Government of Nepal
Ministry of Infrastructure and Transport
Department of Transport Management
NEPAL INDIA REGIONAL TRADE AND TRANSPORT PROJECT
SUB-PROJECT OFFICE

Terms of Reference (ToR)

Software Development

For

Road Accident Information Management System

(RA-IMS)

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Terms of Reference

Road Accident Database Information Management System

1. BACKGROUND

Department of Transport Management was established in 2041BS for the smooth management of transport. The purpose of this department and its affiliation, as per Vehicle and Transport Management Act 2049 and Vehicle and Transport Management Rules 2054, is to provide safe, reliable and easy transportation service to the public and goods carrier.

With more vehicles on the streets and little demarcation of lanes for those travelling at different speeds, road accidents in the country are rising. This is compounded by poor road conditions, drivers' fault, vehicle conditions, pedestrians and poor enforcement of traffic rules. To improve road safety, data is needed on the most frequent causes of accidents and the most accident-prone locations.

Currently, the information on road accident is carried out manually, and no effective network arrangements are established between Department of Transport Management (DoTM), Department of Roads (DoR) and Traffic Police to collect the accident data for comprehensive accident analysis. The existing paper-based recording process seems not effective as it lacked important information, is cumbersome, and generates a heavy back log of work at traffic police stations. In addition, coordination between the key institutions involved in road traffic management such as Traffic Police, DoR and DoTM also found not coordinated, resulting in piecemeal efforts to improve road safety. Similarly, the institutions like Municipalities, Hospitals, Insurance companies, etc. also do not have easy access to accident data.

A reliable accident database system is the first step towards scientific road safety management for effectively improving the hazardous locations and road safety interventions. The present paper based accident records maintained by the Traffic Police are found difficult in retrieving information/reports for analysis and decision-making required by safety stakeholders. The location of the accident is often reported and recorded in a vague manner and this makes it difficult to identify accident black spots and to design result-oriented, accountable road safety interventions.

Therefore, to establish a reliable, well managed and effective implementation of Road Accident Database System, DoTM under the support of Nepal India Regional Trade And Transport Project (NIRTTP) intends to develop and establish Web Based Road Accident Information Management System (RA-IMS). The System shall be hosted in the server housed within the premises of Government Integrated Data Center (GIDC) located at Singha Durbar. This will improve data collection process and establish reliable safety information database.

1.1 Accident Data Recording Practices in Nepal

Traffic Police in Nepal collects all crash data from the crash sites and compiles them at the local units and these are transmitted back to the concerned district and regional offices. The crash data are ultimately transmitted back to the Traffic Directorate at Nepal Police Headquarter in Kathmandu for entry into the crash database. However, the data in the filled Accident Forms are not transferred to a

computer database and the hard copy of the filled crash record forms are kept in the local traffic police units or general police concerned. The crash data at the Directorate at the center are aggregated to generate national crash statistics but segregated according to the five development regions in Nepal and includes statistics such as age, gender, vehicle involved, and severity of injury. However, as consolidated data, those do not provide data in detailed necessary for comprehensive analysis of road accidents.

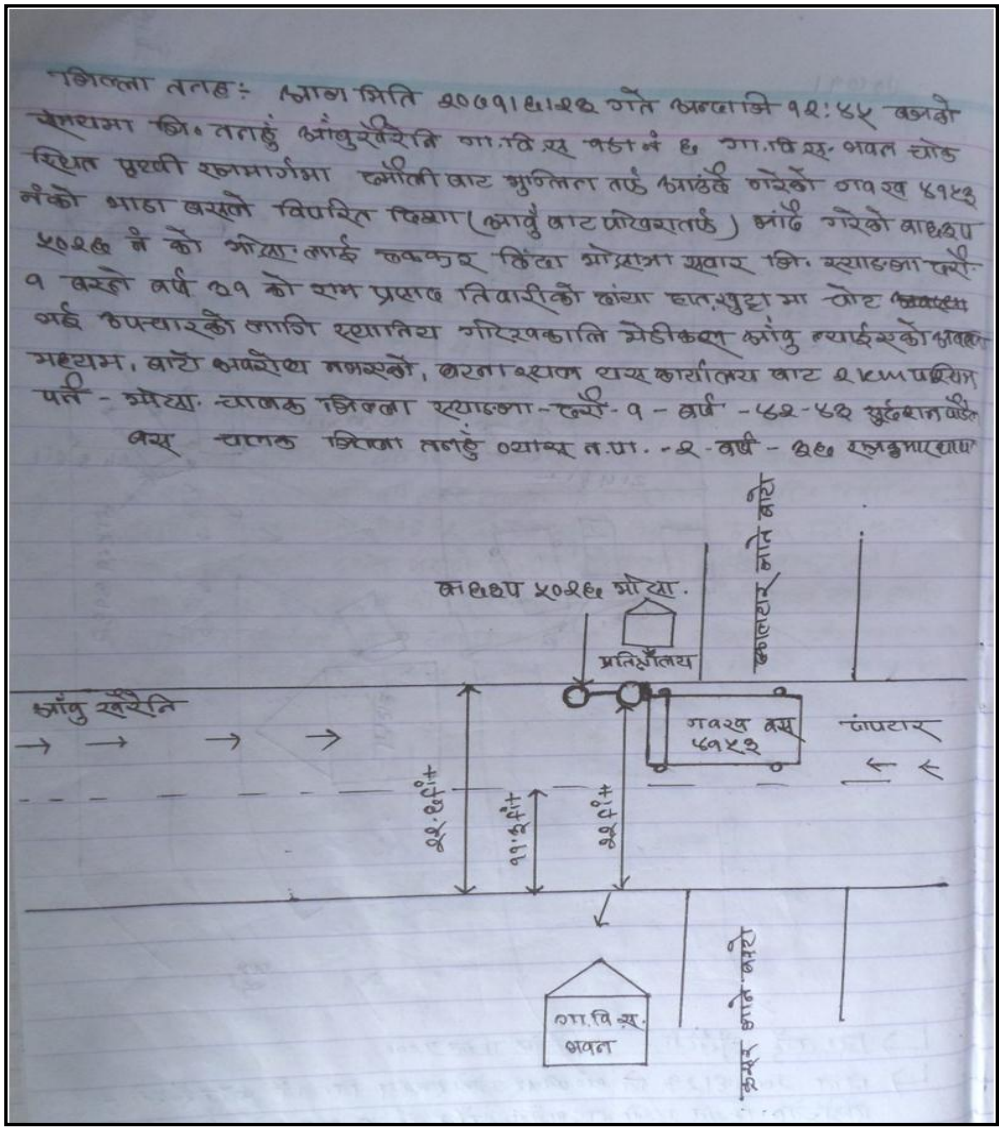


Figure 1First Page of Traffic Police Accident Recording Register

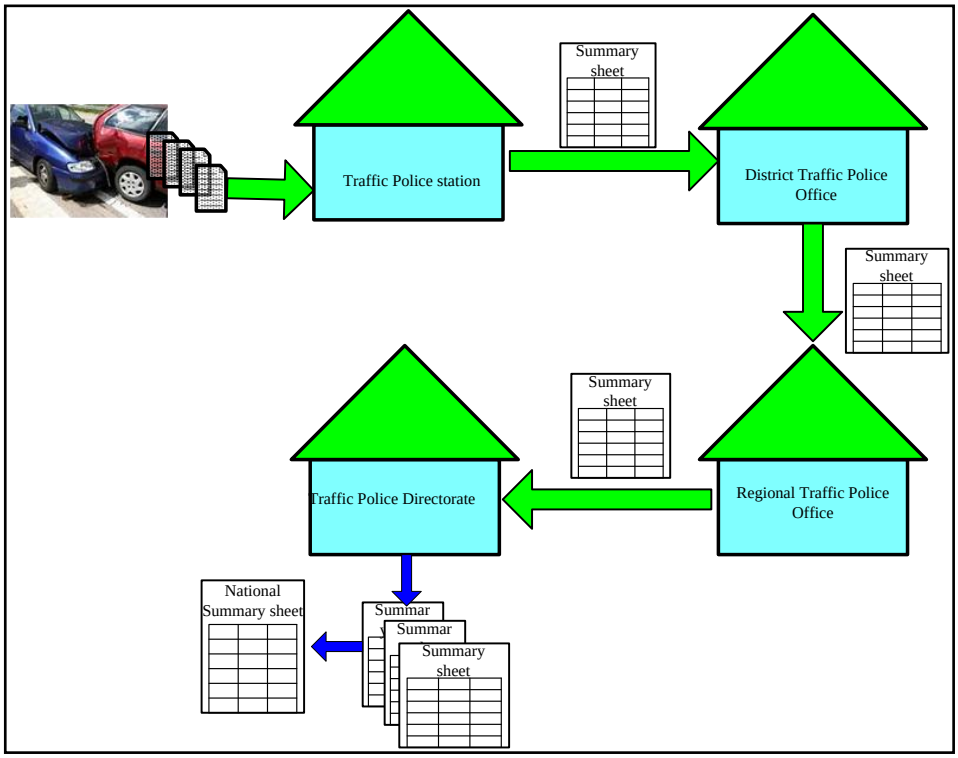
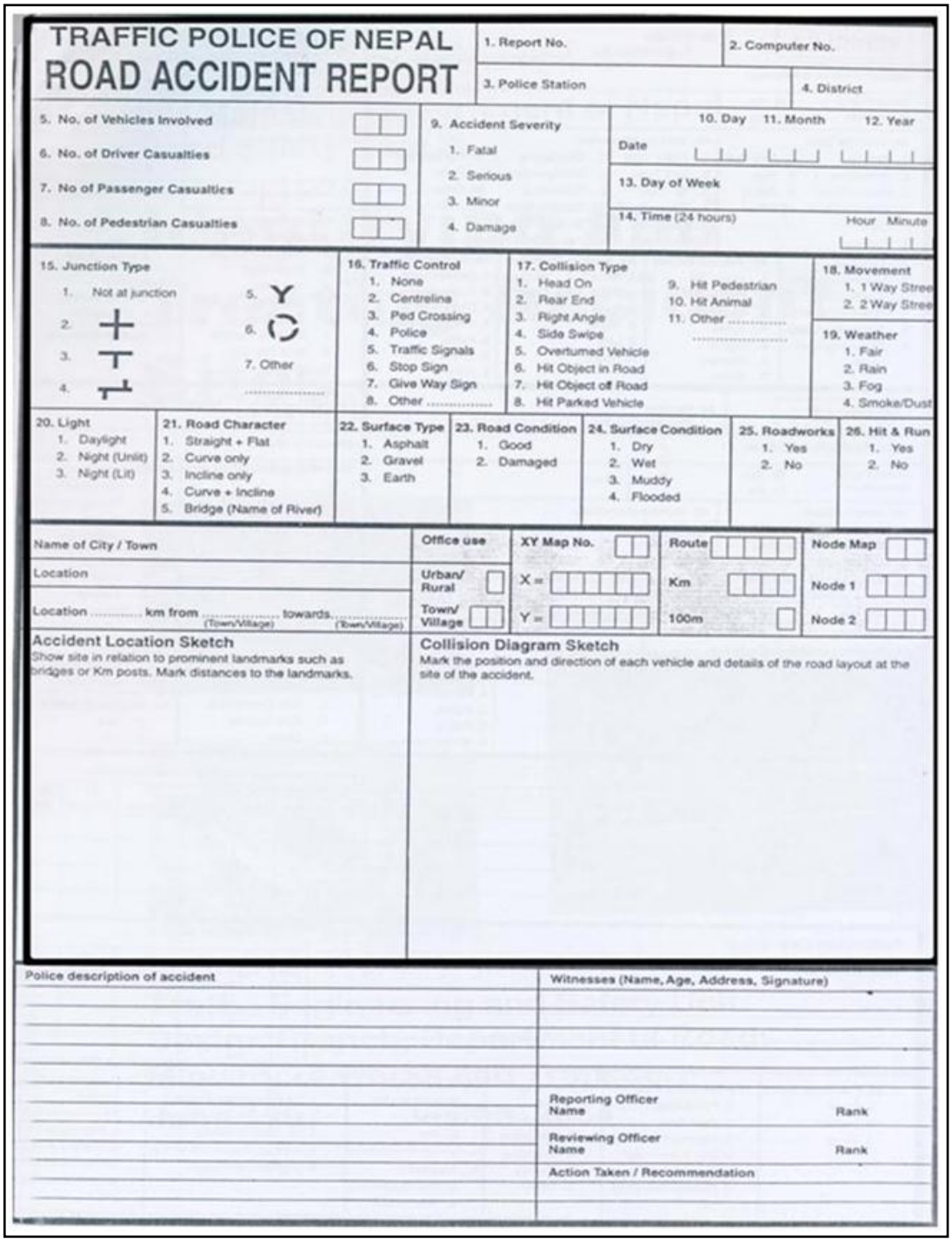


Figure 2 Accident Data Management System

In the urban areas and strategic locations, the traffic police personnel having the jurisdiction over the crash site in question record all details required but in the rural and remote areas where thereis no local traffic police unit, collection of all the crash details is delegated to the general police.

In the other hand, Traffic Police are practicing to apply the full format of "Road Accident Report" in case of the judiciary process. In the case of serious accidents after which Traffic Police should be submitted to the court for their legal treatment, they fill the report form at office. These forms have legal status and considered at the court for their decision of court verdict. These forms include most of the aspects related to the road accident. These forms are shown in the **Figure 2** and **Figure 3**.



TRAFFIC POLICE OF NEPAL

ROAD ACCIDENT REPORT

1. Report No.
2. Computer No.
3. Police Station
4. District

5. No. of Vehicles Involved
6. No. of Driver Casualties
7. No of Passenger Casualtics
8. No. of Pedestrian Casualties

9. Accident Severity
1. Fatal
2. Serious
3. Minor
4. Damage

10. Day 11. Month 12. Year
Date
13. Day of Week
14. Time (24 hours) Hour Minute

15. Junction Type
1. Not at junction
2. +
3. T
4. ⊥
5. Y
6. ○
7. Other

16. Traffic Control
1. None
2. Centreline
3. Ped Crossing
4. Police
5. Traffic Signals
6. Stop Sign
7. Give Way Sign
8. Other

17. Collision Type
1. Head On
2. Rear End
3. Right Angle
4. Side Swipe
5. Overturned Vehicle
6. Hit Object in Road
7. Hit Object off Road
8. Hit Parked Vehicle
9. Hit Pedestrian
10. Hit Animal
11. Other

18. Movement
1. 1 Way Stree
2. 2 Way Stree

19. Weather
1. Fair
2. Rain
3. Fog
4. Smoke/Dust

20. Light
1. Daylight
2. Night (Unlit)
3. Night (Lit)

21. Road Character
1. Straight + Flat
2. Curve only
3. Incline only
4. Curve + Incline
5. Bridge (Name of River)

22. Surface Type
1. Asphalt
2. Gravel
3. Earth

23. Road Condition
1. Good
2. Damaged

24. Surface Condition
1. Dry
2. Wet
3. Muddy
4. Flooded

25. Roadworks
1. Yes
2. No

26. Hit & Run
1. Yes
2. No

Name of City / Town
Location
Location ..... km from ..... towards.....
(Town/Village) (Town/Village)

Office use
Urban/ Rural
Town/ Village

XY Map No.
X =
Y =

Route
Km
100m

Node Map
Node 1
Node 2

Accident Location Sketch
Show site in relation to prominent landmarks such as bridges or Km posts. Mark distances to the landmarks.

Collision Diagram Sketch
Mark the position and direction of each vehicle and details of the road layout at the site of the accident.

Police description of accident

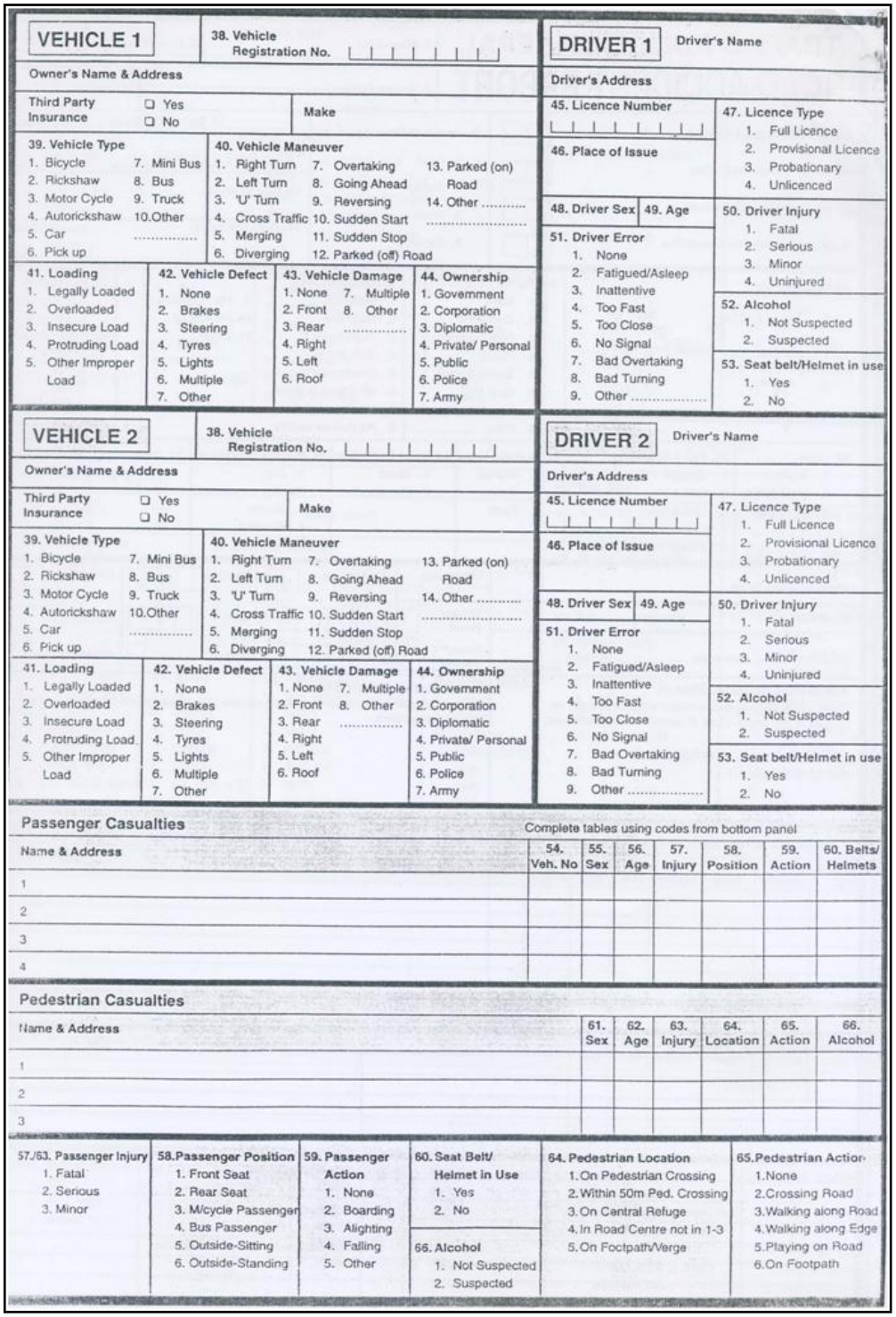
Witnesses (Name, Age, Address, Signature)

Reporting Officer
Name Rank

Reviewing Officer
Name Rank

Action Taken / Recommendation

Figure 3Nepal Police Road Accident Report (page 1)



VEHICLE 1

38. Vehicle Registration No.

Owner's Name & Address

Third Party Insurance ❑ Yes ❑ No

Make

39. Vehicle Type
1. Bicycle 2. Rickshaw 3. Motor Cycle 4. Autorickshaw 5. Car ..... 6. Pick up 7. Mini Bus 8. Bus 9. Truck 10. Other

40. Vehicle Maneuver
1. Right Turn 2. Left Turn 3. 'U' Turn 4. Cross Traffic 5. Merging 6. Diverging 7. Overtaking 8. Going Ahead 9. Reversing 10. Sudden Start 11. Sudden Stop 12. Parked (off) Road 13. Parked (on) Road 14. Other .....

41. Loading
1. Legally Loaded 2. Overloaded 3. Insecure Load 4. Protruding Load 5. Other Improper Load

42. Vehicle Defect
1. None 2. Brakes 3. Steering 4. Tyres 5. Lights 6. Multiple 7. Other

43. Vehicle Damage
1. None 2. Front 3. Rear 4. Right 5. Left 6. Roof 7. Multiple 8. Other .....

44. Ownership
1. Government 2. Corporation 3. Diplomatic 4. Private/ Personal 5. Public 6. Police 7. Army

DRIVER 1

Driver's Name

Driver's Address

45. Licence Number

46. Place of Issue

47. Licence Type
1. Full Licence 2. Provisional Licence 3. Probationary 4. Unlicenced

48. Driver Sex 49. Age

50. Driver Injury
1. Fatal 2. Serious 3. Minor 4. Uninjured

51. Driver Error
1. None 2. Fatigued/Asleep 3. Inattentive 4. Too Fast 5. Too Close 6. No Signal 7. Bad Overtaking 8. Bad Turning 9. Other .....

52. Alcohol
1. Not Suspected 2. Suspected

53. Seat belt/Helmet in use
1. Yes 2. No

VEHICLE 2

38. Vehicle Registration No.

Owner's Name & Address

Third Party Insurance ❑ Yes ❑ No

Make

39. Vehicle Type
1. Bicycle 2. Rickshaw 3. Motor Cycle 4. Autorickshaw 5. Car ..... 6. Pick up 7. Mini Bus 8. Bus 9. Truck 10. Other

40. Vehicle Maneuver
1. Right Turn 2. Left Turn 3. 'U' Turn 4. Cross Traffic 5. Merging 6. Diverging 7. Overtaking 8. Going Ahead 9. Reversing 10. Sudden Start 11. Sudden Stop 12. Parked (off) Road 13. Parked (on) Road 14. Other .....

41. Loading
1. Legally Loaded 2. Overloaded 3. Insecure Load 4. Protruding Load 5. Other Improper Load

42. Vehicle Defect
1. None 2. Brakes 3. Steering 4. Tyres 5. Lights 6. Multiple 7. Other

43. Vehicle Damage
1. None 2. Front 3. Rear 4. Right 5. Left 6. Roof 7. Multiple 8. Other .....

44. Ownership
1. Government 2. Corporation 3. Diplomatic 4. Private/ Personal 5. Public 6. Police 7. Army

DRIVER 2

Driver's Name

Driver's Address

45. Licence Number

46. Place of Issue

47. Licence Type
1. Full Licence 2. Provisional Licence 3. Probationary 4. Unlicenced

48. Driver Sex 49. Age

50. Driver Injury
1. Fatal 2. Serious 3. Minor 4. Uninjured

51. Driver Error
1. None 2. Fatigued/Asleep 3. Inattentive 4. Too Fast 5. Too Close 6. No Signal 7. Bad Overtaking 8. Bad Turning 9. Other .....

52. Alcohol
1. Not Suspected 2. Suspected

53. Seat belt/Helmet in use
1. Yes 2. No

Passenger Casualties

Complete tables using codes from bottom panel

Name & Address	54. Veh. No	55. Sex	56. Age	57. Injury	58. Position	59. Action	60. Belts/ Helmets
1							
2							
3							
4							

Pedestrian Casualties

Name & Address	61. Sex	62. Age	63. Injury	64. Location	65. Action	66. Alcohol
1						
2						
3						

57./63. Passenger Injury
1. Fatal 2. Serious 3. Minor

58. Passenger Position
1. Front Seat 2. Rear Seat 3. M/cycle Passenger 4. Bus Passenger 5. Outside-Sitting 6. Outside-Standing

59. Passenger Action
1. None 2. Boarding 3. Alighting 4. Falling 5. Other

60. Seat Belt/ Helmet in Use
1. Yes 2. No

66. Alcohol
1. Not Suspected 2. Suspected

64. Pedestrian Location
1. On Pedestrian Crossing 2. Within 50m Ped. Crossing 3. On Central Refuge 4. In Road Centre not in 1-3 5. On Footpath/Verge

65. Pedestrian Action
1. None 2. Crossing Road 3. Walking along Road 4. Walking along Edge 5. Playing on Road 6. On Footpath

Figure 4 Nepal Police Road Accident Report (page 2)

1.2 Objective

The main objective of this assignment is to develop Web Based Road Accident Information Management System (RA-IMS) and Capacity Building around an accident data systemthat facilitates real time data collection and statistics available for timely decision making, policy formulation, monitoring and program implementation for improvement of Road Safety.

2. PROPOSED DESIGN

The proposed design of Web Based Road Accident Information Management System (RA-IMS) is presented in the **Figure 1**.

The web based RA-IMS shall be designed and developed on the basis of Road Accident Form (Figure 2 and Figure 3) and shall be hosted in the server established at the Government Integrated Data Center (GIDC) located at the Singhadurbar, Kathmandu. Apart from the fields mentioned in Figure 2 and Figure 3, the database might require additional data fields for RA-IMS database for cross analysis of accident information. The RA-IMS shall be accessible to all the stakeholders having provided User Login authorizations for different level access according to the requirements. DoTM, as an Executing Agency (EA) of the RA-IMS, shall have full control (Read and Write) over the system and shall be responsible for providing user level access to stakeholders.

The RA-IMS shall be integrated with the mobile application for recording accident data using mobile devices in offline mode by traffic police at local level. After verification of data by the authorized person-in-charge at local Traffic Police Stations, every local Traffic Police Stations using their own login access provided by the DoTM shall upload verified accident data in the centralized server through the internet connection. Every addition of accident record shall be notified to the DoTM and Traffic Police Directorate by the system itself.

Once the accident data is uploaded, the data could be accessed by the users of any locations having internet connections.

The RA-MIS shall be developed in such a way that it plays a key role in decision-making process.Therefore, it shall generate the following standard reports but not limited and it shall have provision of intelligent report generator for additional reports wherever necessary on the basis of data recorded in the database.

Some of the Standard Reports, but not limited to the following, are:

1. Number of Accidents Vs Time of accident & Accident Severity
2. Number of Accidents Vs Accident Severity & Collision Type
3. Number of Accidents Vs Accident Cause & Vehicle Type
4. Accident Statistics
5. Identify Safer/Bad Driver according to the License Number

Additionally, the database of RA-IMS shall be powerful and scalable for future expansion of database and integration with other related applications like Vehicle Registration, Citizenship, License Registration, Municipalities, Applications of Insurance Companies, Hospitals, etc.

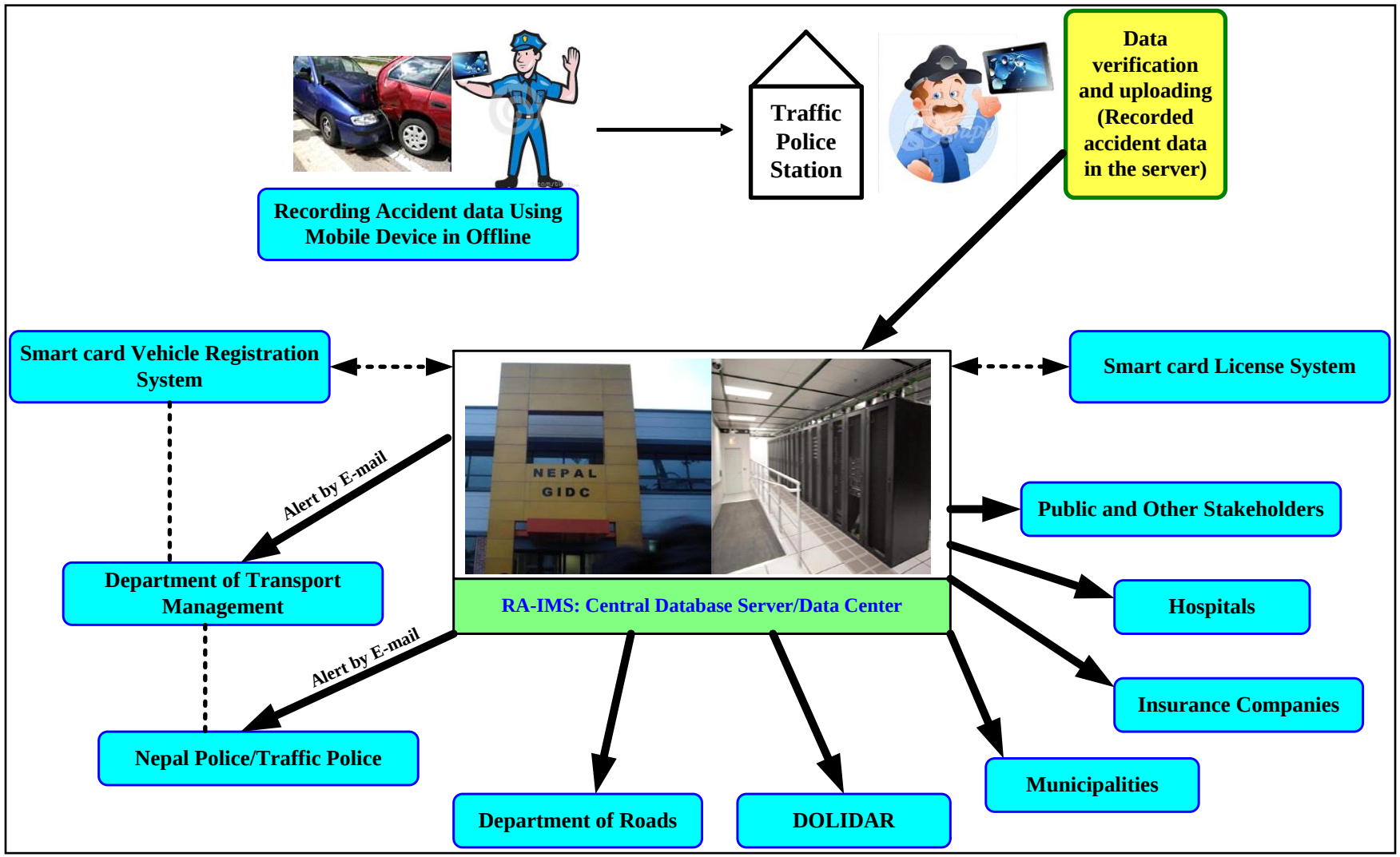


Figure 5 Recommended type of RA-IMS

3. SCOPE OF THE SERVICE

The scope of the proposed service is to study the existing process and prepare the system requirement specifications, develop a web based RA-IMS integrated with mobile application for the effective implementation. The consultant undertakes to perform the services with the highest standards of professional and ethical competence and integrity. The Consultant of the RA-IMS shall carryout activities but not limited tothe following in close consultation with the Executing Agency (EA) to achieve the objectives of the Project:

a) Carry out detailed system study including functional requirement assessment, finalize the system requirement specifications and system design document of the RA-IMS with the integration of mobile application for accident data recording in close consultation with the designated team.

b) Submit and present the Design Report of RA-IMS

c) Upon approval of design from EA, carry out system development

d) Shall be fully responsible for installation, configuration, commissioning and hosting of the System established at the GIDC for online access.

e) Shall be fully responsible for installation of required applications and software including database software for successfuloperation and hosting of RA-IMS.

f) Prepare Acceptance Test Procedure and carry out testing of complete systemin the presence of the EA. The test shall include: Quality Assurance and Bug Testing, Multiple Browser Compatibility, Application Security, Performance - Load and Stress Testing, Unit Testing, etc.

g) Upon completion of the work awarded, provide training/orientation to designated team of EA (DoTM), Traffic Police, DOR, etc.

h) Submit a complete report including handbook/manuals on Operation andMaintenance of the RA-IMS

i) Handover the Complete Error-Free RA-IMS System including Source Code acceptable to the EA in fully Operational Condition.

j) Provide full Service warranty with one year operation and maintenance support and extended support warranty for the additional period of three years.

k) The Consultant shall be fully responsible for any discrepancies and errors occurred during the project period.

4. FEATURES AND SPECIFICATIONS

Design and Development of RA-IMS: The web based Road Accident Information Management System (RA-IMS)is dynamic web sites combined with server side programming which provide functionalities such as interacting with users, connecting to back-end databases, and generating results to browsers.

The RA-IMS shall be user-friendly with high data security. The RA-IMS shall be integrated with the Domain of Executing Agency (EA) Department of Transport Management (DOTM) http://www.dotm.gov.np.The link of RA-MIS shall also be included in the domain of Nepal Police, DOR, etc. according to the understanding of the stakeholders.

The web based RA-MIS shall have the facility for recording accident data and generating standard as well as dynamic reports for further analysis and decision-making. The System shall also have the facility of accident recording and browsing standard reports using Mobile Devices. Therefore, the Consultant shall integrate mobile application with the core web based RA-IMS for providing easy access to the computer as well as mobile users. The mobile application shall be compatible for the Android users.

The RA-IMS shall be developed on the basis of Road Accident Form (**Figure 2** and **Figure 3**) with the provision of scalability according to the future requirement.

The RA-IMS shall support GIS Maps, Open Street Mapsand Google Maps enabled for recording accident data and analysis of various data and generation of reports. In case if the system shall be enabled with the GIS Map, required GIS Mapsand licenses for Maps if any shall be provided by the EA for integration with the system.

After determining the appropriate forms, formats, information and database, the Consultant needs to design and develop the RA-IMS. The RA-IMS shall be able to produce and maintain big volume, storage and speed for instant online data entry, recording, retrieving, producing and analyzing the data and its contents.

The RA-IMS shall have major sections like Accident Recording Engine, GIS Engine, Safety Analysis Engine, Standard Reports, Dynamic Standard and Spatial Query Builder and Administration and Tools sections.

Accident Recording: The main feature of the proposed system i.e. RA-IMS is the application of mobile device for the recording of accident data. The data saved on the mobile device would be then transferred to the central server. A typical specification of the mobile device is given below:

7.0 inches TFT LCD 1280 x 800 pixels and 16M colors

1.2 GHz Quad-core + 1.5 GB RAM

Storage: 8GB inbuilt, micro SD up to 64 GB

Camera: 3.2MP Rear + 1.3MP Front

Operating System: Android OS, v4.4.2 (Kit-Kat)

Battery: Li-Po 4000 mAh battery

Others: Wifi 2G & 3G network, SNS integration, Document viewer, Geo-tagging

The data transmission of the recorded files will be done by ADSL Router. The specification of router is given as:

- 150Mbps 11N WLAN, ADSL/ADSL2/2+ Router with4-Port Ethernet built-in

Accident Recording Enginehelps in capturing accident data.

GIS Engine helps to plot accidents on digital maps and has the capability of accident analysis. This includes plotting options, polygon searches, creating monitor sites and black spot identification. Grid analysis, cluster analysis and monitoring sites are also enabled.

Safety Analysis Engine enables cross tab analysis, kilometer analysis.

Standard Reports Module generates routine reports like accidents based on severity, accidents classified according to type of area, time, weather conditions, road conditions, vehicle types, and passenger/pedestrian casualty statistics, etc.

Dynamic Query Builder helps create user-defined query or constraints and view sub-sets of accident data. The user can run the Safety Analysis Engine for this set.

Administration and Tools Module allows for system administration and maintains the digital map versions. Granting access rights, periodic backlog file and distribution of data are controlled by the Administration module. Importing digital maps, interfacing with different systems, creating monitor areas, updating accident symbols and collision symbols and labeling the maps are done through the tools module.

On the basis of above major engines, not limited to the following, the system shall have the following features satisfying the system requirements:

- **A web-based System:** The RA-IMSshall be user-friendly, dynamic and interactive with higher level of data security. The system must accommodate all the web-based system features. The communication shall be done with 256 bit AES encryption over SSL layer. The authentication will be done with industry recommended standard of three legged OAuth 2.0 protocol.

  The system shall be integrated with Mobile Application for recording accident data and browsing standard reports.The systemshall be able to make data entry in the forms or formats developed for information capture from the accident location using Mobile Devices and Computer/Laptops. The data with mobile platforms shall support offline recording and synchronize with online servers when internet is available after all verifications have been completed.

  The RA-IMS is a web based system; therefore the data could be accessed using any browser at any location.

- **Technologies:**Open source scripting languages and open source database server built based on a Relational Database Management System (RDBMS) capable of handling a large concurrent database connection are proposed for developing RA-IMS. For android,technology shall be used over native Android SDK using Java.

  - The technology for coding shall be Server Side Scripting/Coding.
  - The System must be developed on compatible platforms of Windows and Linux.

- **Data Entry or Uploading Functions:** The RA-IMS shall have both the features of data entry online as well as offline for recording accident data at accident locations and uploading filled forms to the Central Server after verification carried out by the authorized In-charge of Local Traffic Police Stations. The verified accident data shall be uploaded through Internet connection. The system shall ensure data security during the process of recording data and uploading data to the Server.

- **Secure Login Screen**: The System shall provide secured access through the login screen where each of the users can access the system via their web browser.
- **Data Entry Module**: The system shall have built-in data entry module which allows designated users the ability to add or edit records by typing or selected from a drop-down list. The priority shall be given to the selection from a drop down list.

- **Content:** The Consultant needs to determine the data contents, forms, formats and other related information in close consultation with the EA, however, as general guideline it may contain the following:

  - **Road Accident Form (Figure 2 and Figure 3)**
  - **Road Safety Related Information**
  - **Information of stakeholders involved in Road Safety**
  - **Rules and Regulations on Road Safety**
  - **Team working on Road Safety**
  - **Suggestion Box**
  - **Contact Information, etc.**

- **Visibility and Accessibility:** The site should have highly visibility and be easy to find via all major search engines and must be compatible with all major web browsers.

- **Access Control:** The system shall have different access control features as per user levels and user privileges. This access control feature should be dynamic in nature so that rights of a particular module may be assigned to any user apart from his/her level. Every stakeholder shall be provided with User Login facility according to their roles and responsibilities. This shall be defined in consultation with the EA.

- **Powerful and Scalable:** The system shall be dynamic to adopt the change the parameters as defined in government acts, rules, regulation, directives, etc. Database shall be robust, agile and able to expand and scale up more easily and shall be able to handle big volume of data and complex SQL queries.

- **Maker and Checker System:** Update ofstored accident date needs to be validated by the EA, therefore it is recommended to have the facility of maker and checker as separate authority for check and balance of the transactions carried out.

- **Audit Trail:**The System shall have inbuilt facility for detecting security violations, performance problems, and flaws in applications.

- **GEA/NGIF Compliance:** The RA-IMS shall follow Nepal Government Enterprise Architecture (GEA) and Nepal Government Interoperability Framework (GIF). Compliance of these features by any government software systemwill facilitate the data interchange among different government agencies.

The RA-IMS shall have the provision of inter connection with the systems especially Smart Card Licensing System, Embossed Vehicle Registration System, Citizenship, etc.

System should have English and Nepali User Interface with a single click of a button at any level of its operation. System shall support Nepali Unicode as well as English/Nepali dates.

Security: The code used in the system development must be written carefully in order to avoid any vulnerability andshall be secured through layers of security system to combat today's cyber security threats and vulnerabilities. The security system shall enable the smooth operation of the RA-IMS. The system shall have an integral security system including following security features:

Coding Level Security: Security issue shall be taken into account while coding RA-IMS. All communications shall be done with 256 bit AES encryption over SSL.

Access Level Security: Stateless REST API shall reduce the threats of session hijacks, signed requests shall ensure API is consumed by trusted clients only, blowfish password hashing with 3-legged OAuth 2.0 authentication, ACL for role based access.

Database Level Security: Access to database and their roles, read/write permission, access to database, session monitoring, etc.

Network Level Security: Access of system inside/outside, IP and port filtering, etc.

Data Storage and Back-up System: The system shall have the automatic data storage system as and when the data are entered or fed in regular intervals. So the system shall have in-built back-up system to avoid any data loss.

Data Export System: The database system shall have facility to export the data to other application program such as SPSS and STATA, MS-Excel for further analysis of data.

Functionalities to be supported: The System shall have functions not limited to the following:

- Search and view accidents on the Map
- View the accidents on the map using display options
- Perform analyses on searched accidents
- View the Monthly/Half Yearly/Yearly trend of accidents
- View the latest updates

Management Dashboard: Commonly used reports shall be displayed via the dashboard which allows users to monitor recent trends quickly and easily.Charts can be quickly modified to display as a bar, line, or column.

GIS Related Features: System shall support the integration of GIS Maps and some public maps like Open Street Map, Google Maps, etc.

System shall support the following features on map:

- Option to drag the map to view locations outside the view port
- Option to zoom in / zoom out
- Option to view history forward / backward
- Option to measure distance between two locations in the map
- Option to select accidents by drawing a feature (select by rectangle, select by circle)
- Option to print own digital or open source maps with accident location and labels
- Option to export own digital or open source maps with accident location and labels, as JPEG, PDF files

Cluster Analysis: The System shall have the facility to review collision hotspots using the advanced cluster analysis feature.

Corridor Analysis: The System shall have the facility of corridor and route analysis since these are the common features of collision analysis systems.

Black spots Analysis: The System shall generate accident concentration zones or carry out the black spots Analysis.

Kilometer analysis: The System shall analyze accidents along a selected stretch of road.

Accident rate analysis: The System shall carry out accident rate analysis and generate reports.

Grid Analysis: The System shall have the facility of Grid Analysis for identifying the frequency of accident hotspots.

Powerful Cross Tabulation Module: The system shall have the facility to cross-tabulate datasets using common attributes and a number of measures.These analyses can be saved and re-run on a regular basis making local management information preparation quick and easy.

Creating Custom Charts: The System shall generate different chart and have the facility to view, customize, print and export for use in local offline reports.

Viewing Collisions on the Map: The map is used to quickly show the locations of collisions using a number of mapping base layers. It should have facility to quickly change the zoom levels to suit the requirements and even change the display to show vehicle icons in place of the normal casualty pins.Collisions can be selected using queries or by drawing polygons around map features.

Searching the Map: The system shall have the facility for searching quickly for a road on the map by clicking on the button and entering the search parameters

Comparing Query Results: The system shall have side-by-side comparisons of the query results and the whole collision dataset with information on vehicles, casualties and severity breakdowns included.

Standard Reports: The system shall generate traditional tabulated reports which can be viewed online or downloaded for local analysis.

Dynamic Reports: The system shall have the facility to select from any of the Accident Data Form fields entered to create report by defining the row and columns.

Summary Reports: Shall be able to generate all the accidents that are retrieved from the system as a result of a search, query or an analysis.

Displaying Summary Collision Information: Summary information about a collision on the mapping screen shall be displayed by the selection ofinformation tool and click on the individual marker.

Plotting Query Results: Once the query is completed, the system shall be ableto browse quickly the results on the map.

Entering Casualty Details: Simple data entry shall be provided through the use of helpful drop-down boxes with symbolized entries.

Condition and Collision Drawing: The system shall have the facility of condition and collision drawing sketch according to the requirement of Road Accident Form (Accident Location Sketch and Collision Diagram Sketch) in mobile devices as well as Computer/Laptops. Other symbolized entries shall be provided through the use of helpful drop-down boxes.

System Integration: The system shall be integratedwith the software systemsANPR enabled Vehicle Registration and Smart Card License Registration. The system shall have provisions of integration with the Citizenship, applications of Municipalities, Insurance Companies, Hospitals, etc. wherever possible.

Data Migration and Transfer: The system shall be fully capable of data migration and transfer facility.

Support and Maintenance: After the handover of the RA-IMS to the EA, the Consultant shall provide full Service warranty with one year maintenance and support and extended warranty for the additional period of three years where a regular support, maintenance and regular updates shall be carried out by the Consultant. The support level depends upon the complexity of the task, which shall determine the service should either be remote support or on call support.

5. TRAINING AND KNOWLEDGE TRANSFER

The Consultant shall prepare the technical, user and operational training manuals and session plans for the successful design, development and operation of the system. The trainings shall be conducted for the designated staffs of EA (DoTM), Traffic Police, DOR, etc.

The training shall be organized centrally by the Consultant in consultation with the EA.Training shall include:

a) Intensive ‘Training of Trainers’ programs

b) IT Administrators Training

c) Hands on Operational Training

6. DELIVERABLES

The Consultant shall furnish following documents during the project period:

1. Inception Report with Work Plan and Manning Schedule
2. Original RA-IMS Software and System (with in-built security system) in Electronic Version
3. The Source Code
4. System Requirement Specifications
5. Design Document
6. Testing Procedures and Test Reports

7. Completion Report
8. Operational/User Manuals

7. OPERATION AND MAINTENANCE OF SYSTEM

The Consultant shall provide full service warranty for at least one year operation and maintenance support from the date of final acceptance by the EA. During the warranty period, the Consultant shall address all the errors, bugs, gaps in the functionality offered by the system at no additional cost.

The terms of reference also requires extended support warranty for the additional period of three years after the completion of one year support warranty.

8. FACILITIES TO BE PROVIDED BY THE CLIENT

In order to support the supplier, DOTM will provide the following:

a) Liaison officer to facilitate the discussions with the government authorities and other agencies;
b) Introductory letter to stakeholders to introduce and authorize the consultants to observe the operation of the systems to be integrated
c) Venue for the presentation and/or discussion.

9. QUALIFICATION AND WORK EXPERIENCE

9.1 Qualification and Experience of the Firm:

1. Firms interested to participate in the bid must have minimum five years of existence or any of the partners in case of JV and/ or in association.
2. Must have documented experience in design and development of minimum of 5 web based systems, 2 GIS Maps and 2 Android applications or any of the partners in case of JV and/or associate partners.
3. Interested firms must furnish information indicating that they are qualified to perform the services. Firms may submit proposal solely or form an association with other firms.
4. Other relevant documents like company registration, VAT registration, latest tax clearance certificate, etc. must be included in the Proposal.

9.2 Professional Staff and Key Expert

The input of key expert is shown in **Table 9.1**.

Table 9.1 Key Expert Input

Description		**Person Man- Months**	
1. Key Professionals :	**No.**	**Input**	**Total**
1.1 Team Leader	1	6	6
1.2 System Analyst	1	2	2
1.3 Database Designer	1	2	2
1.4 Web Programmer/Developer	2	4	8
1.5 Android Application Developer	1	3	3
1.6 GIS Expert	2	3	6
1.7 Road Safety Expert	1	2	2
2. Non Key Expert: (to be proposed by the Firms as required if any)			

2.1.			
2.2.			
2.3			

9.3 Qualifications and Responsibilities of Key-Experts

a) Team Leader

The Team Leader must have at least Masters Degree in Computer Engineering / Computer Science / Information Technology with at least 10 years of working experience in web based database management system designing, development and implementation.

The Team Leader must be responsible for overall project management, system integration, quality assurance, coordination and liaison, etc. S/he shall work in close coordination with the EA.

b) System Analyst

The System Analyst must have at least Masters Degree in Computer Engineering / Computer Science / Information Technology with at least 10 years of working experience in web based database system analysis, designing, development and implementation. S/he shall have experience in development of web based database management system in open source scripting languages and open source database server built based on a Relational Database Management System (RDBMS).

c) Database Designer

The Database Designer must have at least Bachelor Degree in Computer Engineering / Computer Science / Information Technology with at least 5 years of working experience in development of database management system in Open source scripting languages and open source database server built based on a Relational Database Management System (RDBMS). S/he shall have demonstrated experience of designing, development, implementing and maintenance of databases including data recovery, security, scalability and disaster recovery.

d) Web Programmer/Developer

The Web Programmer/Developer must have at least Bachelor Degree in Computer Engineering / Computer Science / Information Technology with at least 5 years of working experience in web based system programming, preferably having experience in development of data management system in Open source scripting languages and open source database server built based on a relational database management system (RDBMS). S/he must have demonstrated experience of developing web based applications.

e) Android Application Developer

Android Application Developer must have at least Bachelors Degree in Computer Engineering / Computer Science / Information Technology with at least 2 years of working experience in designing and development of Android Applications for mobile devices. S/he must have demonstrated experience of developing Android Applications.

f) GIS Expert

GIS Expert must have at least Masters Degree in GIS/Geo Informatics/Civil Engineering/Computer Engineering/Computer Science/ Information Technology with at least 5 years of working experience in preparing GIS based database and creating GIS data and maps and have experience in implementing spatial design plan using open source GIS framework.

g) Road Safety Expert:

Road Safety Expert must have at least Masters Degree in Road Safety / Civil Engineering / related field with at least 10 years of working experience in transport sector and road safety.

10. SELECTION METHOD

The consulting firm selection method shall be Quality and Cost Based Selection (QCBS) as per the guideline of The World Bank.

11. PROJECT PERIOD

The consulting firm shall complete all the tasks, obligations and reporting within six (6) monthsfrom the date of signing the Contract Agreement. The firm shall present the work schedule covering all the tasks to be covered under this project.

12. EVALUATION CRITERIA

Evaluation of the REOI for the shortlisting of consultant firm is done on the basis of following criteria:

a) Firm Registration
b) VAT/PAN Registration
c) Tax clearance up to FY 2070/071
d) Firm's Contact Information

The detailed criteria and sub-criteria and respective point system for the evaluation of Full Technical Proposals are given in the **Table 12.1**.

Table 12.1Evaluation Criteria

1	**Experience of the Consultants Firm (any of the partners in case of JV or in association):**		**15**
	a	Experience of the firm in the design and development of web based system:	5
	b	Experience of the firm in the design and development of Android applications	5
	c	Experience of the firm in GIS:	5
2	**Adequacy of the proposed methodology and work plan in responding to the Terms of Reference**		**35**
	a	Technical approach and methodology	20
	b	Work plan and manning schedule	10
	c	Understanding of Terms of Reference	5
3	**Key professional staff qualifications and competence for the assignment**		**45**
	a	Team Leader/Project Manager	15
	b	System Analyst	5
	c	Database Designer	5
	d	Web Programmer/Developer	5
	e	Android Application Developer	5
	f	GIS Expert	5
	g	Road Safety Expert	5
4	**Transfer of knowledge (training) program:**		**5**
	a	Relevance of training program, training approach and methodology	5