, distance and time for each phase of a crash

Source: JP Research India

Haddon Matrix Approach

To understand how injuries occur and develop strategies for intervention

PHASES		FACTORS		
		HUMAN	VEHICLE	INFRASTRUCTURE
PRE-CRASH	Crash prevention	<ul style="list-style-type: none"> Information Attitudes Impairment Police enforcement <p>1</p>	<ul style="list-style-type: none"> Roadworthiness Working lights Good brakes Handling Speed control <p>2</p>	<ul style="list-style-type: none"> Road design and layout Speed limits Pedestrian Facilities <p>3</p>
CRASH	Injury prevention during the crash	<ul style="list-style-type: none"> Use of safety systems <p>4</p>	<ul style="list-style-type: none"> Crash worthiness Crash protective design Occupant restraints Other Safety devices <p>5</p>	<ul style="list-style-type: none"> Crash protective roadside objects <p>6</p>
POST-CRASH	Life Sustaining	<ul style="list-style-type: none"> First-aid skill Access to medics <p>7</p>	<ul style="list-style-type: none"> Ease of access Fire risk <p>8</p>	<ul style="list-style-type: none"> Rescue facilities Congestion <p>9</p>

Source: JP Research India

3 FACTORS of the Haddon Matrix



HUMAN



VEHICLE



INFRASTRUCTURE /
ENVIRONMENT

3 PHASES of the Haddon Matrix



PRE-CRASH



CRASH



POST-CRASH

Source :

1. <https://www.facebook.com/Mongolia-like-share-302705686813290/videos/best-car-crash-accident-compilation-2017-idiot-driver-fails/303688233381702/>
2. https://news.mn/wpcontent/uploads/2020/06/faa03f9105a4108321be098969ab260b_x3.jpg

Case Study: Car collision with tree

Source: RASSI Database



Car with 4 occupants was travelling on a 2-lane undivided state highway. Unit 1 was travelling straight on the left lane of the road and the vehicle went off the roadway and collided with a tree.

3 occupants including driver of the unit 1 died on the spot and one occupant succumbed to death after 8 days of hospitalization.

Crash Time: 8:30 PM

VEHICLE PHOTOGRAPHY - 8-Angle pictures

Source: RASSI Database



**Collision damage mainly on the right side of vehicle.
Other damage related to extrication and towing.**



Impact damage



Source: RASSI Database

Impact damage direction



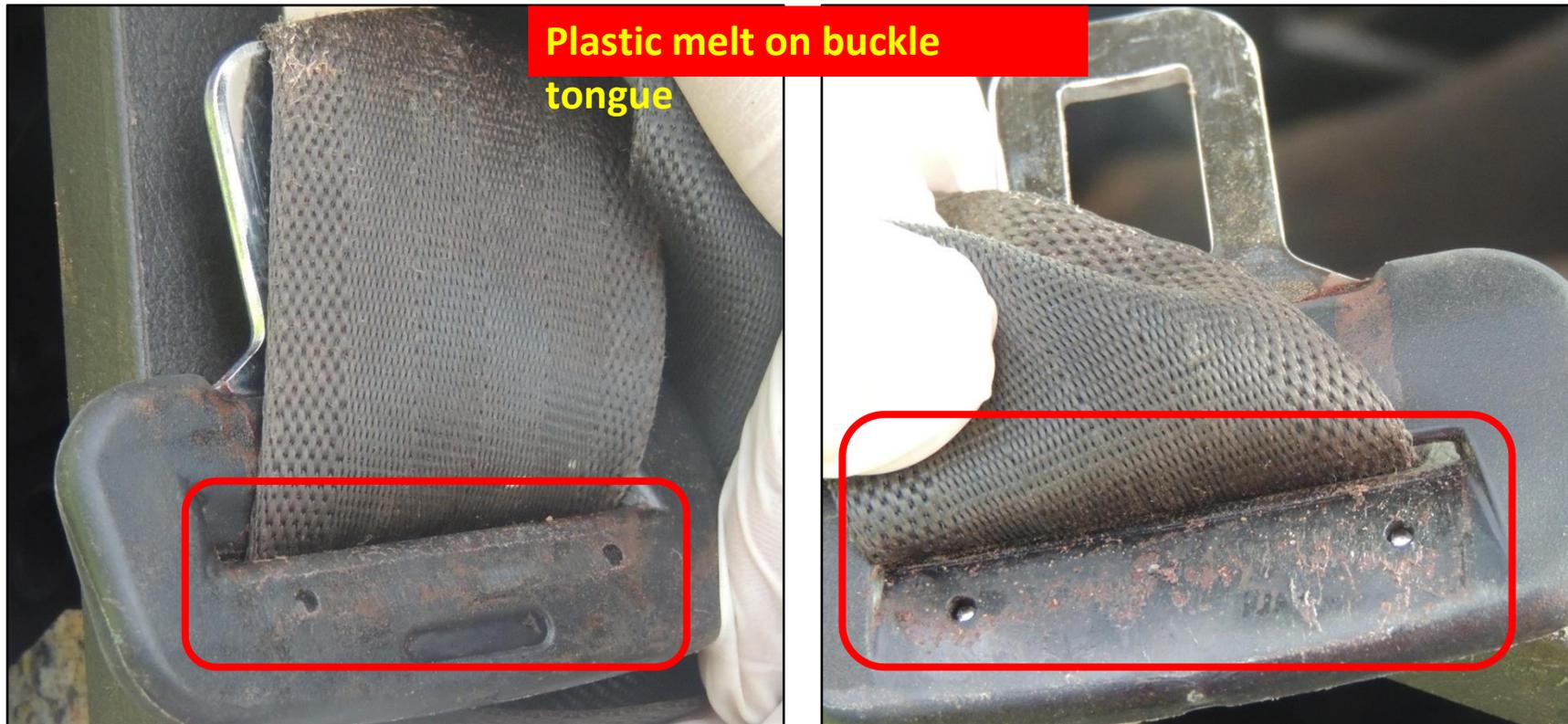
Source: RASSI Database

Occupant seating position and belt use

Source: RASSI Database



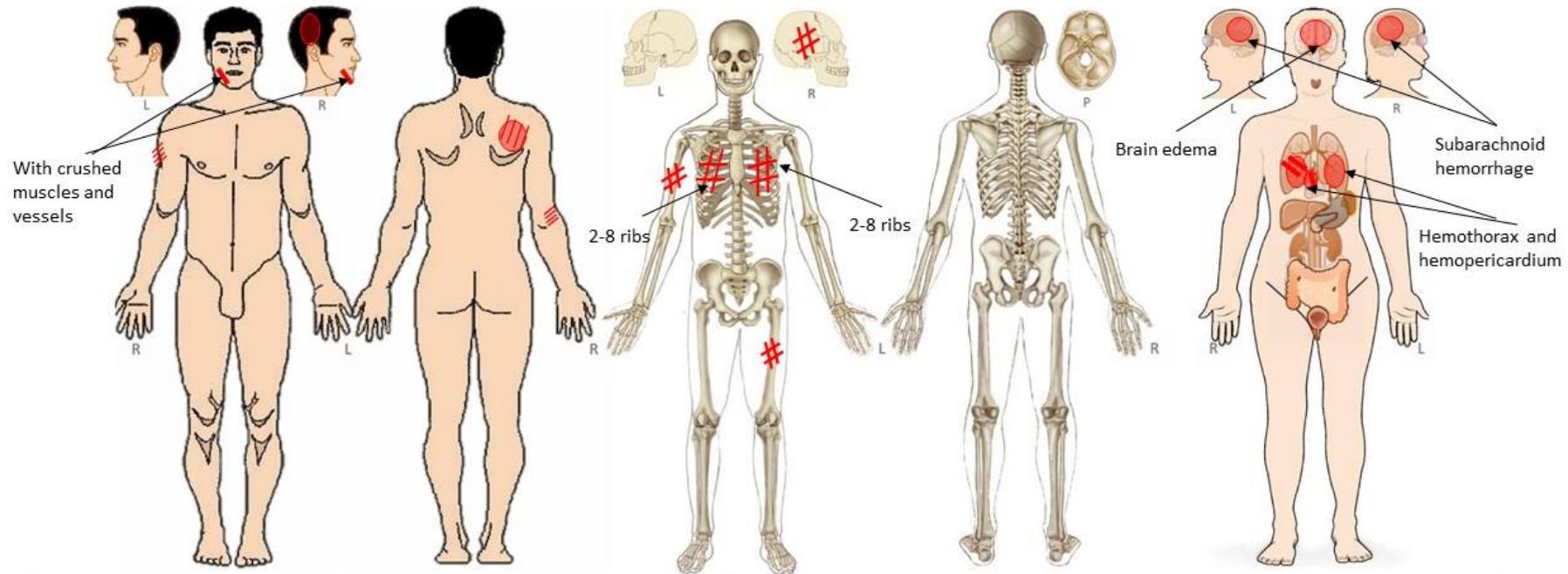
Seat belt inspection



Source: RASSI Database

Driver injuries

CASE NUMBER	UNIT NUMBER	OCCUPANT NUMBER	OCCUPANT GENDER	OCCUPANT AGE	HISP	MAIS
91-2020-015-0001	1	1	Male	33	Fatal	9

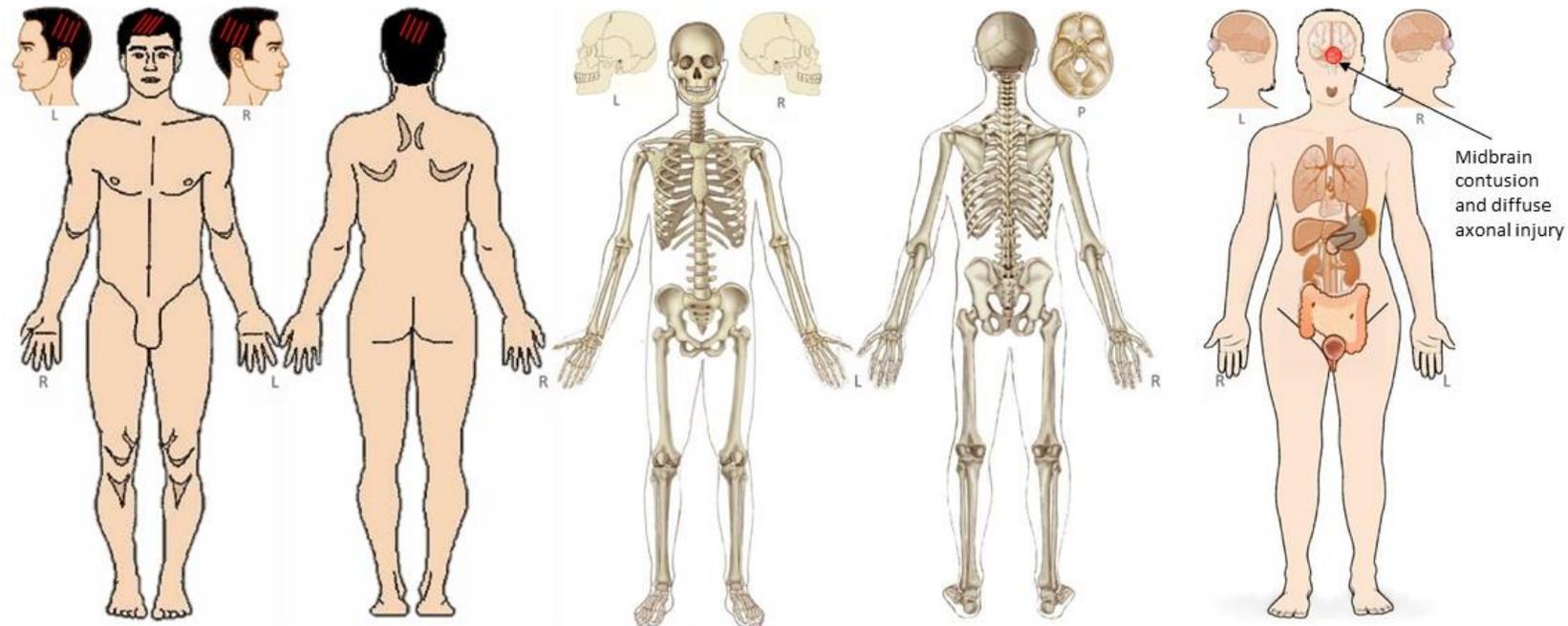


Source: JP Research India

Co-passenger injuries

CASE NUMBER	UNIT NUMBER	OCCUPANT NUMBER	OCCUPANT GENDER	OCCUPANT AGE	HISP	MAIS
91-2020-015-0001	1	2	Male	31	Fatal	5

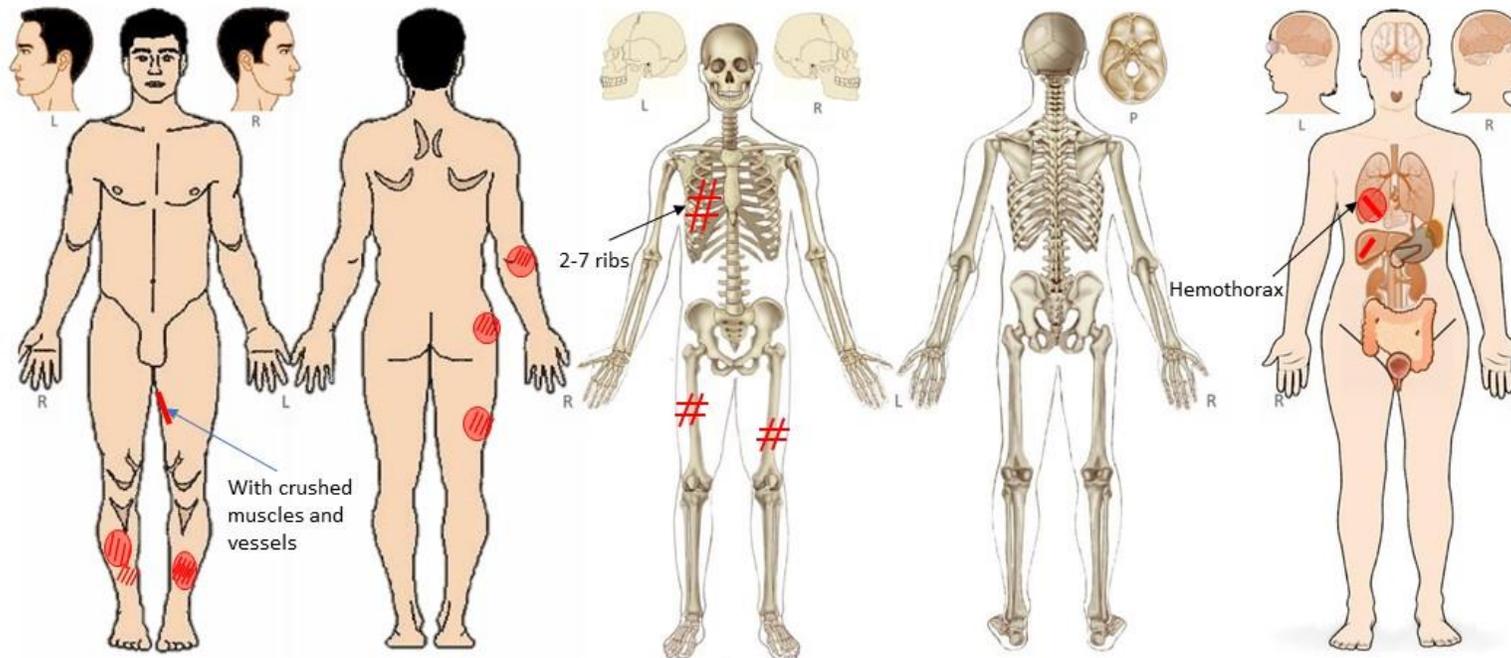
 ABRASION
  LACERATION
  CONTUSION\HAEMORRHAGE
  FRACTURE
  DISLOCATION
  CRUSH



Source: JP Research India

Right Rear passenger injuries

CASE NUMBER	UNIT NUMBER	OCCUPANT NUMBER	OCCUPANT GENDER	OCCUPANT AGE	HISP	MAIS
91-2020-015-0001	1	3	Male	29	Fatal	9

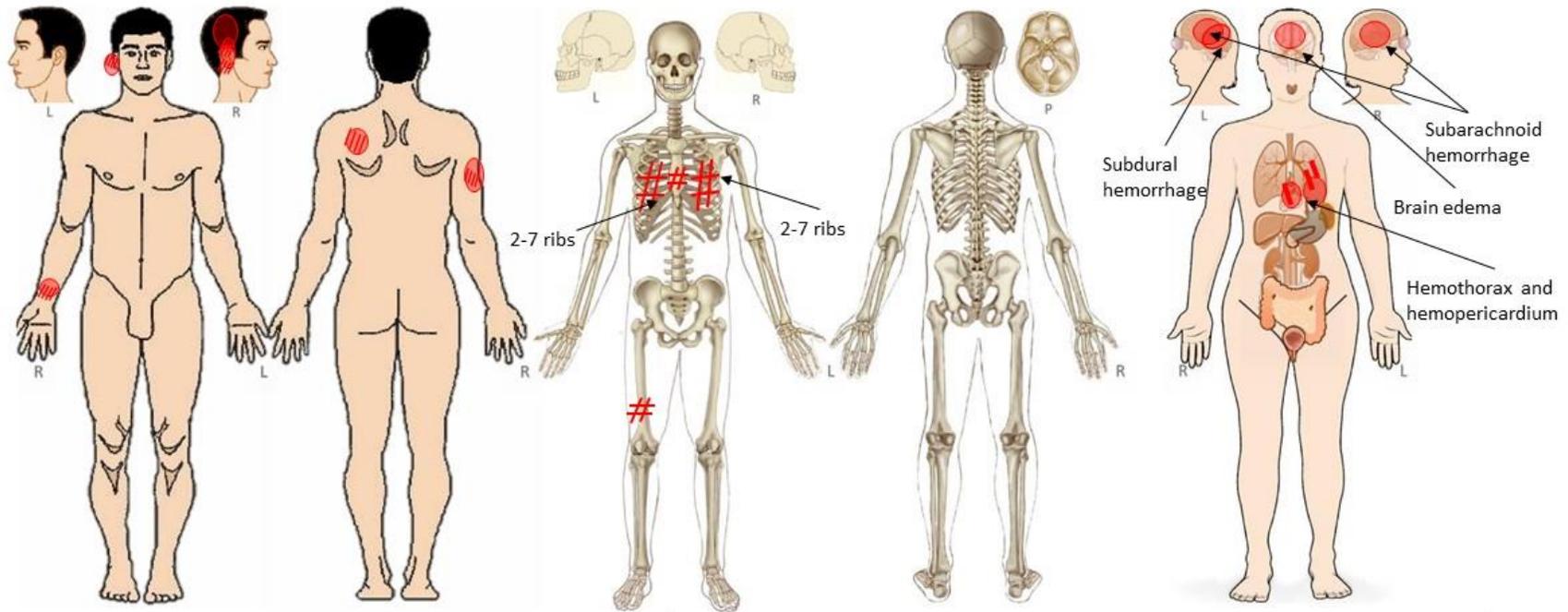


Source: JP Research India

Left rear passenger injuries

CASE NUMBER	UNIT NUMBER	OCCUPANT NUMBER	OCCUPANT GENDER	OCCUPANT AGE	HISP	MAIS
91-2020-015-0001	1	4	Male	33	Fatal	4

 ABRASION
  LACERATION
  CONTUSION\HAEMORRHAGE
  FRACTURE
  DISLOCATION
  CRUSH



Source: JP Research India

Scene Examination - GPS: 21.21574, 78.94901



- Undivided 2-lane highway
- Poor road surface
- No road markings
- No speed limit signage
- Overtaking on oncoming lane
- Roadside trees
- Roadside shops/parking
- Roadside bus stops

Source: JP Research India

Crash scene examination



Approximate Car Direction

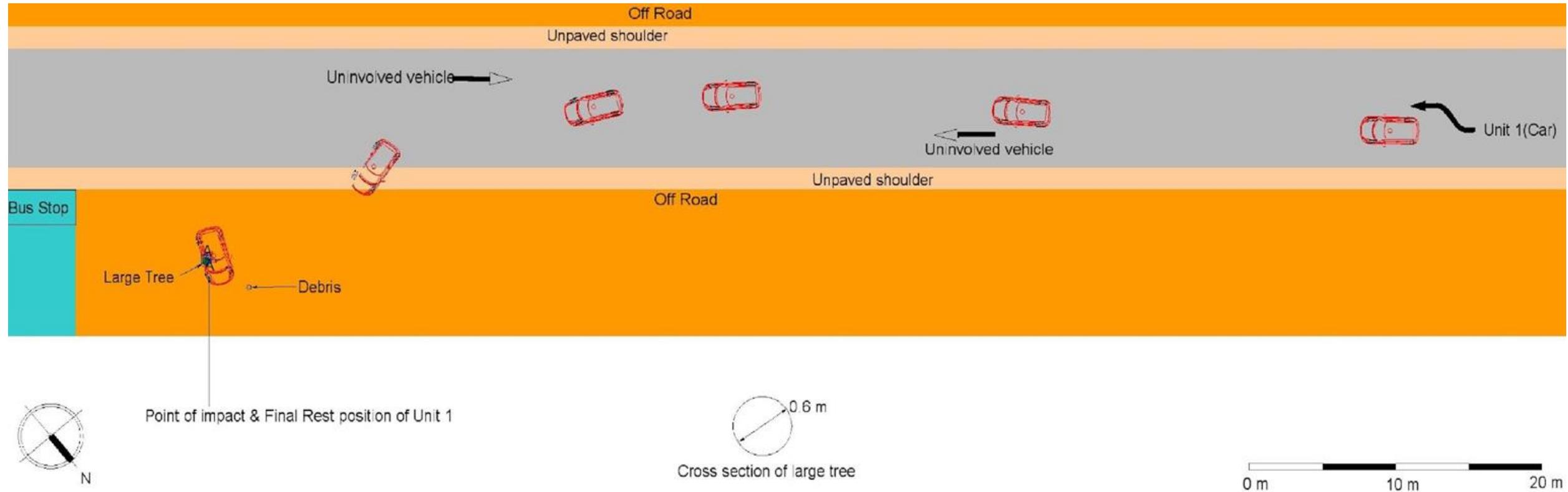
Source: JP Research India

Crash scene examination



Source: JP Research India

Scene diagram – to scale



Source: JP Research India

Crash reconstruction- *Car speed 80 (± 10) km/h*



Source: JP Research India

Applying Haddon Matrix Approach

PHASES		FACTORS		
		HUMAN	VEHICLE	INFRASTRUCTURE
PRE-CRASH	Crash prevention	<u>Car:</u> Overtaking on undivided road Speeding???	None Found	<u>Car:</u> <ul style="list-style-type: none"> Poor road surface No marking/signage Undivided road No lighting
CRASH	Injury prevention during the crash	<u>Car:</u> Seatbelt not used	<u>Car:</u> Passenger Compartment Intrusion • Other Safety devices	<u>Car:</u> Impact with road side tree
		None Found Access to medical	<u>Car:</u> Occupant Entrapment FIRE RISK	<u>Car:</u> Delay in extrication Congestion
POST-CRASH	Life Sustaining	None Found Access to medical	<u>Car:</u> Occupant Entrapment FIRE RISK	<u>Car:</u> Delay in extrication Congestion

Source: JP Research India

Sample crash report forms

MG NSRF/A

ACCIDENT STATISTICS

Incident URN

Other ref.

1.3 ACCIDENT REFERENCE

*FATAL / SERIOUS / SLIGHT

1.9 TIME DAY* 1.7 DATE 2 0 Y Y

1st Road Class & No. or (Unclassified - UC) (Not Known - NK) 1st Road Name

Outside House No. or Name or Marker Post No. at junction with / or metres N S E W * of

2nd Road Class & No. 2nd Road

Sector /Beat No.

1.10 Local Auth No. (if known)

Number

Number

1.21 LIGHT CONDITIONS		X
Daylight:		1
Darkness: street lights present and lit		4
Darkness: street lights present but unlit		5
Darkness: no street lighting		6
Darkness: street lighting unknown		7

1.24 SPECIAL CONDITIONS AT SITE		X
None		0
Auto traffic signal out		1
Auto traffic signal partially defective		2
Permanent road signing or marking defective or obscured		3
Roadworks		4
Road surface defective		5
Oil or diesel		6
Mud		7

1.25 CARRIAGEWAY HAZARDS		X
None		0
Dislodged vehicle load in carriageway		1
Other object in carriageway		2
Involvement with previous accident		3
Pedestrian in carriageway - not injured		6
Any animal in carriageway (except ridden horse)		7

Slip road	05
Crossroads	06
Junction more than four arms (not RAB)	07
Using private drive or entrance	08
Other junction	09

Raining without high winds	
Snowing without high winds	
Fine with high winds	
Raining with high winds	
Snowing with high winds	
Fog or mist — if hazard	
Other	
Unknown	

JUNCTION ACCIDENTS ONLY	
1.17 JUNCTION CONTROL	X

1.23 ROAD SURFACE CONDITION	X
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सडक दुर्घटना प्रतिवेदन

1. प्रतिवेदन नं. 2. कम्प्युटर नं.

3. प्रहरी कार्यालय 4. जिल्ला

5. सडकको वर्गीकरण 6. दुर्घटनाको स्थिति

7. सडकको चौडाई 8. सडकको लम्बाई

9. सडकको स्थिति 10. सडकको नाम

11. जरायमको विवरण (20 मि. बिन्दु):

1. अक्षय्य हाट 2. Y 3. + 4. T 5. T 6. T

12. सडकको विवरण:

1. सडकको स्थिति 2. सडकको नाम

13. सडकको स्थिति 14. सडकको नाम

15. सडकको स्थिति 16. सडकको नाम

17. सडकको स्थिति 18. सडकको नाम

19. सडकको स्थिति 20. सडकको नाम

21. सडकको स्थिति 22. सडकको नाम

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91. सडकको स्थिति 92. सडकको नाम

93. सडकको स्थिति 94. सडकको नाम

95. सडकको स्थिति 96. सडकको नाम

97. सडकको स्थिति 98. सडकको नाम

99. सडकको स्थिति 100. सडकको नाम



Image source: Hexagon

WHO recommended minimum data elements

Crash-related	Road-related	Vehicle-related	Person-related
<ul style="list-style-type: none"> • Crash identifier (unique reference number assigned to the crash, usually by police) • Crash data • Crash time • Crash municipality/ place • Crash location • Crash type • Impact type • Weather conditions • Light conditions • Crash severity^o 	<ul style="list-style-type: none"> • Type of roadway* • Road functional class* • Speed limit* • Road obstacles • Road surface conditions* • Junction • Traffic control at junction* • Road curve* • Road segment grade* 	<ul style="list-style-type: none"> • Vehicle number • Vehicle type† • Vehicle make† • Vehicle model† • Vehicle model year† • Engine size† • Vehicle special function† • Vehicle manoeuvre (what the vehicle was doing at the time of the crash) 	<ul style="list-style-type: none"> • Person ID • Occupant's vehicle number • Pedestrian's linked vehicle number • Date of birth • Sex • Type of road user • Seating position • Injury severity • Safety equipment • Pedestrian manoeuvre • Alcohol use suspected • Alcohol test • Drug use • Driving licence issue date • Age^o

Source: WHO 2026

APRSO guidance

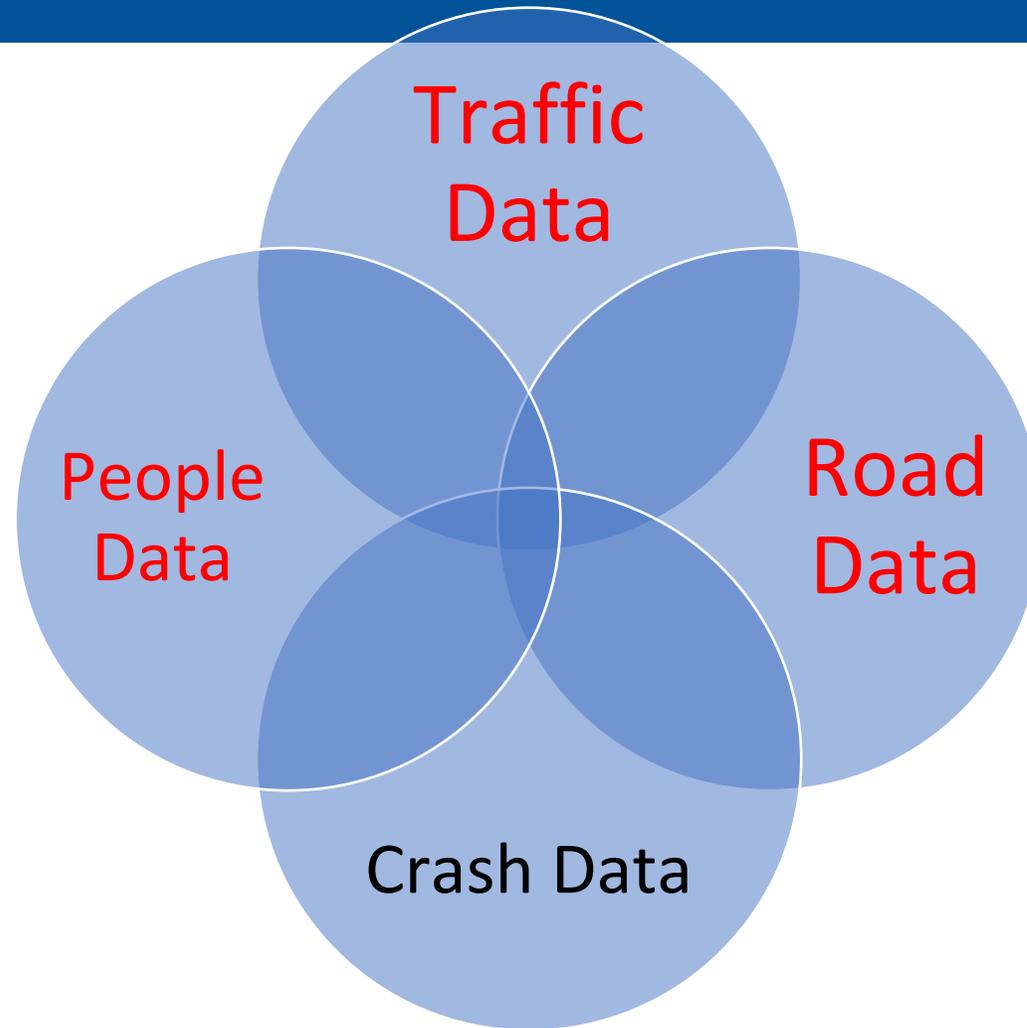
Crash data elements recommended for collection at the national level



THE ASIA-PACIFIC ROAD SAFETY OBSERVATORY'S INDICATORS FOR MEMBER COUNTRIES

JUNE 2022

Tomorrow: Other road safety data



Thank You!

