Modern Method of Accident Data Collection and Management

IRF-India Chapter
6th Webinar on
Road Accident/Crash Data Collection & Management

Dr. P K Sikdar
President, ICT Pvt. Ltd.
& Advisor, IRF (India Chapter)

Requirements of UN Decade of Action for Road Safety 2011-2020 & Now in Second Decade (2020-2030)

Pillar-1: Road Safety Management

Strengthen institutional capacity to further national road safety efforts.

(It is possible when we know the nature of the road safety problems through the most logical and complete crash data)

Pillar-2: Safer Roads & Mobility

Improve the safety of road networks for the benefit of all road users, especially VRUs.

(It is possible to identify and locate the infrastructure safety problems, and to correct the infrastructure)

DECADE OF ACTION FOR ROAD SAFETY 2021 - 2030

Why Accident (Crash) Data ?

Factors contributing to road accidents should be known for intervention

- Driver behaviour or fault
- Roadway design or traffic control
- Poor roadway maintenance
- Vehicle failure/defect

Existing accident data recorded by traffic police do not reflect the actual cause of road accident, and less useful for scientific analysis

A comprehensive data collection is required to identify exact causes of accidents and for design of countermeasures

Road Safety Management System in Developing World

Commonly adopted approach is based on ad-hoc interventions alone

What is needed – is a data-led evidence-based interventions - focused on results

Data driven strategies are completely missing in our road safety actions ….

Reliable Crash Data is a big challenge….

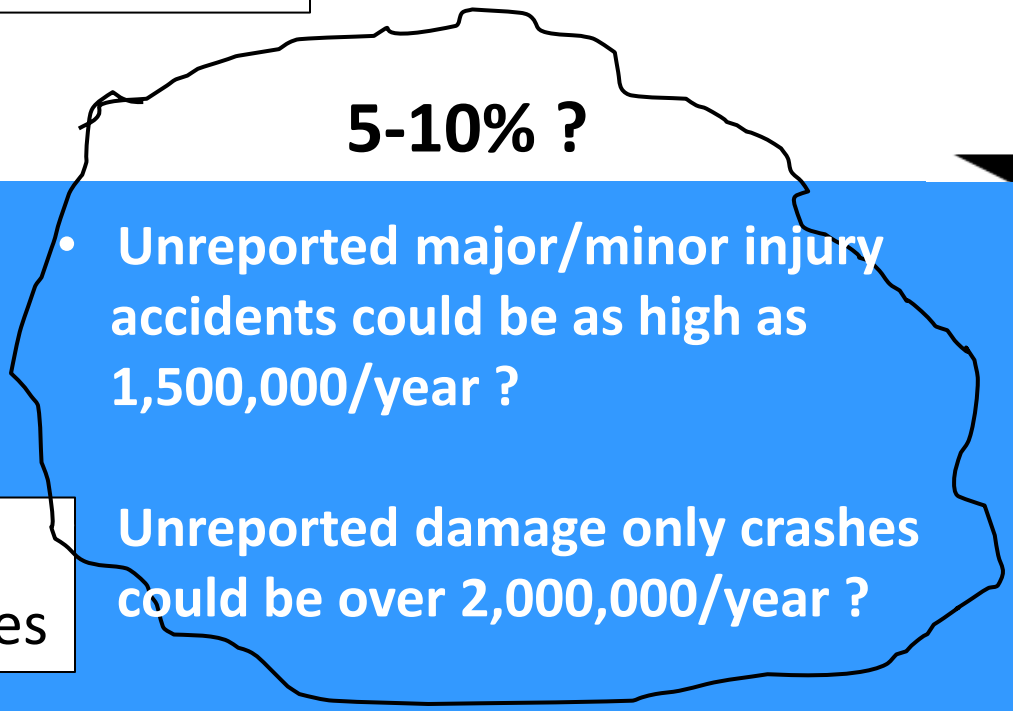
Maybe we know only a small fraction of our total **road safety problem …**

Evidence based investigation only can direct the most appropriate Action Plan for Road Safety

We can see only the tip of the **Iceberg**

The problem is much bigger than we think (what we know is just tip of the iceberg ?)

Many injury and damage only accidents are not recorded in police statistics



1:15:70

International
1 death:85 injuries

India
1:3

NOTE: As per 2019 data, Road Deaths = 151,113 and Injuries = 451,361

We need a Revolution in Scientific Road Crash/ Accident Data Collection/Management

Technology has brought about level playing field worldwide (Grab the opportunity and leap frog)

What we cannot measure……,
we cannot manage……

(If you cannot measure road safety of the network, you cannot manage road safety….)

Crash Data in Developing Countries

- It is a crime record for adjudication purpose, not for correction in design/operation/control/behaviour
- No mechanism to share data with other Stakeholders
- Incomplete data collected by Police officers; and not good for any scientific investigation
- Cause of crash is attributed mostly to the driver fault or behavior
- Insufficient details such as exact location and road condition
- Collection method is laborious

Crash Data Collection

1. Minimum Data

I. Crash identification (a unique number-based system)
II. Time (the date, hour, minute, day of week)
III. Location (to create GIS enabled database)
IV. Crash type
V. Vehicles involved (number, type)
VI. Crash consequences (fatalities within 24 hours/30days, injuries, material damage)

2. Road and Traffic Data

3. Additional Data

Crash Data Collection

1. Minimum Data
2. **Road and Traffic Data** – to relate crashes with the site condition
   - Geometric details of crash site
   - Specific places/objects – pedestrian crossing, rail crossing, bridge, tunnel, bus/tram stop, parking place, etc.
   - Road surface condition
   - Delineation at the site
   - Roadside hazards
   - Visibility conditions
   - Weather conditions
   - Traffic control
   - Position of crash – travel direction, location - traffic lane, shoulder, roadside, etc.
   - Main causes of crash – speeding, overtaking, right of way, etc.
3. Additional Data

Crash Data Collection

1. Minimum Data
2. Road and Traffic Data
3. **Additional Data**
   - Driver details
   - Impairment of the driver
   - Use of restraint devices
   - Condition and behavior of the pedestrian involved in crash
   - Vehicle license plate number
   - Brand make of vehicle
   - Vehicle operator (private, commercial, public transport…)
   - Emergency service involvement

Merits of Modern Crash Data System

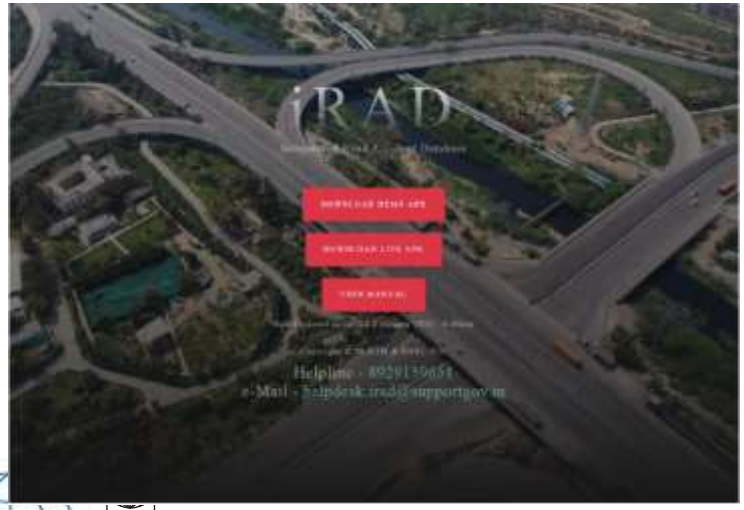
- **Traffic Police** – the system will help in speedy data collection and in automatic FIR generation, which will help save time and cost; also better enforcement
- **Road authorities** – database will help to analyze the actual cause of road accidents, and to design the engineering measures to provide safer roads
- **Insurance companies** – the database will help to settle claims faster and will assist in the research for future insurance reforms using the trends
- **Vehicle Manufacturers** – the database will help to identify the cause of the injury relating to internal structure of the vehicles and will help assess possible pattern in injury.
- **Health authorities -** This may also help in future research and development in trauma care for road accident victims.
- **Data can be shared with Many Others** –
  - Policy Makers
  - Decision Makers
  - Lawyers
  - Education and Enforcement Groups
  - Researchers
  - Vehicle Manufacturers
  - NGOs and Community Groups

Modern Systems Worldwide

- **APRAD** by UNESCAP (2001) – Asia Pacific Road Accident Database (MS-Access based) – made available to all ESCAP countries
- **CADaS** (Common Accident Data Set) by EU (2011), an updated one from CARE (of 1991)
- **ARDD** (Australian Road Death Database) – Bureau of Infrastructure, Transport and Regional Economics (BITRE - 1989) – death within 30 days is recorded
- **CAS** (Crash Analysis System) – New Zealand Transport Agency (NZTA)
- **IRTAD** (International Road Traffic and Accident Database) – shared by 32 OECD countries, and fed with 500 data items of road accidents
- **STRADA** (Swedish Traffic Accident Data Acquisition) – 2016 National Information System containing data on traffic accidents and injuries
- Road Accident Information System (**RAIS**) - Tanzania since 2015 now in whole country
- **iMAAP** is new after MAAP since 1980 (by TRL) used in UK and worldwide
- In Australian Capital Territory (ACT), any normal accident reported by citizen by filling an Online Form of AFP (Australian Federal Police). AFP will be involved only when there is fatality or road is blocked or ambulance etc required
- **FARS** (Fatality Analysis Reporting System) of NHTSA (since 1975) for all 50 states of USA - data about fatal crashes (death within 30 days)

Modern Systems in India

- Early development of **GeoKAM** in Kerala
- Highly acclaimed **TN RADMS** in Tamil Nadu
- Other developments in **Karnataka**, **Pune** (Maharashtra) – all disappeared soon
- Recent development in **Himachal Pradesh** (iMAAP based system by TRL)
- MoRTH trying to develop **IRAD** (Integrated Road Accident Database)
- Many other states tried and failed to sustain



Major Reasons for Problems Faced:

1) Highly sophisticated system is attempted, and failed to sustain
2) Trying to do everything possible with the database
3) Skill available to sustain the sophisticated system is absent
1) Trying to change the road safety scenario overnight, which none in the world could do

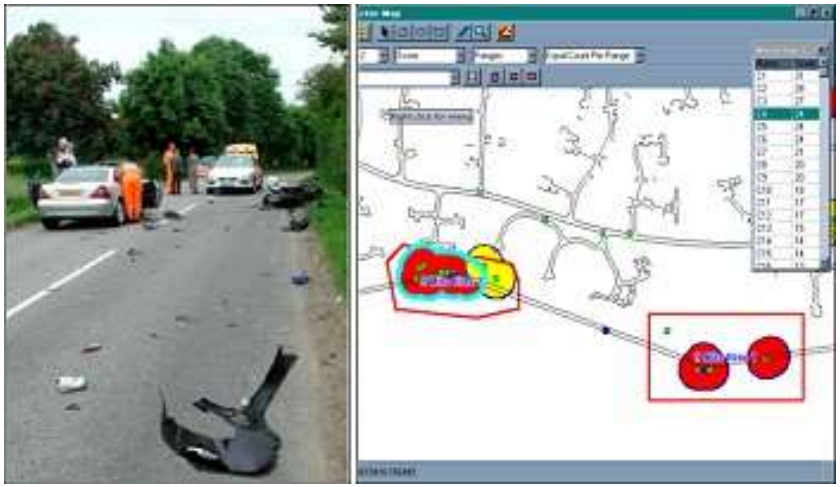
Capacity Building for Road Crash Data System

1. Accident data collection and investigation

- A simplistic easy and less cumbersome data collection method is required which can be used by trained police officer to collect the data. Moreover, the most significant information required for investigation shall be collected and it should be through use of modern electronic devices to make it free from any corruption.

2. Accident reconstruction

- The scientific method of accident reconstruction using the accident data should be utilized to link the causal factors so as to guide the correction in the system of road design, enforcement and road use behaviour.



Modern Crash Data Collection & Management for India & Developing World

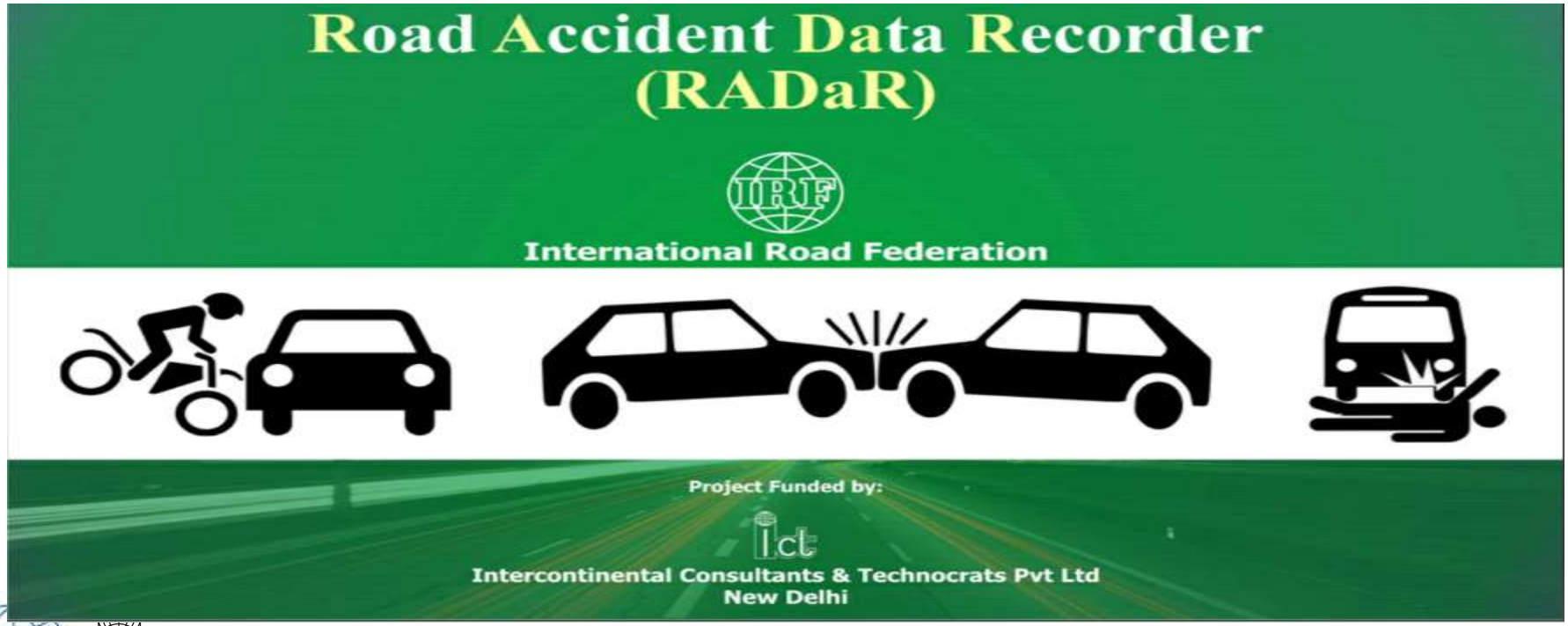
An End to End solution for road accident data recording and analysis is provided by **RADaR**

A worldwide first development of a system where the crash data is collected at accident scene and other locations using a hand-held electronic device like Tablet or Smartphone with data transmitted and stored in web-server. The reporting tool available in web-based server called ***RADMS*** provides 45 cross-classification Tables and Graphics as normally required.

For all other sophisticated analysis, give the data to more than 100 top class institutions (IITs, NITs and Universities) dotted around the country with best technical know-how for detailed crash analysis.

What is RADaR ?

Road Accident Data Recorder (RADaR) is an innovative and scientific data collection and reporting system designed as an application for Android tablet or Smartphone with network connectivity to web-based database server



Features of RADaR

- A quick and easy automated tool to collect comprehensive road crash data, by a few hours' training of policeman
- User friendly software application loaded on to Tablet computer or Smartphone working on ANDROID operating system
- GPS/GPRS facility to record exact crash location in global coordinate system, uses Google map and to transmit data to web-based central server or Cloud server
- Drop-down menus of ***RADaR*** application enable easy recording of data using touch screen mode
- Facility to take photographs/video of road crash scene, and to record crash site on Google network map with GPS coordinates
- Pictorial Menu-driven recording of road layout of crash site and collision diagram plotted on layout for scientific investigations

How RADaR Works ?

Enforcement Personnel

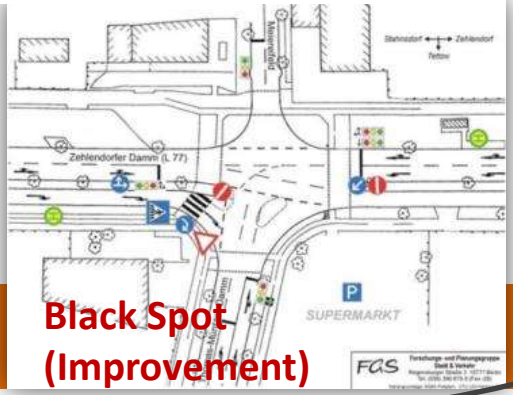
RADaR Application

RADaR
Reporting Tool

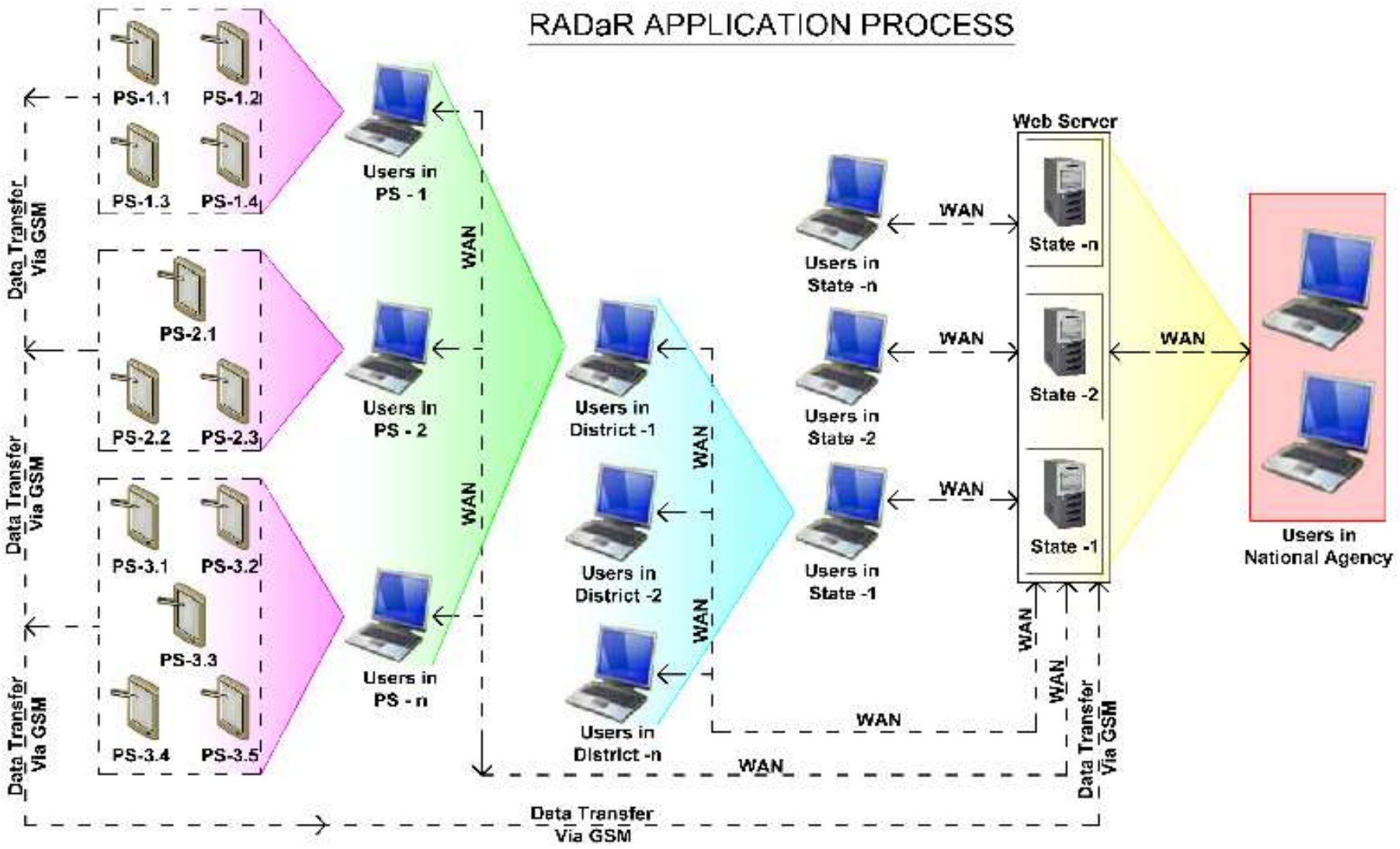
Resuscitation Centres

Motor Insurance

Adjudication



Black Spot
(Improvement)



Hierarchical Access to Web-based Central Accident Database

Data on Crash/Accident Details

- **Timing of Accident**
  - Type of Area and Time of Day
  - Day/Date/Month of Year
- **Location of Accident**
  - Location Type
  - Location/Coordinates
- **Vehicle Details**
  - Number of Vehicles Involved
  - Type of Impacting Vehicles
  - Vehicle Type
  - Vehicle Defect
  - Vehicle Maneuvers
  - Age of Vehicle
- **Road Details**
  - Road Character
  - Road Type
  - Road Layout
  - Road Width
  - Road Works
  - Surface Condition
  - Horizontal Geometry
  - Vertical Geometry
  - Type of Junction Control
  - Surface Type
- **Pedestrian/Passenger Details**
  - Pedestrian/Passenger under Influence
  - Pedestrian/Passenger Position
  - Pedestrian/Passenger Action
  - Age of Pedestrian/Passenger
- **Driver Details**
  - Driver Under Influence
  - Safety Devices
  - Sex of Driver
  - Type of Driving License
  - Educational Qualification
  - Possible Driver Error
  - Nature of Traffic Violations
  - Hit and Run
- **Victim Details**
  - Type of Victim
  - Age of Victim(including Driver)
  - Number of Fatalities
- **Other General Information**
  - Weather Condition
  - Light Condition
  - Type of Collision

ROAD ACCIDENT RECORDING FORM

A. Accident Identification Details

1. FIR No. 2. Time of accident 3. Date of accident (D D M M Y Y)

4. Name of Place 5. Police Station

6. District 7. State

8. Type of Area ☐ Urban ☐ Rural

9. Accident Type ☐ Fatal ☐ Grievously injured (Hospitalised) ☐ Minor injury (not hospitalised) ☐ Non-injury

10. No. of persons killed ☐ No. of persons grievously injured ☐ No. of persons minor injured ☐

11. No. of Motorized vehicle involved ☐ No. of Non-motorized vehicle involved ☐ No. of pedestrian involved ☐

12. Type of Weather ☐ Sunny/Clear ☐ Rainy ☐ Foggy/Misty ☐ Hail/Sleet ☐ Others (Specify)

13. Hit & Run ☐ Yes ☐ No

14. Type of Collision

(A) ☐ Vehicle to Vehicle ☐ Vehicle to Pedestrian ☐ Vehicle to Bicycle ☐ Vehicle to animal
☐ Hit parked vehicle ☐ Hit Fixed/stationary object

(B) ☐ Hit from back ☐ Hit from side ☐ Run Off Road ☐ Vehicle overturn ☐ Head on collision ☐ Others (Specify)

B. Road Related Details

15. Road Name 16. Road Number

17. Landmark 18. Chainage

19. GPS Location Latitude Longitude

20. Lanes ☐ 2 Lanes or less ☐ More than 2 Lanes

21. Surface Condition ☐ Paved ☐ Unpaved

22. Road Type (A) ☐ Expressway ☐ National highway ☐ State highway ☐ Other roads
(B) ☐ Urban ☐ Non urban

23. Physical Divider ☐ Yes ☐ No

24. Ongoing Road Works/ Construction ☐ Yes ☐ No

25. Speed Limit ☐ < 40 ☐ 40 – 60 ☐ 60 – 80 ☐ >80 ☐ Not available

26. Accident Spot ☐ Residential area ☐ Institutional area ☐ Market/commercial area ☐ Open ☐ Others (specify)

27. Road Features (A) ☐ Straight road ☐ Curved road
(B) ☐ Bridge ☐ Culvert ☐ None
(C) Pot Holes ☐ Yes ☐ No
(D) Steep gradient ☐ Yes ☐ No

28. Road Junction (if applicable) ☐ T Junction ☐ Y Junction ☐ Four Arm Junction ☐ Staggered Junction ☐ Round About Junction

29. Type of Traffic Control (if applicable) ☐ Traffic Light Signal ☐ Police Control ☐ Stop Sign ☐ Flashing Signal/Blinker ☐ Uncontrolled

30. Pedestrian infrastructure (if applicable)

(A) Footpath ☐ Yes ☐ No (B) Foot Bridge/ Subway ☐ Yes ☐ No (C) Zebra Crossing ☐ Yes ☐ No

Chainage: This is the distance measured along the road centre line from a clear start point of the road. NHAI or PWD can provide this information.

GPS Location: Global Positioning System (GPS) device can provide the exact location of a point. A GPS device can give latitude and longitude of a location. This is used to mark the location on a digital map.

C. Vehicles Involved in Accident:

Vehicle Sl. No. ('31')	Type of Vehicle ('32')	Registration No. ('33')	Disposition ('34')	Load Condition ('35')		Mechanical Failure ('36')	Age of Vehicle ('37')
				Passenger	Goods		

Coding Instructions:

No. '32'
1. Motorised Two Wheeler
2. Auto Rickshaw
3. Car/Jeep/Van/Taxi
4. Bus
5. Truck/Lorry
6. Heavy Articulated Vehicle/Trolly
7. Tempo/Tractor
8. Bicycle
9. Cycle rickshaw
10. Hand drawn cart
11. Animal drawn cart
12. Other (specify)
13. Not known

No. '34'
1. Needs to be Towed
2. Can be driven away

No. '35'
1. Normally Loaded
2. Overloaded/Hanging
3. Empty
4. Not Known

No.'36'
1. Yes
2. No

D. Drivers Details

Driver of Vehicle No.(from column 31) ('38')	Driver of Vehicle type(from column 32) ('39')	Sex ('40')	Age ('41')	Impacting Vehicle No.(from column 31) ('42')	Impacting Vehicle type (from col. 32) ('43)	Type of Licence ('44')	License No. ('45')	Involvement of alcohol ('46')	Type of Traffic Violation ('47')	Type of Injury ('48')	Using Requisite Safety Device ('49')

Coding Instructions:

No.'40'
1. [illegible]

No. '43'
(Same as No. '32')

No.'44'
1. Valid Permanent License
2. Learner License
3. Without License
4. Not known

No.'46'
1. Yes
2. No
3. Unknown

No. '47'
1. Over speeding
2. Jumping red light
3. Driving on wrong side
4. Drunken driving
5. Use of mobile phone
6. Non violation
7. Not known

No. '48'
1. Fatal
2. Injury needing hospitalisation
3. Injury not needing hospitalisation
4. Non injury
5. Not known

No. '49'
1. Seat belt
2. Helmet
3. Not known (in case of hit & run)

E. Persons Other than Drivers Involved in Accident:

Persons Sl. No. ('50')	Person Type ('51')	Occupant of vehicle No(col31) ('52')	Occupant of vehicle type(col32) ('53')	Sex ('54')	Age ('55')	Impacting Vehicle no(col 31) ('56')	Impacting Vehicle type (col 32) ('57')	Type of Injury ('58')	Using Requisite Safety Device ('59')

No. '51'
1. Passenger
2. Pedestrian
3. Cyclist

No. '52' & '56' (Same as No. '31')

No. '53' & '57' (Same as No. '32')

No. '54'
1. Male
2. Female

No. '58'
1. Fatal
2. Injury needing hospitalisation
3. Injury not needing hospitalisation

No. '59'
1. Helmet
2. Seat Belt
3. Not known (in case of hit & run)

ROAD ACCIDENT RECORDING FORM

Source:

MoRTH

cont.

RADaR Analysis (Reporting) Tables

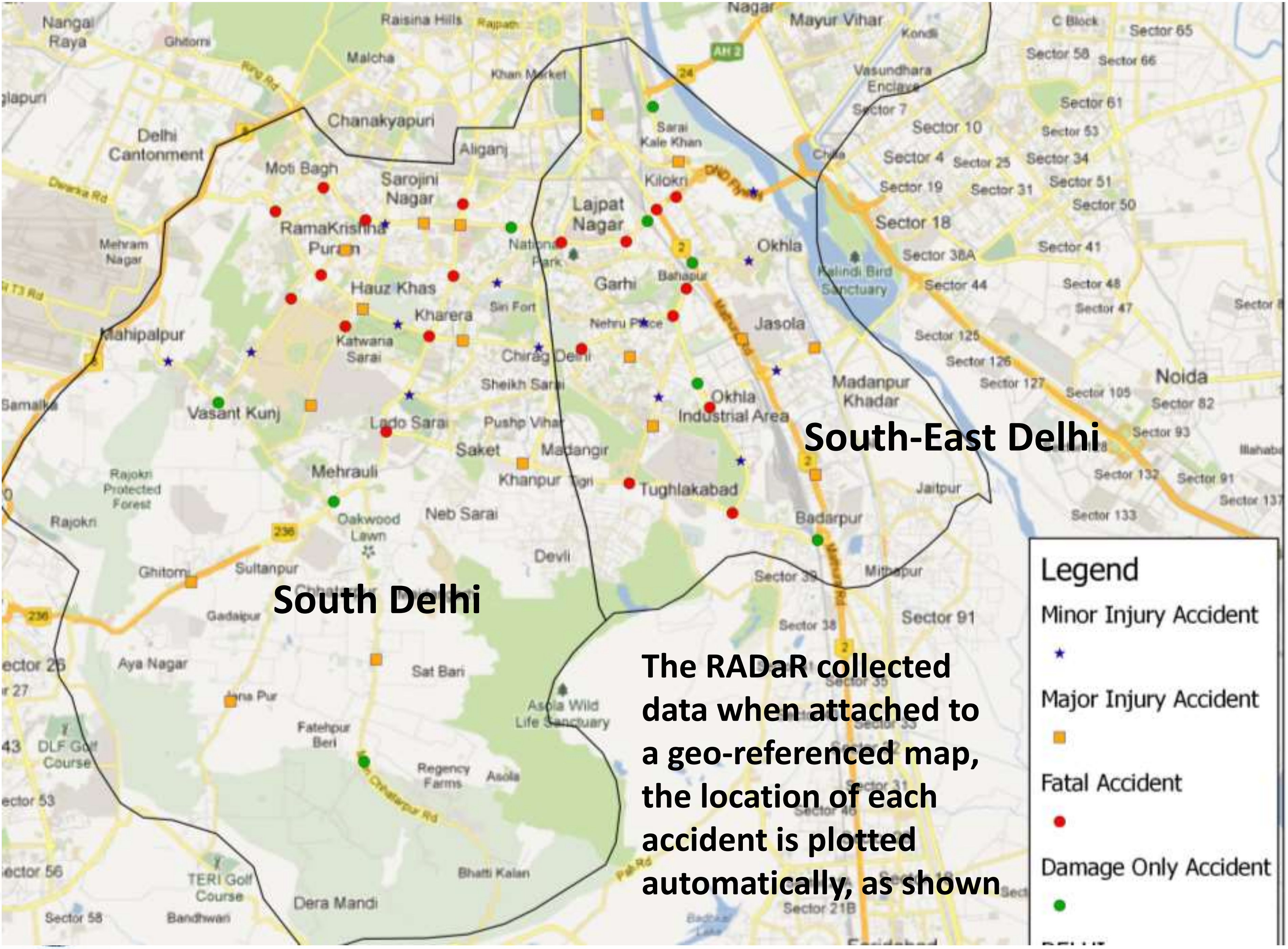
1. Accidents Classified According to Month of Year
2. Accidents Classified According to Type of Area and Time of the Day
3. Accidents Classified According to Road Type
4. Accidents Classified According to Number of Fatalities
5. Accidents Classified According to Number of Vehicles Involved
6. Accidents Classified According to Type of Collision
7. Accidents Classified According to Presence of Road Works
8. Accidents Classified According to Weather Condition
9. Accidents Classified According to Location Type
10. Accidents Classified According to Age Profile of the Victim (including Driver)
11. Accidents Classified According to Use of Alcohol/Safety Devices/ Driving License
12. Accidents Classified According to Type of Victim
13. Accidents Classified According to Nature of Traffic Violations
14. Accidents Classified According to Load Condition of Involved Vehicles
15. Fatal Accidents Classified According to Type of Impacting Vehicles

RADaR Analysis (Reporting) Tables

16. Major Injury Accidents Classified According to Type of Impacting Vehicles
17. Minor Injury Accidents Classified According to Type of Impacting Vehicles
18. Accidents Classified According to Road Character
19. Accidents Classified According to Road Layout
20. Accidents Classified According to Road Width
21. Accidents Classified According to Horizontal Geometry
22. Accidents Classified According to Vertical Geometry
23. Accidents Classified According to Type of Junction Control
24. Accidents Classified According to Light Condition
25. Accidents Classified According to Surface Type
26. Accidents Classified According to Hit and Run
27. Accidents Classified According to Road Condition
28. Accidents Classified According to Surface Condition
29. Accidents Classified According to Vehicle Type
30. Accidents Classified According to Vehicle Maneuvers

RADaR Analysis (Reporting) Tables

31. Accidents Classified According to Sex of Driver
32. Accidents Classified According to Vehicle Defect
33. Accidents Classified According to Type of Driving License
34. Accidents Classified According to Seat Belt/Helmet use by Driver
35. Accidents Classified According to Educational Qualification of Driver
36. Accidents Classified According to Driver Under influence
37. Accidents Classified According to Passenger Position
38. Accidents Classified According to Pedestrian/Passenger under Influence
39. Accidents Classified According to Possible Driver Error
40. Accidents Classified According to Age of Pedestrian/Passenger
41. Accidents Classified According to Passenger Action
42. Accidents Classified According to Pedestrian Location
43. Accidents Classified According to Pedestrian Action
44. Accidents Classified According to Location
45. Accidents Classified According to Age of Vehicles



The RADaR collected data when attached to a geo-referenced map, the location of each accident is plotted automatically, as shown

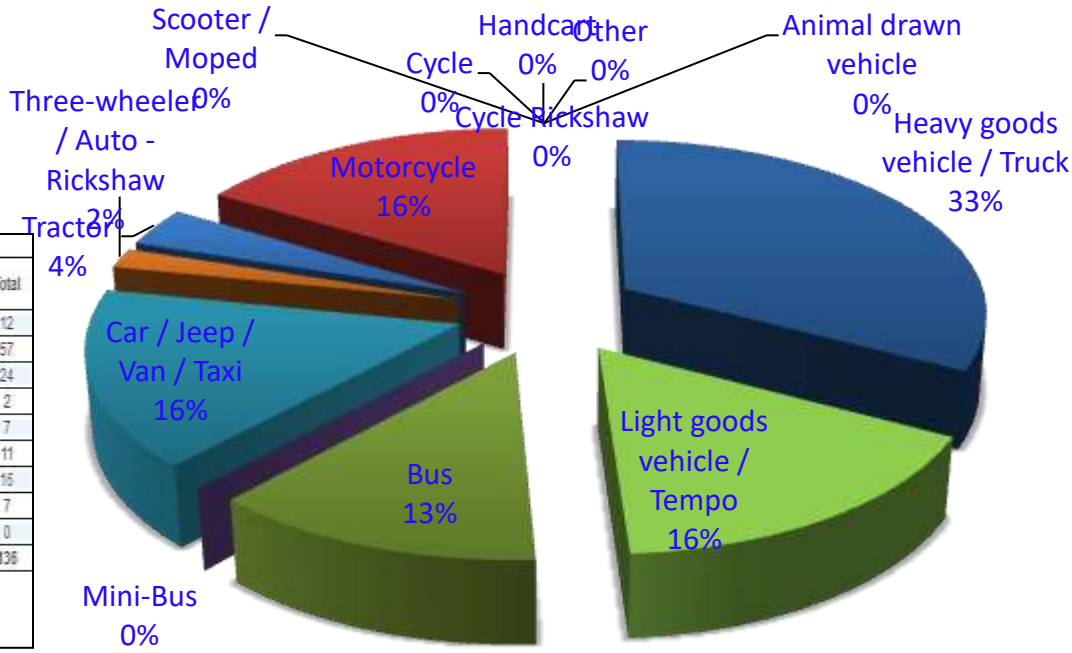
Examples of RADaR Reporting tool's Analysis Tables

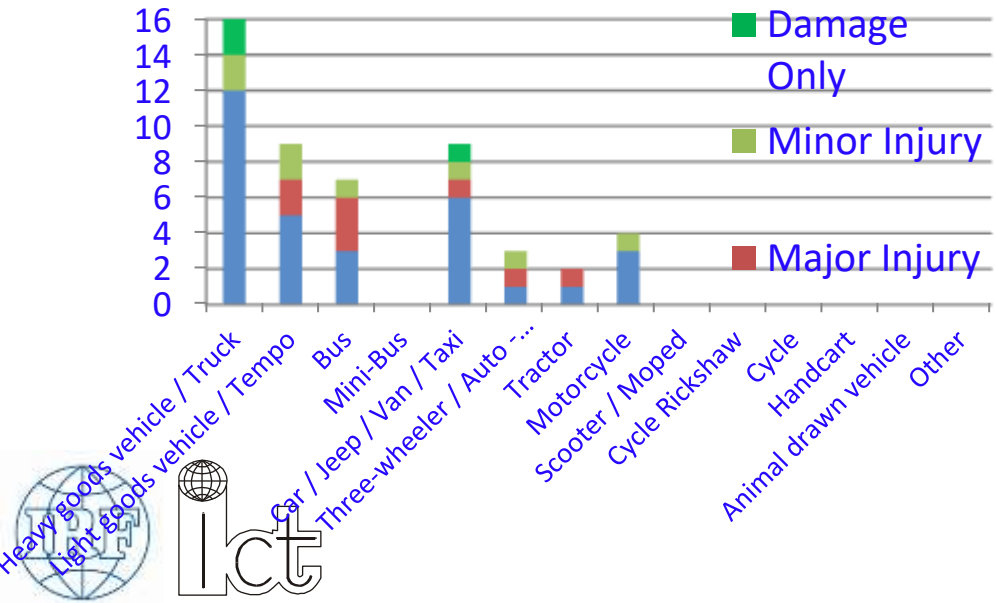
Province Level Table

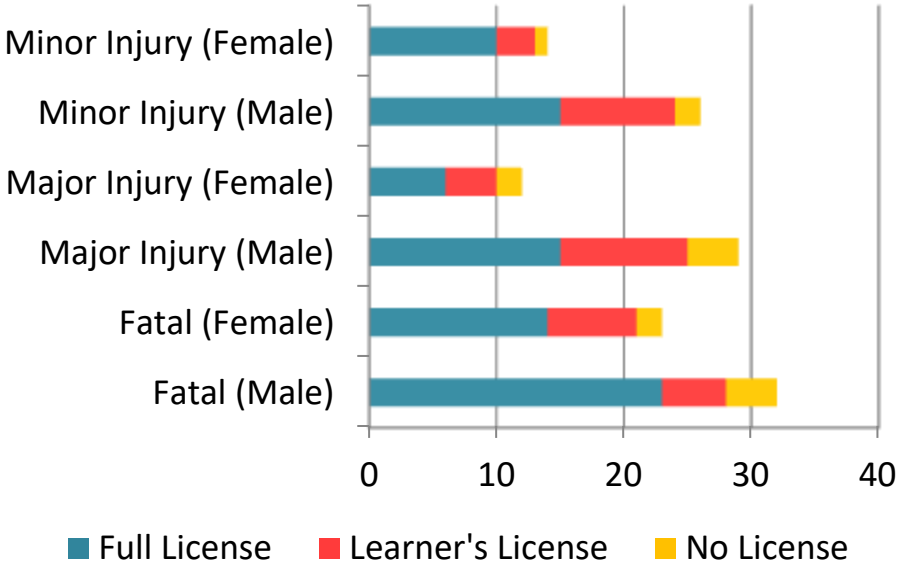
Table 19: -Accidents Classified According to Road Layout

SL No.	Severity / Road Configuration	Number of Accidents					Number of Persons Involved						
		Fatal	Major Injury	Minor Injury	Damage Only	Total	Fatal		Major Injury		Minor Injury		Total
							Male	Female	Male	Female	Male	Female	
1	Single / Intermediate Lane	4	0	2	1	7	4	2	0	0	4	2	12
2	Two Lane	12	4	5	0	21	12	8	14	6	11	6	57
3	Four Lane	6	1	0	1	8	3	8	9	0	4	0	24
4	Six Lane	1	0	0	0	1	0	1	0	0	0	1	2
5	Normal Junction	1	1	1	0	3	2	0	2	1	2	0	7
6	Staggered Junction	2	0	0	0	2	5	1	1	2	1	1	11
7	Skewed Junction	4	2	0	0	6	5	3	2	3	2	1	16
8	Roundabout	1	0	0	1	2	1	0	1	0	2	3	7
9	Railway Crossing	0	0	0	0	0	0	0	0	0	0	0	0
	Total	31	8	8	3	50	32	23	29	12	26	14	136

GO BACK PRINT PAGE

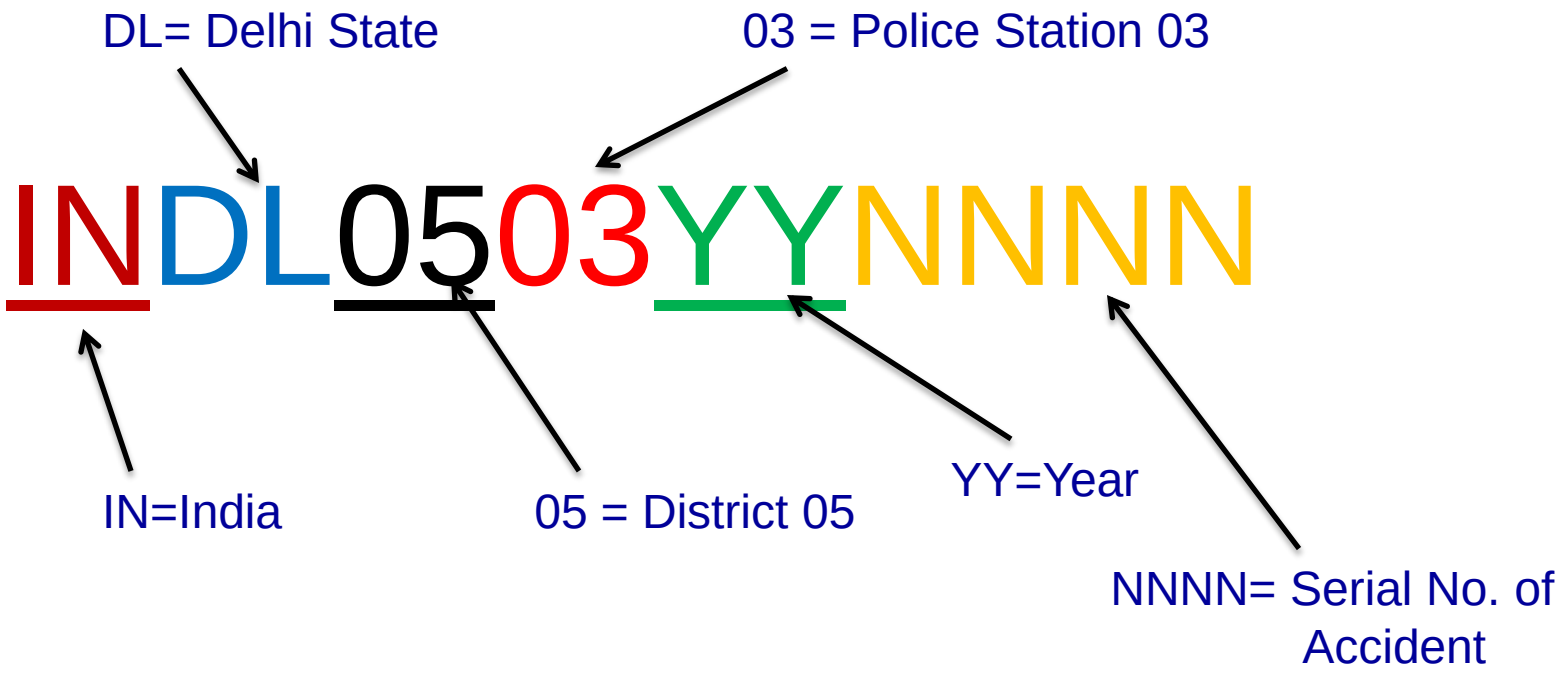






CODING FOR THE ACCIDENT DATA FOR EASY REFERENCE

Unique Identification of Each Accident Record



Example: INDL05031900056

In Summary: Success Depends on Data & Ingenuity

- Lack of appropriate data is the biggest challenge in most developing countries – safety cannot be enhanced without data
- Casual approach of "let us do something now" without any back-up data leads to all failures
- To maximize the return on investment, the engineering interventions shall be based on data-led investigations alone
- Systematic collection and analysis of crash data is prudent for effective Road Safety Management
- Crash Data Collection System, like *RADaR*, is the basic requirement for all developing countries
- Do not fall into the "Trap" of developing the "world's best" crash database system – Suggestion is: be modest and simple, but modern (use latest technology) for the system
- Do not ask for the "moon" in the database system, where there is nothing at this time; incrementally and quickly go to the "moon"

FAQs,.. No,.. Possible Questions..

- Can RADaR identify blackspots in the network and prioritize them ? Can it suggest the required countermeasures ?
- Can RADaR do the GIS (spatial) analysis of the accident data ?
- Can RADaR prepare stick diagram, heat map, corridor analysis, cluster analysis, and so on ??
- Can RADaR prepare the accident report ?
- Can RADaR give the causes of accidents ?

Answers to these Questions

RADaR has facilitated your crash data collection, most comfortably using modern method.

You can do world of analysis, and it is upto your requirements !!!

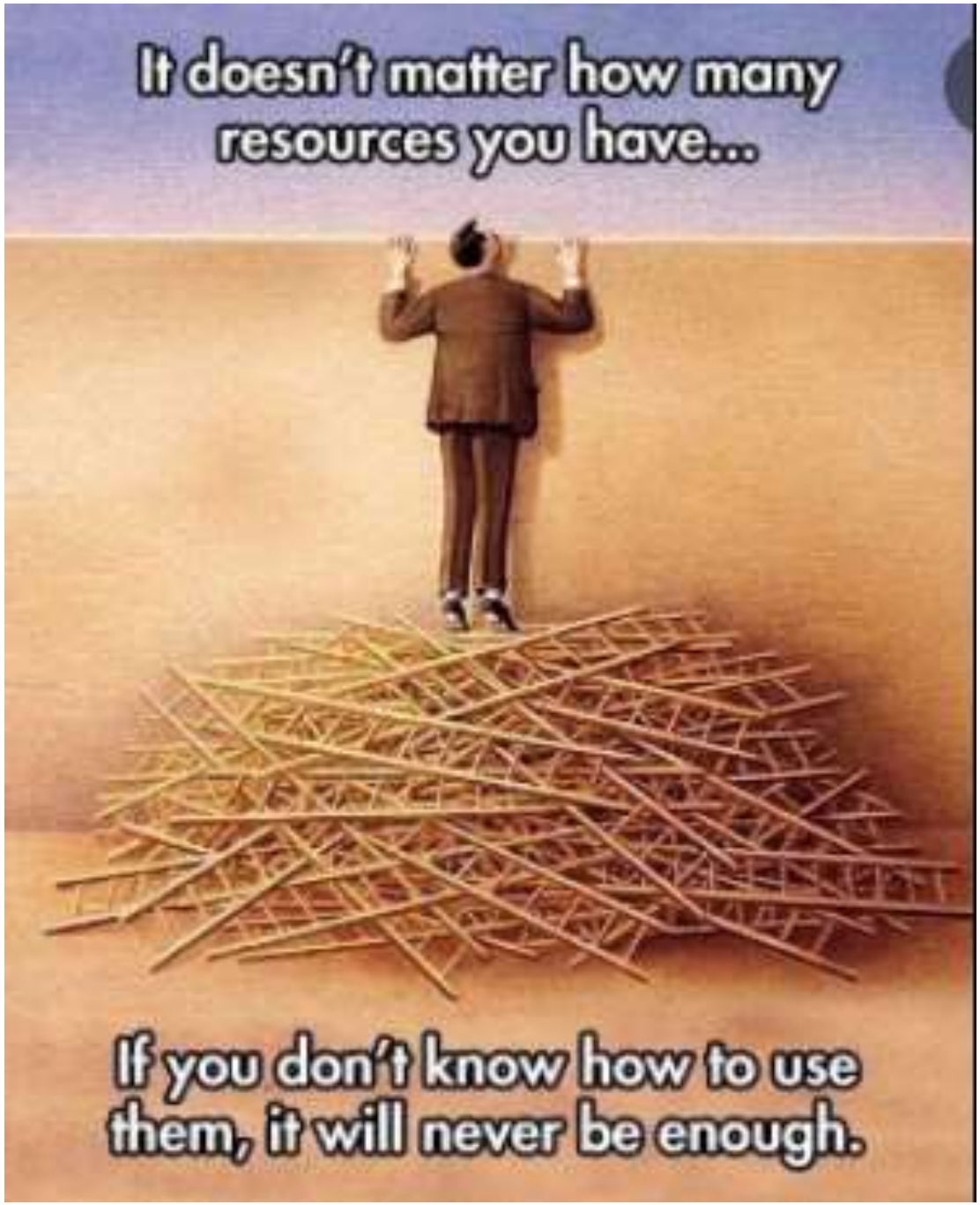
(It does extensive cross-classifications, which is part of RADaR Reporting Tool: ***RADMS***)

It is you, who has to answer all those questions using the detailed data that has been collected. You have to analyse the data and present it in any way you want.

Accident/Crash Data Collected

- Accident data to be collected not as crime record and only for FIR
- The required information for the FIR shall be part of all data collected (FIR printed automatically)
- The hospital which treats the victims will fill a format as part of RADaR collected data (Injury Report of Victims)
- Vehicle inspection data will also be available from mechanical engineer's (vehicle inspection report)
- All other information about the driver and vehicle information are directly collected from "Vahan" and "Sarathi" databases of the State/Central Government web-linked databases.

Our Indian way of doing things, for the crash database system



Acknowledgements

Mr. Shawon Aziz
Mr. Akhil Raj

"Knowing is not enough;
we must apply.
Willing is not enough;
we must do."

- Goethe

THANK YOU

pksikdar@ictonline.com