

**Government of Nepal
Ministry of Physical Infrastructure and Transport
National Road Safety Council**

Development of Nepal Road Crash Database System (NRCDS)

Final Report

Volume 1: Main Text



Submitted jointly by
Partha Parajuli, Road Safety Engineer/ Team Leader (International)
Anthony Eagle, Road Crash Database Specialist (International)
Naresh Shrestha, Road Crash Database Specialist (National)

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Appendix 11: Nepal Road Crash Database System Management Manual

Appendix 12: Nepal Road Crash Database System Users' Manual

ABBREVIATIONS AND ACCRONYMS

ABS	Australian Bureau of Statistics
ACC	Accident Compensation Centre
ADB	Asian Development Bank
ADU	Accident Data Unit
ARF	Accident Report (Record) Form
ARRB	Australian Road Research Board
BRTA	Bangladesh Road Transport Authority
CAS	Crash Analysis System
CBS	Central Bureau of Statistics
CIN	Crash Identification Number
CITEC	Queensland Government's Primary Information and Communication Technology (ICT) Service Provider
Confirm	CITEC's Information Brokerage Service which provides convenient electronic search and data retrieval facilities
COTS	Commercial-Off-The- Shelf
CPI	Consumer Price Index
CTD	Construction and Transport Division (of MOPIT)
DAU	Data Analysis Unit (of MOPIT)
DCC	Descriptive Crash Code
DDC	District Development Committee
DfID	Division for International Development (UK)
DOA	Decade of Action
DOHS	Department of Health Services
DOLIDAR	Department of Local Infrastructure Development and Agricultural Roads

DOR	Department of Roads
DOTM	Department of Transport Management
DRF	Data Request Form
EPA	Environment Protection Act
EPR	Environment Protection Rules
EU	European Union
EXCEL	MS Office Spreadsheet Programme
FIR	First Information Report
FSI	Fatal and Serious Injury
GDP	Gross Domestic Product
GIDC	Government Integrated Data Centre
GIS	Geographic Information System
GON	Government of Nepal
HMIS	Highway Management Information System (of DOR)
IBS	A Software developer Company in India
ID	Identification
INGO	International Non-Government Organization
IRTAD	International Road Traffic and Accident Database
IT	Information Technology
ITD	Information Technology Department (of NPS), Naxal
KISS	Keep It Simple and Sustainable
KVDA	Kathmandu Valley Development Authority
LMIC	Low and Middle Income Countries
LPS	Local Police Station
LRN	Local Road Network
MAAP	Micro-computer Accident Analysis Program

MOC	Ministry of Communications
MOE	Ministry of Education
MOFALD	Ministry of Federal Affairs and Local Development
MOPH	Ministry of Population and Health
MOHA	Ministry of Home Affairs
MOPIT	Ministry of Physical Infrastructure and Transport
MOUDH	Ministry of Urban Development and Housing
MS	Microsoft
MVTA	Motor Vehicle Tax Act
MVTMA	Motor Vehicle and Transport Management Act
MVTMR	Motor Vehicle and Transport Management Regulations
MVTR	Motor Vehicle Tax Rules
NCDU	Non-Communicable Disease Unit
NA	Nepal Army
NGO	Non-Governmental Organization
NIRTTP	Nepal India Regional Trade & Transit Project
NNGO	National Non-Governmental Organization
NPC	National Planning Commission
NPRIME	Nepal Police Records and Information Management Exchange
NRCDS	Nepal Road Crash Data System
NPRCDS	Nepal Police Road Crash Database System
NRSAP	Nepal Road Safety Action Plan
NRSC	National Road Safety Council (Nepal)
NRSIMS	Nepal Road Safety Information Management System
NRSMS	Nepal Road Safety Management System
NPS	Nepal Police Service

NPTB	Nepal Police Traffic Branch
NRDS	A Database Software based on Oracle used by NPS to store its data
NTC	National Trauma Centre
NTDRC	Nepal Transportation and Development Research Centre
NTSP	Nepal Transport Sector Policy
NZTA	New Zealand Transport Authority
NZ	New Zealand
OECD	Organizations of Economic Development
OESR	Office of Economic and Statistical Research
PDO	Property Damage Only
PRA	Public Roads Act
QDTMR	Queensland Department of Transport and Main Roads
QPRIME	Queensland Police Records and Information Management Exchange
QPS	Queensland Police Service
QRCDS	Queensland Road Crash Database System
QT	Queensland Transport
RADMS	Road Accident Data Management System
RAMM	Road Asset Maintenance Management Tool used in New Zealand
RAP	Rural Access Programme
RBA	Road Board Act
RIP	Rural Infrastructure Project
RMP	Road Maintenance Project
RSA	Road Safety Act
RSA	Road Safety Audit
RSDP	Road Sector Development Project
RSSN	Road Safety Society Nepal

RSSP	Road Safety Support Project
RTA	Road Traffic Accident
RTI	Relational Technology International (New Zealand)
RTU	Road Traffic Unit
SIDA	Swedish International Development Agency
SQL	Structured Query Language
TD	Traffic Directorate (of NPS), Naxal
TDA	Town Development Act
TDC	Town Development Committee
TDFA	Town Development Fund
TESU	Traffic Engineering and Safety Unit
TPO	Traffic Police Office
TMR	Transport and Main Roads
TOR	Terms of Reference
TOT	Training of Trainers
TRAILS	Transport Registration and Integrated Licensing System
TRL	Transport Research Laboratory (UK)
UK	United Kingdom
UN	United Nations
USA	United States of America
VDC	Village Development Committee
VKT	Vehicle Kilometres Travelled
VTMA	Vehicle and Transport Management Act
VTMR	Vehicle and Transport Management Regulations
WB	World Bank
WHO	World Health Organization

EXECUTIVE SUMMARY

Roads are the only affordable modes of long distance travel and freight transport for the majority of people in Nepal. There has been an astronomical increase in the road network (about 10% over the last 30 years) in the country along with the corresponding increase in vehicular traffic of over 15% (weighted average yearly growth across all vehicle types) to meet this travel and transport needs in the recent past. This growth has, however, come at great cost resulting from poor road safety outcomes from the system developed during this period.

The road safety situation in Nepal can be regarded as alarming. Limited available data (excluding underreporting) shows that, over the last five years since 2010/11, approximately 5 people were killed, 11 people were seriously injured and 22 people were slightly injured in about 25 road crashes every day on Nepalese roads.

The fatality rate of 14.33 deaths per 10,000 registered vehicles and 6.37 deaths per 100,000 population is extremely disturbing figures for a low income country like Nepal with only 44.5 registered vehicles per 1,000 people (38 cars and motorcycles per 1,000 people) in 2011 (Nepal and Parajuli, 2015).

ND LEA Inc. *et al.* (2008) estimated that road traffic crashes cost Nepal between 0.4% and 0.8% of GDP annually (approximately NRs 2.70 billion or \$30 million). More recently, WHO (2013) estimated that road crashes in Nepal has resulted an estimated *GDP* loss of 0.8%. Country's alarming road safety situation could be attributed to many factors (Nepal and Parajuli (2015)). In absence of inadequate data collection, management, analysis and reporting system, these figures are to be considered as extremely sketchy. These facts and figures can be sourced from well-developed and maintained Road Crash Database System. Realising the importance of the comprehensive crash data in the management of road safety, Government of Nepal has accorded high priority in the improvement of existing crash data collection and storage system.

Global Plan for the Decade of Action for Road Safety 2011-2020 (WHO, 2011) have emphasised the importance of data systems for on-going monitoring and evaluation in *Pillar 1: Road Safety Management*: Activity 6: Establish and support data systems for on-going monitoring and evaluation to include a number of process and outcome measures.

Nepal Road Safety Action Plan 2013-2020 (MOPIT, 2013) under Pillar 1, Road Safety Management, identified the need to establish the system of collecting and storing crash data. The action "Reliably, scientifically compile, analyze the RTA statistics and research on countermeasures" precisely specifies the data compilation and research work for identifying countermeasures. Development of Road Crash Database System, which is the subject of this report and which represents one of the component programmes of ongoing Road Safety Support Project (RSSP), contributes to the delivery of this key activity of Nepal Road Safety Action Plan.

Review of selected previous works and studies undertaken, locally, regionally and internationally along with the consultation with the stakeholders (one to one and as a group) in relation to the collection of crash data, development of Crash Database System and usage of crash data has revealed wide differences in the method and process of collecting, compiling, storing, analysing and reporting system as well as in the nature and extent of their uses/ applications.

The creation of crash database started in mid 1990s with an excellent "state of art" data storage and analysis system. Nepal could not sustain it due to a number of reasons including institutional, legal and funding issues. Currently crash data collection is just limited to filling up the crash report form. In terms of the storage, Traffic Police maintains a record of aggregated crash data in the computer. These data do not give engineers and road safety specialists clues on how to reduce those crashes and where and what type of countermeasures were needed or would work. The need for the development of Nepal Road Crash Database System was once again realised in the country following presentation of Concept Paper 2 in the NRSC meeting in July 2015. The review process identified gaps in institutional, legal and funding framework for sustained operation and maintenance of the database system.

Regionally, in particular Bangladesh and some of the States of India have recently started implementing web based data collection system. What form of storing database system and to what extent and levels of crash data are used in safety analysis such as types of crashes (descriptive crash codes) and reports are not known at this stage.

Internationally, crash data collection, storage and performance reporting practices were investigated from UK, USA and Australia/ New Zealand systems especially in relation to DCC codes. Based on these studies and experience of the key team members, recommendations have

been made on the types of crashes, contributing factors and performance reporting system suitably modified to Nepal context for establishing NRCDS.

Sustainability has been found to be a key issue for the ongoing entries of data and updates, operation and maintenance of the crash database system in Nepal. A simple system, which is easy to understand, easy to update, easy to maintain and operate has been suggested within the existing (or proposed as relevant) legal, institutional and funding framework. A set of policy guidelines has been suggested for consideration by the Government. Once endorsed, the policy will provide robust framework for sustained management of NRCDS.

An extensive review of the "Accident" Report Form currently in use for crash data collection in Nepal by Police was made. A two-stage process has been suggested for implementation to improve the data collection system. In the first stage, a minimum level of changes are made in order to allow the continuity in data collection and start storing these data without the need of the training. In the second stage, all desirable improvements in the form are implemented along with the introduction of tablets and web based data collection and transfer option. The tablet apps will have validation features, similar to the one in the desk top computer held in Traffic Directorate of Nepal Police Service (NPS). The data, already automatically coded correctly in most instances, will reach district, regional and central headquarters as well as to NPS computer server straight away automatically.

Coding of crashes is of vital importance for any crash data to be meaningful. The study has proposed descriptive crash coding system to determine the type of crashes based on best international practices but customised to Nepal situation. More crash types, if required can be added at a later stage.

The Crash Database System needs ongoing management. The system should be managed only by trained personnel who would be given access to it. Time series road safety performance data in the country by type, region, division, road, severity, year, contributing factors etc for public consumption can be queried from the proposed database system and uploaded in the NRSC/ MOPIT DOR, DOLIDAR, Traffic Police and other agencies for consumption by members of public. Instruction Sheet to complete Road Crash Report Form by police officers, Crash Database Management Manual to provide guidance on the operation and management of database system

and Data Users' Manual to guide users on how and what types of crash data they can request is developed in order to provide clarity in the management of the system and data usage.

The proposed Nepal Road Crash Database System Project is a very small cog in a large wheel of projects to be completed. Without this first cog, improvement in crash database and the use of these data for road safety analysis and for identifying countermeasures in the reduction in the number of crashes and the severity of crashes will be severely limited.

Many stakeholders are interested to introduce web based data collection system and dissemination of road crash data by means of implementing multiple users' access with cloud based data backup system. These additional features can be implemented within the proposed database system when more resources become available. These are resource intensive, requires extensive training programmes and there are issues with sustainability as demonstrated by the failure of the complex system implemented in the past.

This first NRCDS Project focussed on identifying gaps in the data collection and storage systems and in making recommendations for the improvement in the existing systems. Secondly, a new database system, which is currently non-existent, is developed. Thirdly, coding system for crash data, which is also currently non-existent, is implemented. The crash coding system is entirely a new concept in the region and in Nepal. The Project has delivered a new "state of art" yet very simple to manage road crash database system that incorporates crash codes, which are most valuable for safety analysis. Most conventional database systems implemented in the region provides only clues to identify problem points and sections on road network and generate safety performance indicators but do not provide information that assist safety engineers to precisely suggest targeted road safety initiatives (TRSI).

Before any future projects involving the tablets, smart phone applications for web based collection or dissemination of data are proposed, many of the issues identified by this study have to be addressed. The ownership, responsibility, accountability, ongoing funding, legislation are all-important for ensuring sustainability. Most importantly no other projects may go forward without first deciding on what data to collect and how to code it, because the introduction of any electronic devices will require this information before any programming of applications can be done.

Crash data is not the only item, but is a key item in the creation of the Nepal Road Safety Information Management System (NRSIMS) (Parajuli, 2015a). For road safety performance

analysis, reporting, programming and prioritization of safety improvement works, there is a need of population data, vehicle data, road users data, traffic data, road data, speed data, data on the use of seat belts, helmet to name a few. For instance, exposure of road users to crash risks can only be estimated when these information are available. A road with 150 vehicles per day will have lower priority in road safety treatment works than the road with 15,000 vehicles per day for the same number of road crashes. Road safety professionals program and prioritize road safety treatment works not just on the basis of crash data but also on the basis of the host of information to be collected and analysed from Road Safety Information Management System. The development of crash database is the way forward in the creation of "holistic" NRSIMS. By incorporating their planning, policy and programming or other decision and business models in NRSIMS, agencies responsible for managing road safety can further develop Road Safety Management Information System to make well informed decisions on road safety.

There are a number of activities that need to be completed following the creation of Nepal Road Crash Database System (NRCDS) under this Project for its sustained operation and management and further ongoing developments. These are included in the last Chapter of this report. One of the key recommendations for immediate consideration includes the incorporation of NRCDS in the Transport Sector Policy, Public Roads Act, Road Safety Act, and Vehicle and Transport Management Act currently under review or in the process of development. Secondly, the Government should consider the adoption of the Crash Database Policy suggested in this Study as soon as possible. Thirdly, capacity of two major agencies (NPS and NRSC/ MOPIT) involved in the collection, storage, management and analysis of crash data needs to be enhanced for which two separate Capacity Enhancement Projects have been recommended. These projects need to be conceptualised, developed and realised by the Government to ensure quality crash data is accessible for all in a sustained manner.

CHAPTER 1

INTRODUCTION

1.1 Background and Context

The UN Decade of Global Action (WHO, 2011) mandates member countries to develop their national road safety action plans for decade (2011 – 2020), which included the five pillars: road safety management, safer roads and mobility, safer vehicles, safer road users and post-crash response.

Following this Global initiative the Government of Nepal promulgated the Nepal Road Safety Action Plan (NRSAP, 2013 – 2020) in February 2013 (MOPIT, 2013).

Roads are the only affordable modes of long distance travel and freight transport for the majority of people in Nepal. There has been an astronomical increase in the road network (about 10% over the last 30 years) in the country along with the corresponding increase in vehicular traffic of over 15% (weighted average yearly growth across all vehicle types) to meet this travel and transport needs in the recent past. This growth has, however, come at great cost resulting from poor road safety outcomes from the system developed during this period.

The road safety situation in Nepal can be regarded as alarming. Limited available data (excluding underreporting) shows that, over the last five years since 2010/11, approximately 5 people were killed, 11 people were seriously injured and 22 people were slightly injured in about 25 road crashes every day on Nepalese roads.

The fatality rate of 14.33 deaths per 10,000 registered vehicles and 6.37 deaths per 100,000 population is extremely disturbing figures for a low income country like Nepal with only 44.5 registered vehicles per 1,000 people (38 cars and motorcycles per 1,000 people) in 2011 (Nepal and Parajuli, 2015). Similar figures for Australia are 0.79 deaths per 10,000 registered vehicles and 6.00 deaths per 100,000 population with 760 registered vehicles per 1,000 people (580 passenger vehicles per 1,000 people) (ABS, 2013). This shows that fatality rate per 10,000 registered vehicles in Nepal was *18 times higher* than in Australia in 2011. Although the fatality rates per 100,000 people were similar in Nepal and Australia in 2011, passenger vehicle ownership

rate in Australia was *15 times higher* than in Nepal (*17 times higher* in terms total registered vehicles). More alarmingly, these figures are on the rise in Nepal whereas they are decreasing in Australia and all over OECD countries. With the expansion of road networks and numbers of vehicles, the number of crashes and fatalities has been increasing continually. These statistics warrant an urgent need for improving safety in Nepal's roads by means of implementing a comprehensive Road Safety Management System for which time series crash data is vital (Nepal and Parajuli, 2015).

ND LEA Inc. *et al.* (2008a) estimated that road traffic crashes cost Nepal between 0.4% and 0.8% of GDP annually (approximately NRs 2.70 billion or \$30 million). More recently, WHO (2015) estimated that road crashes in Nepal has resulted an estimated *GDP* loss of 0.8%. Considering the heavy loss of lives and wealth in road crashes the concerned road and traffic management agencies have started to incorporate road safety issues in their programs of road development. Such a disturbing trend in road safety statistics in Nepal is the result of the lack of comprehensive road safety management system in place. Country's alarming road safety situation could be attributed, but not limited, to (Nepal and Parajuli (2015) the following:

- Primary national focus on only expanding road access to a greater number of districts with no regards to road safety;
- Lack of adequate institutional arrangements and legal frameworks for road safety;
- Lack of proper safety-related technical frameworks and policy documents;
- Lack of cooperation and coordination among fragmented road safety organisations;
- Insufficient funding and inefficient funding arrangements for road safety;
- Inadequate national standards for transport infrastructure design, construction and maintenance;
- Lack of proper actions on crash prevention system (driver licensing, public education, vehicle registration, testing, law enforcement etc.);
- Lack of proper post-crash management and response system;
- Inadequate data collection, management, analysis and reporting system,
- Lack of proper scientific research on road safety countermeasures; and

- Lack of proper national planning, policy and strategy: formulation, implementation and evaluation.

The need of the development and implementation of road safety management system that could reverse the current trend in road crashes in the country can only be demonstrated and policy and decision makers alerted when scientifically collected and analysed facts and figures can be presented. These facts and figures can be sourced from well-developed and maintained Road Crash Database System. Realising the importance of the comprehensive crash data in the management of road safety, Government of Nepal has accorded high priority in the improvement of existing crash data collection and storage system.

Global Plan for the Decade of Action for Road Safety 2011-2020 (WHO, 2011) have emphasised the importance of data systems for on-going monitoring and evaluation in *Pillar 1: Road Safety Management*: Activity 6: Establish and support data systems for on-going monitoring and evaluation to include a number of process and outcome measures.

Under Pillar 1 of Road Safety Management, Nepal Road Safety Action Plan 2013-2020, National Road Safety Council, Ministry of Physical Infrastructure and Transport, Government of Nepal correctly identified the need to establish the system of collecting and storing crash data. The action "Reliably, scientifically compile, analyze the RTA statistics and research on countermeasures" precisely specifies the data compilation and research work for identifying countermeasures. Development of Road Crash Database System, which is the subject of this report and which represents one of the component programmes of ongoing Road Safety Support Project (RSSP), contributes to the delivery of this key activity of Nepal Road Safety Action Plan.

Information on where, when, who, what, why and how road crashes have occurred are important for planners, engineers and policy makers to make and prioritize all investment decisions on road safety improvement works in future as safety has been given high priority by the Government. Realizing this importance, the Government of Nepal has decided to use part of the RSSP grant proceed for the development of a road crash database system and related policy guidelines, management manual and users' manual.

The ADB funded Road Connectivity Sector I Project, recommended in its report that the system of entering data from the crash record forms needs to be substantially improved and upgraded. Traffic Police should accord this responsibility with high priority. DOR and DOLIDAR, as the

concerned agencies for planning and management of strategic road network and lower order networks in the country, are ultimately responsible for analysing road crashes, identifying black spots and hazardous sections and implementing countermeasures at these locations. This is the general practice in place globally for effective crash mitigation and reduction. Therefore, DOR and DOLIDAR should compile all crash data maintained at Traffic Police Headquarters for comprehensive crash analysis while the latter authorities should confine itself to enforcement and collection of crash data at the sites.

1.2 Objective

The main objective of the project assignment is to develop and deliver a sustainable Nepal Road Crash Database System (NRCDS) for use by road safety practitioners in order to make them able to identify existing black spots on roads and potential hazardous locations and suggest corrective measures on the basis of trends, types and factors contributing to road crashes. The analysis can be extended to develop road safety programs and develop projects based on the scientific evidence of data. In absence of such a database system, many road safety initiatives, which have been recently implemented, are being based either on an adhoc basis or merely on the basis of the recommendations from Road Safety Audits. It may be noted that in many countries, including in Australia, the trend is to allocate about 70% of the road safety funding in the implementation of re-active initiatives (based on crash analysis) and 30% for pro-active initiatives (e.g., based on Road Safety Audit recommendations).

Use of the proposed NRCDS will enable road safety practitioners to identify clusters of road crashes and suggest corrective measures. Attempts in the past to create such a database using complex software platforms (For example MAAP5) were not successful. This Project aims to deliver a simple and workable database system based on the best international practice but at the same time ensures the system that would be sustainable, efficient and workable in the Nepal context.

1.3 Scope

The main scope of the study is to develop Road Crash Database System to be used by road safety agencies (DOR, DOLIDAR, DDCs, TDCs and VDCs) for safety analysis, safety performance monitoring and reporting. The scope also includes the development of documentations for the road

crash database and crash database system based on Nepalese conditions and incorporating best practices around the globe. Fundamentally it must be sustainable in the Nepal context.

Followings are the key tasks identified in the Terms of References:

- Review and summarise key findings and recommendations of previous studies;
- Develop a Policy Guidelines Document for the Road Crash Database;
- Identify gaps in the collected data and suggest improvements;
- Develop Crash Data Coding System;
- Create Template of Crash Codes;
- Develop Management Manual for Nepal Road Crash Database System;
- Develop Users' Manual for Nepal Road Crash Database System;
- Undertake consultations with key stakeholders;
- Develop, test and validate Nepal Road Crash Database System; and
- Train database operators for entering crash data on ongoing basis and in managing the created database.

These tasks are more particularly described in Chapter 2.

CHAPTER 2

METHODOLOGY

2.1 Introduction

The methodology used in the development of the crash database system consists of the following tasks. These tasks were outlined in the Terms of References and constitute the scope of services of this study. These tasks together with the sequence of their undertaking are shown in Figure 2.1. Each task identified contains input, method statement and output as described in the following sections.

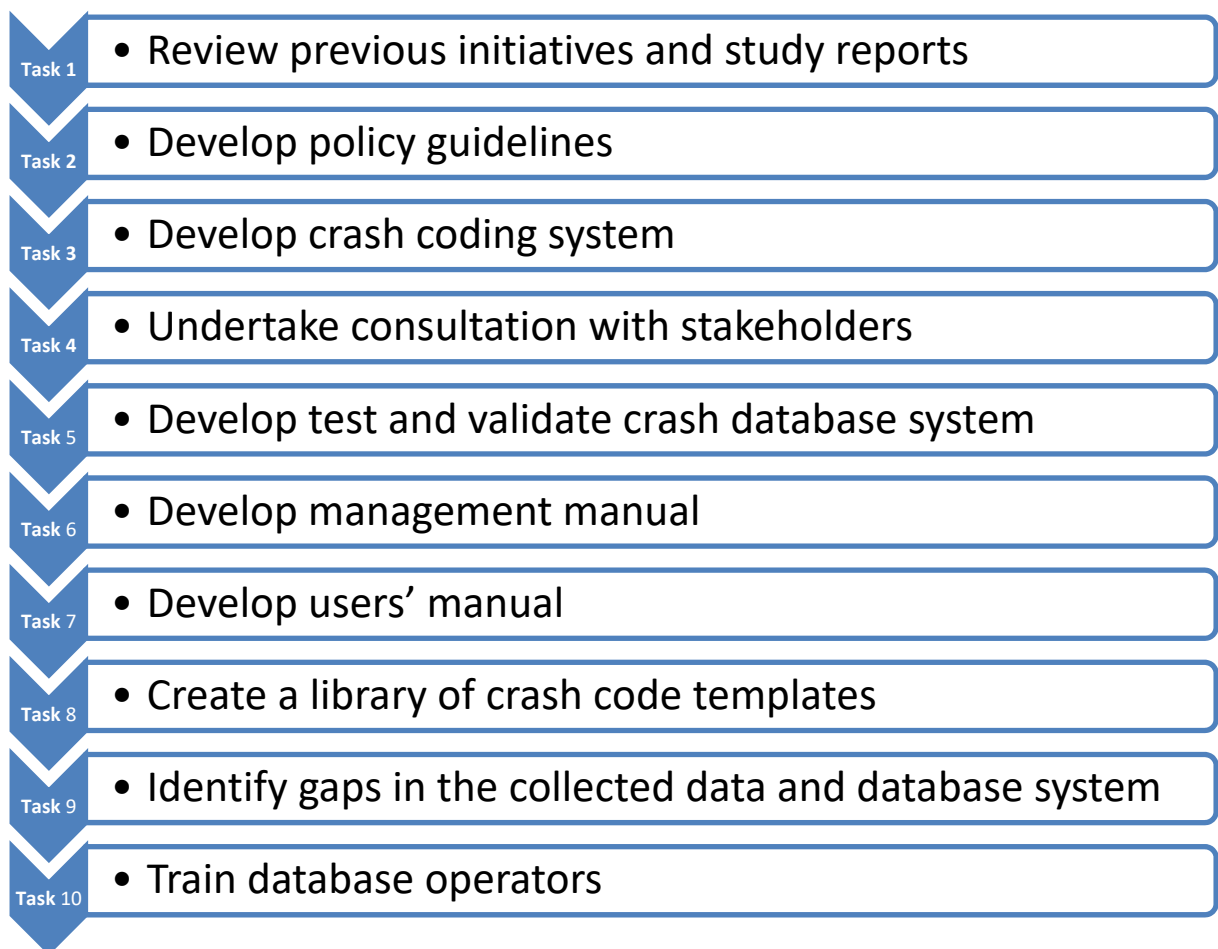


Figure 2.1: Methodology Chart

2.2 Review of Previous Initiatives and Study Reports

Input: The team collected all available previous studies and familiarized with the works undertaken in the past in Nepal, selected regional and international initiatives in relation to the

development of road crash database system with the objectives of collecting issues involved and identifying current and best practice of crash database system. The list of selected previous initiatives and study reports are included in the References.

Method Statement: The team reviewed all collected reports and held several meetings with a number of relevant authorities and officials who are related to road safety and in the collection of crash data and development of road crash database system in Nepal.

Output: A number of issues have been identified, suggested measures to address the sustainability of the database for discussion with the NRSC nominated to oversee the development of crash database system under the proposed service. The review also led to the conceptualization of the framework for the proposed database system. The output of this task is the summary of key findings and recommendations which are contained in Chapter 3 and Chapter 4. It also led to the development of sustainability framework and a set of policy guidelines which are contained in Chapter 5 and Chapter 6 respectively.

2.3 Development of Policy Guidelines

Input: Development of policy guidelines for road crash database system is considered to be one of the critical elements for the sustainability of the system. These policy guidelines need to be based on the review of the existing institutional legal and funding framework. Input for understanding framework included consultation with various government departments and selected individual professionals. Review of road safety related policies, legislations, strategy, action plans and guidelines available in Nepal and selected regional and other countries provided basis for the development of draft policy guidelines.

Method Statement: In developing this policy the team considered the following. The requirement of systematic collection of road crash data should be legislated in the proposed Road Safety Act following which a detailed policy document needs to be developed. The policy document would specify what is a road crash, what types of crash data are to be collected, when it is to be collected, how it should be stored and maintained, who should be responsible for collecting and storing crash data and maintaining and managing crash database. Who should be allowed to access, what data should be made public and what data should be confidential (privacy policy) and so on.

In case of delay in developing Road Safety Act, the approach taken in this project is to first develop a policy document as part of this task and the same will have to be supported by the Act. The policy document also spells out the unified definition of a crash as mentioned above

and method of collection. Based on this policy document, a set of data specification, method of collecting data, method of storing data (database), management of database, and eligibility to use data base, obligation of agency to maintain / update data, source of uninterrupted funding for collecting data set and ongoing management of database, limitations of data set has been developed.

Road Crash Database Policy, which has been developed to implement the relevant provision (section) of Road Safety Act, represents a higher-level document, which informs the development of Guidelines for the Development of Crash Database.

Output: The output of this task is the delivery of draft Policy Guidelines Document for Road Crash Database System for consideration and endorsement by the Government. These guidelines will assist management in the correct use and procedures to follow in relation to the Road Crash Data Base. They will also assist in the drafting of legislation of Road Safety Act.

2.4 Development of Crash Data Coding System

Input: Examples of some of the inputs for undertaking the development of crash coding system include:

- Review of best practice coding system used overseas including in Australia;
- Consultation with Nepal Roads Safety Professional;
- Consultation with NIRTTP (DOTM);
- Consultation with NPTB;
- Consultation with DOLIDAR;
- Consultation with DOR;
- Consultation with RTU of DOR; and
- Consultation with other government and non-government organizations identified as the work progresses

Method Statement: The concept of Descriptive Crash Code (DCC) system is entirely new to Nepal and perhaps in the region as a whole but not new in countries with best practice road safety management systems and Road Crash Database Systems. Difficulties in selling the concept and its importance were encountered during the implementation of the Project but towards the end of the study the concept was well taken and its importance understood by most stakeholders.

The crash coding system helps in identifying clusters of similar types or similar groups of crashes and is important for the treatment of crash locations. For example, cluster of rear end crashes at the approach of an intersection could provide clues to safety engineers of the deficiency on roads and design appropriate safety treatments. Depending on the primary and/or secondary contributing factors (high approach speed, low amber time or poor/skid pavement surface etc.) it is possible to suggest appropriate targeted road safety countermeasures to reduce these crashes in future. Similarly, existence of many similar right-through crashes at an intersection may require replacing permissive phase by protective phase of traffic signal. Too many head on crashes at a location may be treated by median strip and /or by providing passing (overtaking) lanes or by banning overtaking. Cluster of road departure crashes may call for the installation of roadside barriers (guard rails). These are examples only. There are over 75 different types of crashes used in other developed countries in their crash database. Depending on the nature of crash, each crash are coded and included in the crash database for its meaningful use by engineers. The Crash Database System, which has been implemented in most countries in the region and previously in Nepal with limited information such as number of crashes by severity type, contributing factors, location etc is of limited use for engineering analysis. This type of database system is good only to monitor what types of crashes by severity and "parent" group (broad group) are occurring, what contributing factors are causing these crashes, where these crashes are occurring. All these information are important but not enough for safety analysis. This is the key difference between the system that has been proposed and the systems that are in use in the region. A Nepal Crash Coding System based on best international practice and upon agreement with key stakeholders has been developed. The proposed coding system has been used in developing Nepal Road Crash Database System.

Output: Based on the extensive study of the crashes occurring in Nepal, most common types of crashes are identified and categorized into 10 parent (broad) groups of similar nature. Crashes in each group are further classified into types under the parent group. Chapter 8 contains detailed description of Descriptive Crash Code (DCC) system.

This set of descriptive codes allows consistency in classifying crash types in Nepal. It also helps road safety engineers and road safety experts to identify clusters at crash locations and recommend remedial treatments to reduce road crashes.

2.5 Consultation with Stakeholders

Input: Inputs for consultation with stakeholders include:

- Findings from the review of various crash database system development

- Issues identified in the existing database system and its gaps in the existing institutional, legal and funding framework
- Draft policy guidelines for the development and management of crash database system
- Descriptive crash coding system (DCC)
- Other workshop materials such as Issue papers, presentation, handouts
- Meeting notes

Method Statement: The team has used “one on one” meetings for consultation with selected road safety specialists and relevant government officials where / if required on specific technical details on the local requirement of crash database system. It has also used the workshop opportunity to present the inception report and seek initial input from relevant stakeholders. If the comments or feedbacks were deemed not to be relevant or cannot be incorporated in the framework for technical or other reasons, such reasons were kept on record. The outcome of the consultation (workshop or one to one meetings) is an agreement on coding system, format and content of the policy documents and type of database system to be developed. Post-workshop meetings with more stakeholders or follow up meetings were also used as a tool for consultation.

Output: The outputs of this task are the records of minutes of meeting and the list of key inputs provided by the stakeholders present in the workshop.

2.6 Development, Testing and Validation

Input: There are two different subtasks involved in the development of crash database system. The first is the development of data entry form screen that appears at the user interface. This is essentially a translation of paper based crash report form but in a different format that is more user-friendly. It also contains provision for number of checks to ensure consistency in the data entered from crash report form. These are hidden and are not seen on the screen. The second task is the creation of EXCEL spreadsheet that takes data from the entry form. This is essentially a data storage system. The data entered in the form goes directly in the appropriate cells with crash coding system. The system will have a series of data testing and validation codes which are hidden from the common data operators and users of the database. Some of the inputs for these tasks include:

- Findings from the review of best practice crash data base system
- Findings from the review of the features in the latest version of EXCEL
- Findings from the review of MAAP from TRL web site regarding its features

- NPTB crash reports

Method Statement: A variety of database systems were studied during the review of selected regional international and local initiatives. It is plausible to start with the simple and easy to understand system and gradually build it into complex and more sophisticated system later if needed. "Keep It Simple & Sustainable" (KISS) represents a sustainable and "value for money" approach in consideration with the difficulties associated with adopting complex systems attempted in the past. It is proposed that an Excel spreadsheet based database system be used at this stage, which will be able to handle the management of crash data to start with. Excel is a powerful tool to manage and manipulate data and most engineers are comfortable in its use. It is believed latest version of MS Excel can handle storage of crash data of over five years easily. Excel data can be transported to GIS systems to create GIS layers when required to display data spatially and temporally. Recommendations will be made on future direction NRCDS should take when resources are available. Works can be implemented (under a follow up project) to develop system that can display cluster of crashes in the road network using available GIS layers of roads. Some forms of relational database software may be used when crash data grows. Excel based database system should be able to be transitioned into Access based systems or GIS based systems in future.

Advanced and more sophisticated crash database systems can automatically generate a collision diagram but this would require complex algorithms and licensed software. It is envisaged to incorporate these complex features later when sustainability issue is resolved and more funding becomes available. At this stage a simple MS EXCEL platform has been used. The use of MS EXCEL is what is required by the Terms of Reference too.

Testing and validating the created database is a common step in any system development process. Testing is about making sure that the data entered has been stored in the correct cells in the created database system. Validating involves the correctness of the data entered and making sure that the data entered in the data entry form is properly coded and it corresponds with the crash coding system. This is not about statistical validation of crash data. Statistical analysis and validation is the data analysis issue and not the database development issue. There has been misunderstanding among some stakeholders that this project should also develop features involving the analysis and data retrieval system. Entering crash data for a period of 3 to 6 months was allowed subject to MOPIT would be able to provide crash report forms from Traffic Police. At the time of submitting this report, only about 100 crash report forms were made available by Traffic Police. It is not the scope of the Project to enter the data to create a

database from which data can be analyzed. In fact there are not enough report forms preserved by the Traffic Police required to create a meaningful database with completed data. Data from the available crash report forms are not complete and there are many information missing. Crash Report Forms obtained from Traffic Police have been used for testing and validating process and for demonstrating what happens when the forms are not completed fully. Testing and validation has been demonstrated to the relevant authorities including NRSC, DOR and Traffic Police.

Output: The outputs of the tasks are the heart of the crash database system. Crash data entry forms and crash database system are two outputs of this task. These forms and data storage spreadsheet are standalone systems that are delivered /installed in the nominated computer by MOPIT. The report contains selected/ sample screen shots of the database outlining briefly the process of creating, testing and validating the system and limitations associated with the Nepal Road Crash Database System (NRCDS). The operation of the system has been demonstrated to selected MOPIT officials.

The system is dummy in the sense that it is still a system that contains no meaningful crash data (except those entered using 100 incomplete crash report forms. The system developed is very cost effective and sustainable in the Nepal context. It is capable of storing collected road crash data in the best and sustained way for use by road safety professionals.

2.7 Development of Management Manual

Input: The following are two key inputs in the development of management manual.

- Nepal Road Crash Database System developed as described above;
- Outcome of the review of crash database manuals used overseas

Method Statement: A set of guidelines for the management of the road crash database has been developed and has been delivered as a standalone document under the title "Nepal Road Crash Database Management Manual. The content of the management manual is however included in the report for convenient reference to the readers of the report who may not necessarily have access to the Management Manual. The manual is a tool kit to developers and managers on how to validate, enter, and manage crash data and how to maintain Road Crash Database System. The Management Manual is also training materials for ongoing training to staff for entering crash data into the database system and for ongoing operation and maintenance of the database.

Output: The output of this task is the Nepal Road Crash Database System Management Manual.

2.8 Users' Manual

Input: The followings are the key inputs in undertaking this task:

- The Nepal Road Crash Database System as designed under task 5 described above;
- Nepal Road Crash Database System Management Manual; and
- Selected Users' Manual if any available internationally

Method Statement: A User Manual has also been developed to assist end users of the database to use it properly. The manual gives information on how to understand the coding system, how data is collected, what data that can be queried from the database system. The main aim of the users' manual is also to explain to end users on what they could request from the database system. The manual also gives examples of the types of crash data analysis that can be carried out from the data stored in the database system. This also has a section of how to produce crash cluster diagrams at intersections and sections of road using the data from the database system. This manual is also part of the ongoing training kit.

Output: The output of this task is the Nepal Road Crash Database System Users' Manual.

2.9 Library of Crash Code Templates

Input: The followings are the key inputs in carrying out this task:

- The Crash Data Coding System developed under task 5 as described in Section 2.3 above;
- Feedback from local road safety professionals on the crash types and codes

Method Statement: A set of templates of Descriptive Crash Codes (DCC) (types of crashes as identified in the crash coding system) has been developed. The task of creating templates is relatively simple and straight forward once the crash coding system has been developed. These templates are just the jpeg format of crash codes.

Output: A library of images of each crash type (codes) has been delivered together with brief description of each template. These templates are to be used to create / develop crash or collision diagrams. Use of the same template for particular type of crashes helps ensure consistency. These templates are included in both Management and Users' Manuals.

2.10 Identification of Gaps and Suggested Improvements

Input: There are a number of inputs for this task, which are as follows:

- Findings from the review of existing data collection procedures
- Findings from the review of current Road Accident Form used by NPTB
- Findings from the review of data collection in other countries
- Outcome of the consultation with Nepal Roads Safety Professionals
- Outcomes of the consultation with NIRTTP
- Outcomes of the consultation with NPTB
- Outcomes of the consultation with DOR generally (senior management level)
- Outcomes of the consultation with RTU/DOR specifically (technical working level)
- Outcomes of the consultation with MOPIT officers

Method Statement: It is reasonable to have some data gaps in the collected crash data in the existing form currently being used by Traffic Police or the new form developed by NIRTTP. It is equally possible to have gaps in the current institutional, funding and legal system that could potentially hinder the sustainable operation and management of the crash database system. These gaps have been identified and recommendations made to the MOPIT and NIRTTP/DOTM team as they would be responsible to continue trial, test and develop and incorporate additional features in the system proposed in this Project. Correcting data collection forms is not expected to result in any additional costs but it ensures the usefulness of data to end users in the future. Also, there is room to add other data items in the current form at no additional cost but training to the police and their acceptance remains a key issue (institutional gap) that need to be resolved. For instance, geo-codes of crash locations can be supplemented with Chainage (Kilometer) or TDistance (Travel Distance) data. These recommendations that need or can be made in future are contained in the last Chapter. These gaps in the data and in the system were presented in the workshop of the relevant stakeholders organised by MOPIT. The workshop was also useful in gathering information in a short time and to establish working relationship with all key stakeholders.

Output: The outputs of this task are the list of gaps in the data collected and database management framework (legal, institutional and funding) in the country and suggested improvements. These gaps and suggested improvements are contained in Chapter 7 of the report.

It is envisaged that close co-operation with the NPTB and NIRTTP team will be able to fill many of these gaps. Also, the adoption of the policy guidelines and endorsement of the suggested policy framework will ensure sustainability of the created crash database system.

2.11 Training for Database Operators

Input: The following inputs are required for completing training

- Staff provided by NRSC or DOR (or nominated by Government) (As per TOR);
- Descriptive Crash Code (DCC) system (Section 2.4 above);
- Nepal Road Crash Database System (NRCDS) (Section 2.6 above);
- Nepal Road Crash Database System Management Manual (Section 2.7 above);
- Nepal Road Crash Database System User Manual. (Section 2.8 above);
- Templates of Descriptive Crash Codes (DCC) for use in crash diagrams (Section 2.9 above)
- Computer and office space at MOPIT

Method Statement: The method is on the job training. The Government (both MOPIT and Traffic Police Directorate) are expected to provide counterpart staff towards the end of this short project period to offer training to computer operators responsible for data entry and to system analyst responsible for data analysis, data query required to produce results requested by various agencies and professionals responsible in managing road safety and for public consumption. A brief training will be provided to limited staff nominated by the Government if computer of required specification, data entry operators and data system analyst would not be available.

Output: Apart from leaving a dedicated team of trained individuals to ensure the sustainability of the NRCDS, a brief training report is planned to be delivered after the completion of training. The database operators trained at the end of the project will have the tools and skills for the ongoing entering of crash data and the management of the NRCDS.

CHAPTER 3

SUSTAINABILITY FRAMEWORK

3.1 Introduction

Learning lessons from the past, it is important for this Project to consider at the very onset how the Nepal Road Crash Database System can be made sustainable.

The database system created under the DfID funded Road Maintenance Project (RMP) using sophisticated MAAP5 software from UK could not be sustained following only a few years of operation and the completion of the Project. The system created with project-based approach did not have long lasting ownership to manage, operate and maintain it. It is possibly due, in part, to the absence of legally binding requirements for collecting and maintaining crash records for road safety analysis and in part due to the lack of ongoing funding support following the closing of the RMP. This could also be in part due to the lack of a responsible unit within the Government agencies to look after the database system (ownership). Further the professionals involved in managing road safety may not have realized the need and importance of crash data.

It was further learnt during the discussion with the concerned road safety specialists that the MAAP5 software installed in the DOR's computer crashed and the 'one off' license purchased from the Project fund was lost together with the loss of all crash data collected in the past. DoR could not purchase the expensive software and entering crash data into the system was thus discontinued. DoR or any other agency was not obliged by law to maintain crash data. Professionals were not required to undertake road safety analysis in the planning, design, delivery, operation and maintenance of road system they own.

It is believed that the sustainability of the NRCDS can be ensured if there are legal requirements for a Government agency to maintain such a database, if there is an institution which is responsible for maintaining a road crash database and if there is an ongoing funding support for collecting and storing data as well as resourcing the operating / running cost of the institution, then only the database system would be sustainable.

Requirements to undertake safety analysis of all existing roads and mandatory provision of road safety audits and crash data at various stages of road planning design, construction and operation will result in a greater demand of road crash data from road safety professionals.

With the recent developments and trends in road safety management in Nepal, demand for systematic use of road crash data from a reliable and consistent database system is bound to increase.

Crash database is the heart of any road safety management system. This section briefly describes the recent proposal for the development of Nepal Road Safety Management System (NRSMS) for MOPIT (Nepal and Parajuli, 2015) and its relationship with the proposed Nepal Road Crash Database System. The NRSMS proposal suggests Crash Investigation and Database System as one of its six components. Crash Investigation and Database System is considered to be one of the sub-systems of Nepal Road Safety Information Management System (NRSIMS), which in turn constitutes one of the six important components of the NRSMS.

3.2 Framework for Sustainable Road Safety Management System

The road safety situation in Nepal is alarming. Limited available data shows that, over the last five years since 2010/11, approximately 5 people were killed, 11 people were seriously injured and 22 people were slightly injured in about 25 road crashes every day on Nepalese roads.

The fatality rates of 14.33 deaths per 10,000 registered vehicles and 6.37 deaths per 100,000 population are extremely disturbing figures for a low income country with only 44.5 registered vehicles per 1,000 people (38 cars and motorcycles per 1,000 people) in 2011. Similar figures for Australia are 0.79 deaths per 10,000 registered vehicles and 6.00 deaths per 100,000 populations with 760 registered vehicles per 1,000 people (580 passenger vehicles per 1,000 people) (ABS, 2013). This shows that fatality rate per 10,000 registered vehicles in Nepal was 18 times higher than in Australia in 2011. Although the fatality rates per 100,000 people were similar in Nepal and Australia in 2011, passenger vehicle ownership rate in Australia was 15 times higher than in Nepal (17 times higher in terms total registered vehicles). In addition, these figures are on the rise in Nepal whereas they are decreasing in Australia. With the expansion of road networks and numbers of vehicles, the number of crashes and fatalities has been increasing alarmingly. These statistics warrant an urgent need for improving the safety of Nepal's roads.

ND LEA Inc. et al. (2008a) estimated that road traffic crashes cost Nepal between 0.4% and 0.8% of GDP annually (approximately NRs 2.70 billion or \$30 million). WHO (2013) estimated that road crashes in Nepal has resulted an estimated GDP loss of 0.8% in 2011. Considering the heavy loss of lives and wealth in road crashes the concerned road and traffic management agencies have started to incorporate road safety issues in their programs but it

seems the activities currently being implemented are inadequate as the losses of lives and property from road crashes are increasing. This is really unaffordable in Nepal's context and demands serious efforts to be made towards a road safety management system in Nepal. Such a disturbing trend in road safety statistics in Nepal is the result of the lack of comprehensive road safety management systems in place. Absence of the road safety management system could be attributed, but not limited, to:

- Primary national focus on only expanding road access to a greater number of districts with no regards to road safety;
- Lack of adequate institutional arrangements and legal frameworks for road safety;
- Lack of proper safety-related technical frameworks and policy documents;
- Lack of cooperation and coordination among fragmented road safety organizations;
- Insufficient funding and inefficient funding arrangements for road safety;
- Inadequate national standards for transport infrastructure design, construction and maintenance;
- Lack of proper actions on crash prevention system (driver licensing, public education, vehicle, testing, vehicle registration, law enforcement etc);
- Lack of proper post-crash management and response system;
- Inadequate data collection, management, analysis and reporting system;
- Lack of proper scientific research on road safety countermeasures, and
- Lack of proper national planning, policy and strategy: formulation, implementation and evaluation.

The adverse impacts resulting from the lack of these essential components of road safety management system have been compounded due to poor implementation, monitoring and evaluation practices.

Many developed and developing countries have focused their attention to road safety during the last three to four decades and road safety has been a major strategic area. UN Decade of Action (DOA) for Road Safety 2011-2020 (United Nations, 2011) is an example of such global initiative that has set five pillars to guide national road safety plans and activities as shown in Figure 3.1 below:



Figure 3.1: UN Five Pillars of Road Safety Management

As mentioned in earlier sections, in its commitment to improve road safety and in accordance with the call of United Nations Decade of Action on Road Safety, Government of Nepal has also completed its draft Road Safety Strategy in 2013. The Government has adopted this plan as its policy document on road safety management in the country. Interestingly, the strategy has not set any specific target to reduce death and number of crashes (say by 10% every year or halve its road death and serious injuries). The proposed NRCDS and implementation of the analysis of crash data on regular basis (daily, weekly, monthly, quarterly and yearly) and reporting is expected to support the delivery of the Government's commitment on implementing road safety action plan for the overall improvement of road safety and save innocent lives and reduce the burden of road trauma in the country.

Until recently, in spite of repeated alarms raised by several sectors of society, a reduction in road trauma has not been a key national objective in Nepal. Road safety has not been considered as a major strategic component of Nepal's road sector development program. Interest in the road safety epidemic has however increased significantly during the last few years in accord with the UN Decade of Action for Road Safety 2011-2020 (WHO, 2011). Nepal has participated in this global initiative, albeit very slow pace and years late, and has developed a document outlining its road safety action plans to achieve its safety targets in Nepal Road Safety Action Plan (2013-2020) (MOPIT, 2013). A National Road Safety Council (NRSC) has been established and actions are being taken on several fronts, albeit in isolated and fragmented ways.

Implementation of several activities in this action plan remains sketchy even after the passing of half of the DOA period and the Government of Nepal is looking to accelerate the progress. To help the progress, World Bank has recently contributed \$7.863 million for Nepal Road Safety Support Project for

- (i) Capacity strengthening that includes establishing Nepal Road Safety Council and Secretariat; legislation and capacity strengthening; and small scale safety pilots and
- (ii) Improved physical safety of RSDP roads, for example, crash barriers (World Bank, 2014).

Without having a systematic road crash database, meaningfully monitoring the outcomes on the road safety front and evaluation of road safety improvement projects implemented by the World Bank funding such as RSDP as well as many other projects, will not be possible. Where the money should be spent best cannot be determined due to the lack of comprehensive knowledge / facts on crash contributing factors. For example, spending large sums of money on improving infrastructure would not make sense, if the majority of crashes were due to unsafe use of infrastructure or unsafe driving behaviour.

The recent progress in RSSP has been encouraging although it has only started almost towards the end of project closing date (June 30, 2016). Many project activities such as review of transport sector policy (to include safety as one of the important national transport objectives), review of existing VTMA and VTMR (to include provisions for improving road safety), review of Public Roads Act (to include safety as a requirement of public roads development, operation and maintenance), development of new Road Safety Act, development of road safety engineering professionals (Road Safety Audit Training Courses, Implementation of Road Safety Engineering Courses in the Universities) have started taking off the ground. Development of NRCDS under this contract is one of the several activities of the RSSP.

With the late start of the above project activities and other initiatives, it is almost impossible to deliver road safety actions listed in Nepal Road Safety Action Plan (2013-2020) (MOPIT, 2013).

There is a high risk that this action plan will eventually be another attempted but unsuccessful national plan unless a serious effort is made through a comprehensive road safety management system being in place. And the comprehensive road safety management system requires good data. Only good data will be able to prove if the country is moving towards the right direction or not in delivering road safety outcomes. Thus, NRCDS is the backbone of NRSMS and its development and sustained management is vital.

A sustainable road safety management system needs sustainable road crash database system.

3.3 Road Safety Management System

Road safety is a complex, integrated, dynamic and multi-dimensional problem. Improvement in road safety requires actions on several fronts: engineering and social science, education and public awareness, law and enforcement, health and emergency services, as well as media and publicity campaigns, to name just a few. Actions on multiple fronts are required in a complex environment often with conflicting and competing interests. A well-coordinated and concerted

effort from all agencies working on these fronts is essential. This is possible only by implementing a holistic management system.

Road safety is produced just like other goods and services and the production process is viewed as a management system with three levels: institutional management functions produce interventions, which in turn produce results (Bliss and Breen 2008, 2009). Consideration of all elements of the road safety management system and the linkages between them becomes critical for any country seeking to identify and improve its current performance level on road safety (Bliss and Breen 2008, 2009; OECD 2008).

A Road Safety Management System (RSMS) is an integrated system that links a wide range of road safety aspects in a unified framework in order to achieve positive road safety outcomes. In this management system, vehicles, drivers, pedestrians and other road users are viewed as raw materials which enter into the road network and which are processed there, and all of which are expected to exit from the processing system intact (safely). Quality products from the process (e.g., driving, walking, riding) can be expected only by ensuring quality raw materials (e.g., good users, good vehicles) and quality processing system (the network of roads and road environment).

RSMS has evolved over the last few decades in developed countries. A 'Safe System' approach, which makes allowance for human error and minimises the consequences, especially the risk of death and serious injury, has been accepted internationally as an approach to manage road safety. It is seen as the most appropriate approach in guiding the management of road safety. In a Safe System approach, road safety problems are typically treated by considering the interaction of several components of the transport system, rather than by implementing individual countermeasures in relative isolation. This means that the full range of road safety aspects such as governance and planning, crash prevention systems, post-crash management systems, crash investigation and database systems, research and developments need to be linked together. Safe System is the best option to manage road safety in Nepal.

3.4 Necessity of Nepal Road Safety Management System

As discussed previously, in Nepal every day on average, 5 persons were killed 11 were seriously injured and 22 sustained minor injuries in about 25 road crashes over the last five year period since 2010/2011. This data may have been grossly underreported in the absence of formal mechanism to collect road crash data in Nepal. In spite of repeated alarms raised by several sectors of society, a reduction in road trauma has not been a key national objective. Road safety has not been considered as a major strategic component of Nepal's road sector

development program. Interest in the road safety epidemic has however increased significantly during the last few years in accord with the UN Decade of Action for Road Safety 2011-2020. A National Road Safety Council (NRSC) has been recently established in Nepal and actions are being taken on several fronts, albeit in isolated and fragmented ways. A comprehensive Road Safety Management System in Nepal (NRSMS) is essential in order to:

- control and reduce largely preventable road crash trauma on Nepalese roads;
- minimise road crash costs to Nepalese society; and
- achieve sustainable Nepal road safety outcomes.

3.5 Components of NRSMS

Nepal and Parajuli (2015) have proposed the development of NRSMS with the following six principal components:

- **Component 1 (C1)** Nepal Road Safety Information Management (NRSIM) and Database System: population, vehicle, drivers, traffic, road and summary crash statistics;
- **Component 2 (C2)** Governance and Planning: leadership and commitment, institutional framework (organisational structure, resources, roles and responsibilities), funding framework (funding model), legal frameworks (acts and regulations) and technical frameworks (road safety documents); road safety countermeasures; road safety evaluation and improvement process; and road safety planning, policy and strategy (policy, vision, mission/targets, strategy and action plans and activities);
- **Component 3 (C3)** Pre-crash (Crash Prevention) Systems: crash prevention and road risk management system: road users, speeds, vehicles and roads:
 - Sub-component 3.1 (C3.1) Safer Road Users: road use rules, driver licensing system, public education and awareness, law enforcement, competence and training;
 - Sub-component 3.2 (C3.2) Safer Speeds: speed management system and speed limits;
 - Sub-component 3.3 (C3.3) Safer Vehicles: roadworthiness- national car assessment program, vehicle standards compliance, vehicle inspection and maintenance system; and

- Sub-component 3.4 (C3.4) Safer Roads: road design and maintenance, traffic control devices, road safety audit, roadside hazard management.
- **Component 4 (C4)** Post-crash (Post-crash Response and Management) System: post-crash response and management system such as emergency preparedness, response and treatments;
- **Component 5 (C5)** Crash Investigation and Database System: crash investigation, data coding, data collection, data recording and creation of road crash database (*The NRCDS is part of this component.*);
- **Component 6 (C6)** Road Safety Research and Development: road safety monitoring, measurement, investigation and analysis.

3.6 Requirements for Sustainability

It is considered that the current road safety activities in Nepal do not capture all these components in a unified framework. The first step of this comprehensive approach is to bring together all these components into one management system taking into account both national and international practices, supported by scientific research. And scientific research requires, among others, good crash data. Component 5: Crash Investigation and Database System represents the scope of the current consulting service wherein NIRTTP develops crash investigation and data collection system for use by police in court cases, insurance claims etc and RSSP develops crash database system (for use by road safety practitioners in identifying black spot treatments, safety programs development etc).

Nepal Road Safety Action Plan identifies creation and management of crash data as one of the key actions for the decade (WHO, 2011). Development of a sustainable NRCDS contributes to the delivery of one of the main objectives of the Government of Nepal in the provision of better road safety outcomes. NRCDS can be sustained if it is founded on robust legal, institutional, funding and technical framework.

3.7 Legislative Framework

At this stage, no government agency is made legally responsible for maintaining records of crashes for safety analysis. Nepal Traffic Police attends crash scenes, collects information on crashes and maintains records of crashes mainly required for resolving court cases. This is the only source of crash data for road safety engineers to undertake road safety analysis. No other government agencies are legally binding to maintain crash database, which could be used systematically for informing public on the performance of the country on road safety and for

identifying black spots on the road and other potentially hazardous sections of roads in the country. Department of Roads (DOR) which is responsible to deliver safer strategic roads, does not maintain crash data on strategic roads for road safety analysis. Similarly, DOLIDAR also does not have any mandate for maintaining crash data for local and agricultural roads under its jurisdiction. The discussion with officials has revealed that both departments are keen to establish and maintain crash database for their roads and are currently working on this independently.

Nepal is a signatory of the UN Decade of Action (DOA) on road safety. It has the obligation to support the UN call for reducing road deaths and disabilities in the country by implementing road safety measures on several fronts, as guided by its policy. International bi-lateral and multi-lateral agencies, which are funding the development of roads and transport system in the country, are also expected to incorporate safety analysis and road safety improvement measures in the projects funded by them.

In order to gain better understanding of the current status of legal framework and to suggest options for a suitable legal framework for the proposed NRCDS, a number of relevant literature are reviewed. Some of these included:

- New Constitution of the Federal Republic of Nepal (Draft), 2072 (2015);
- Interim Constitution of Nepal 2063 (2007);
- Motor Vehicles and Transport Management Act (MVTMA), 2049 (1993);
- Motor Vehicles and Transport Management Rules (MVTMR), 2054 (1997);
- Motor Vehicle Tax Act (MVTA), 2031 (1974);
- Motor Vehicle Tax Rule (MVTR), 2034 (1977);
- Public Roads Act (PRA), 2031 (1974);
- Road Board Act (RBA), 2058 (2001);
- Local Self-Governance Act, 2056 (1999);
- Local Self Governance Rules, 2056 (1999);
- Town Development Act (TDA), 2054 (1997);
- Town Development Fund Act (TDFA), 2054 (1997);
- Environment Protection Act (EPA), 2053 (1996);
- Environment Protection Rules (EPR), 2054 (1997);

- Traffic Regulations (Draft)/ Traffic Bye-law (Draft), 2072 (2015);
- Nepal Police Act / Regulations - what mandate, directive Nepal Police has that requires them to collect and store crash data is not clear; and
- National Transport Sector Policy (NTSP).

The above list is not exhaustive but selective. More reference materials in the form of government policies, directives, work process, methods, manuals, and guidelines as and when available within the period as work progresses, are collected and reviewed. Notes from the review of some of these documents are provided later in Chapter 5 of the report.

It is indicated that both MVTA and MVTR are currently being reviewed under RSSP, so also the NTSP and PRA. The objective of this review is to ensure that these laws, rules, policies manuals, guidelines, provide for better road safety outcomes and the relevant agencies are mandated and required to consider safety of all citizens on public roads.

It is further indicated that a new Road Safety Act is also being developed under the initiative of RSSP. DoR is understood to be the lead agency for drafting Road Safety Act. DoR is also one of the main stakeholder/user of the database created in this work and is fully consulted.

The study team intends to consult other agencies undertaking the review of these documents that could potentially affect the sustainability of the NRCDS. The objective is to make sure that the collection of crash data is legislated in the proposed RSA and/or revised MVTMA and that the storage and analysis of these data be made mandatory for an appropriate line agency. This way NRCDS secures a robust legal framework.

Although the Government's RSAP identified the need and suggested the development of a road crash database system, there has been no significant progress. It has taken momentum only after RSSP included this action in its program. The work on this front has been commenced recently. However, there are yet a number of issues to be resolved. For instance, clarity on what is a “road crash” is needed and “what types” of crashes are to be collected and need to be defined, probably by the proposed Road Safety Act itself.

3.8 Institutional Framework

The relevant organisation responsible for coordinated road safety planning and management in the country is the Ministry of Physical Infrastructure and Transport (MOPIT). Department of Transport and Management (DOTM) of the Ministry is the regulatory government body responsible for vehicle registration, driver licensing, and route permit issuance and its control, and transport operations. These aspects capture elements of "Safer Vehicles" and "Safer Users"

two of the five pillars of the Road Safety Management System. Department of Roads is responsible to deliver, operate and manage strategic roads and related infrastructure in the country on behalf of the Ministry. "Safer Roads" is the third important pillar of Road Safety Management.

The project level road safety tasks are the responsibility of the respective Project Implementation Units established within the Department. Project Directorate (ADB Projects) under the Department of Roads (DOR) of the Ministry of Physical Infrastructure and Transport carries out the responsibility of DOR at the project level for all ADB financed roads.

Other regional and district road offices are responsible to maintain roads for safe people and freight movements. DOLIDAR owns, manages and operates roads other than strategic roads (district roads, village roads and agricultural roads). These local roads are primarily built and maintained by DDCs and VDCs depending on their function. MOPIT will continue to have the overall responsibility on road safety in its role as line agency. Home Ministry (Nepal Police Service – NPS) is responsible for enforcement and is involved in surveillance, control, post crash response management and legal proceedings resulting from road crashes. Health Ministry as well as Ministry of Education also has some role to play to deliver better road safety outcomes in the country.

Road safety is thus a shared responsibility among various agencies. Activities related to delivering road safety are carried out by several government and non-government agencies. Coordination among these agencies is vital for ensuring better outcomes. The National Road Safety Council (NRSC) established by the Government within MOPIT, as the Secretariat, is the body for general decisions, strategic planning related to road safety improvement and reduction of road crashes. The Road Safety Secretariat at MOPIT performs day-to-day activities related to inter-ministerial coordination of road safety activities.

While the above-described arrangement represents a commonly practiced institutional framework for managing road safety and has worked well in many countries of the world, this has not been the case in Nepal. The resource allocation needed for proper functioning of the institution is very weak currently. It is not able to deliver road safety outcomes as required to meet the global target of reducing road deaths by 20% by 2020 and 50% by 2030. This is evident by the absence of a computerised crash database and road safety information management system with the Government. The absence of proper crash investigation and crash database system is a major obstacle for any meaningful monitoring of the progress on achieving road safety target committed internationally by the nation. Other obstacles are lack

of dedicated safety engineers and support personnel for NRSC secretariat and road safety specialists in the country as a whole. Establishment of NRSC with adequate resources was recommended in the Road Safety Action Plan completed in 2013 and in the ongoing Road Safety Support Project (RSSP) funded by the World Bank. The recommendation has not progressed as expected in absence of staff resources. It will continue for some time unless a major overhaul is implemented to create a separate Road Safety Unit with dedicated road safety specialists within the Ministry.

As the road safety delivery is shared by many agencies, so also the creation of the road crash database. Government departments having responsibility in delivering better road safety outcomes include:

- Ministry of Physical Infrastructure and Transport (MOPIT): NRSC, DOTM, DOR, RBN;
- Ministry of Federal Affairs and Local Development (MOFALD): DOLIDAR;
- Ministry of Home Affairs (MOHA): Traffic Directorate of NPS, SES (Emergency Services);
- Ministry of Health (MOH): NTC, Various government and private hospitals, Ambulance Services;
- Ministry of Education (MOE);
- Ministry of Communication (MOC): On-road Emergency Telephone Services;
- Ministry of Urban Development and Housing (MOUDH);
- Kathmandu Valley Development Authority (KVDA); and
- All municipalities, DDCs and VDCs.

The issue is which of the agencies amongst NRSC, NPS, DOTM, DoR or DOLIDAR should own the NRCDS is not yet clear. Although, historically DoR used to own the crash database, with DOLIDAR established as a new responsible agency for managing most of the roads other than strategic roads, the question has been raised in the initial meetings whether there should be two separate database systems: one for strategic roads and the other for local roads - or one unified system. The ownership issue is further complicated by the fact that DOR and DOLIDAR are under different ministries.

Currently NRSC represents the peak government body, which is responsible for coordinating inter-governmental activities involved in delivering road safety. NRSC sits under MOPIT and

its proposed to be chaired by the Transport Minister. The provisional arrangement of ad-hoc committee adopted in absence of NRSC Act (or Road Safety Act) is that the MOPIT Secretary is chairing the NRSC. The Works and Transport Division of the Ministry manage the day-to-day administration in relation to NRSC Secretariat.

While the issue of inter-ministerial coordination of road safety tasks would be best ensured by the NRSC established under the chair of the Prime Minister, concern has been raised by many about the potential risk of the minimum attention that NRSC may receive from the Prime Minister. The debate as to what would be the best institutional framework for the management of road safety (and therefore of the ownership of NRCDS) will continue until the proposed Road Safety Act, which includes provision of NRSC and its operation model, would be passed by the Parliament. For the purpose of this Project and for any short-term horizon, it is reasonable to assume MOPIT as to be the potential owner of the NRCDS. In the long term, the institutional framework for NRCDS operation and management will be influenced by the implementation of new federal structure of the country.

Internationally, in particular in Australia, each state government is responsible for managing crash data. In Queensland, Queensland Police Service (QPS) is responsible for crash data collection. It maintains its own database system. Queensland Department of Transport and Main Roads (TMR) obtains crash data from the Police, engages Office of Economic and Statistical Research (OESR) under Queensland Treasury for further analysis and receives processed crash data to establish its own Crash Database System. During these processes, personal level data, which are required not to be disclosed for privacy reason, are removed and crash data are further validated and checked for accuracy required for safety analysis purposes. Only cleaner data sets which are customized to suit road safety analysis, road safety program development and prioritisation and for road safety performance reporting are maintained by Queensland Department of Transport and Main Roads in their Crash Database System (called RoadCrash2).

The model of institutional framework for sustained management of Nepal Road Crash Database System (NRCDS) will be recommended following the consultation with stakeholders. This will then be fed into the under-preparation Road Safety Act. The existing framework that is currently limited to the manual record keeping by Nepal Police (Traffic Directorate) needs to be overhauled. The direction that NIRTTP is currently taking in the collection and storage of data will be fully considered. This framework is more or less similar to what is being done in Queensland, Australia. Nepal Police collects and maintains crash data

in their respective district offices. Summarised data are sent to Central Traffic Directorate and are stored in their system (equivalent to QPRIME in Queensland). NIRTTP proposes to store data in the Government Integrated Data Centre (GIDC) (equivalent to OESR in Queensland). Access to this database can be provided to all agencies and including members of the public. It further provides back up of the data. The owner of NRCDS receives data from GIDC, processes further to develop its own data set (cleaner/ validated) and enters these into the system to create NRCDS (equivalent to RoadCrash2).

3.9 Funding Framework

Every road division is allocated some funds to improve road safety measures and to repair the existing traffic signs, delineator posts, road markings and other road safety related works (DOR, 2007). These funds are quite inadequate or are not sufficient for comprehensive road safety activities in Nepal. There is no separate funding allocation for crash data collection, analysis, research and development in the Department's budget. Nepal Police investigates crashes and collects crash data using its own regular operation budget.

Needless to say, the existing funding framework for NRCDS is very weak. It is fair to say that the fund for crash data collection and storage does not exist. Although there is a separate line item for road safety under the road operation and maintenance budget the meagre budget, which can be used for, road safety studies and retrofit does compete with the overall road safety budget. Road Crash Database gets the least priority in the overall road safety budget needs. There is therefore an ample of opportunities in the country to improve road safety.

Following funding options were proposed for discussion:

- Project based funding (e.g., RSSP, RSDP, RIP): Each new road development, maintenance and rehabilitation project can contribute to the development of NRCDS, provided an appropriate funding mechanism is developed and agreed.
- Program based funding: NRCDS may be identified as a separate program in Traffic Directorate of Nepal Police Service and Planning and Design Branch of DoR;
- NRSC funding: NRSC should try to get a separate line item in its operation budget for the development, operation and management of NRCDS;
- Funding from regular road operation budget: DOR and DOLIDAR can allocate share of its road operation and maintenance budget to support the ongoing improvement, maintenance and operation of NRCDS;

- Service charge based funding: Crash data can be sold as a product or analysis service to its users. Users can be internal customers (various government departments, semi-government agencies for their projects and other use); external customers (such as private engineering consultants, road construction contractors, law firms, insurance companies, international and national non-government organizations (INGOs, NGOs), bilateral and multi-lateral funding agencies, development partners and so on) and revenue generated can be used for supporting NRCDS's maintenance. There should be enough road safety related projects, consultancy works, law suits, insurance claims in order for this funding model to be successful.
- Privatization of NRCDS: The development, maintenance and management of NRCDS in this funding model can be entrusted to a selected (on competition basis) IT or Database Consultant in the country on a long-term basis (for a period of at least five years). The model is similar to the above but managed by private party rather than by the government department.

Based on the discussion in the workshop on potential options, a funding framework under the NRSC budget is considered to be appropriate. NRSC needs delegate its responsibility of collecting, managing and operating the "source" crash database (NPRIME) mandated by Road Safety Act and provide annual funding support to NPS for undertaking the delegated tasks. NRCDS, which is maintained in parallel by NRSC/ MOPIT, sources crash data from NPRIME (other than those not to be disclosed under Privacy Act such as personal information) and this will be used for road safety agencies and public consumption.

3.10 Technical Framework

The current technical framework can be described as follows:

Local Traffic Police collects and maintains crash data and sends these data to the Traffic Directorate at central level. In case of fatal and serious injury crashes, these data can be verified by the hospitals but 'slight injury' crashes could not be verified from the hospitals (Thapa, 2013). Traffic Police collects and compiles all data pertaining to road-crashes in Nepal through their network of local, district and regional offices (ND Lea Inc et al., 2008b). In urban and strategic locations, Traffic Police personnel record all details at the site of the road-crashes, while in rural and remote areas; this responsibility is usually assigned to Police (ND Lea Inc et al., 2008b). The primary information at the site may be an anecdotal reference to the crash, whereas, investigations of the crash-sites, including measurements, are performed by specialised teams of the Traffic Police (ND Lea Inc et al., 2008b).

Once the Police personnel attending to the crash site record the road crash, the information is transferred to the office of the local unit or district office of Traffic Police in the Road Crash Record (ND Lea Inc et al., 2008b). The District Traffic Police Office again transmits their crash data to the Traffic Directorate at the Nepal Police Headquarters through their respective regional offices (ND Lea Inc et al., 2008b).

The data completed in Road Crash Record forms are not transferred to computer database by the Traffic Police at present. These data are simply kept in hard copy in their respective local offices (ND Lea Inc et al., 2008b). The Traffic Directorate at Nepal Police Headquarters also maintains consolidated statistics of road-crashes in Nepal segregated by five development regions and includes statistics such as age, gender, vehicle involved, and severity of injury. (ND Lea Inc et al., 2008b). However, as these data are usually in consolidated form, they do not provide information in detail, which would otherwise be necessary for comprehensive analysis of road crashes. DoR informed that the Traffic Directorate at Nepal Police maintains all the crash data in their central computer database system called NRDS, along with other Police data. NRDS is database software based on Oracle but access to this system is restricted due to security and confidentiality issues. (ND Lea Inc et al., 2008b).

There is no information regarding the verification, validation and uses of crash data for road safety management. Also, there is no information regarding how these data collectors are trained and what minimum requirements are there for data reporting, if any.

Based on the existing process and best practice of crash data storage system internationally, several models of crash database system have been discussed and presented in previous sections. These models are discussed and the most suitable framework is adopted following the consultation with road safety stakeholders.

It should be understood that crash data alone stored in the NRCDS do not provide enough clues to road safety engineers for undertaking safety analysis, safety program development and prioritization. Together with the development of NRCDS, data on road network, traffic volume, speed, number and type of vehicles, number of people having driving license, vehicle ownership, population, administrative divisions are necessary for meaningful safety analysis and safety performance reporting. Exposure to crash risks (vehicle kilometer travelled abbreviated as VKT), for example, can be calculated only if data on traffic volume and length of roads are available.

The overarching technical framework for NRCDS, which is adopted by this study, takes into consideration the need for the development of Nepal Road Safety Information Management

System (NRSIMS) and Nepal Road Safety Management Information System (Parajuli, 2015a;Parajuli, 2015b for full discussion). The technical framework of the proposed NRCDS is the subject of the remaining sections of the report.

CHAPTER 4

REVIEW OF INTERNATIONAL INITIATIVES

4.1 Introduction

The purpose of the review of the selected international and regional initiatives towards the management of road crash data is to familiarize with the issues, challenges and opportunities and document findings from these initiatives in relation to the development of crash database system for Nepal. Examples are taken from some of the most relevant countries of the developed world and developing countries of the region. Focus of the documentation is on the works undertaken in the past which are relevant for Nepal with the purpose of investigating why previous attempts in creating crash database system could not be sustained. The issues may be related to institutional weaknesses, absence of legal framework, ongoing funding problems and non-realization of the importance of crash data in planning and design of road works by concerned government agencies responsible for safety management. The findings of the review are the basis for developing policy guidelines, identifying gaps in the existing systems and recommending actions to fill these gaps. Better understanding of the systems available internationally, regionally and nationally is expected to assist the development of a more robust and sustainable database system for Nepal.

Some of the project works which are used in this study to demonstrate case studies of existing road crash data collection and storage practices are described in the following sections. These include examples from UK, USA, Australia, India, Bangladesh and Sri Lanka. World Health Organization (WHO) undertook projects on establishing crash database, which could be useful for developing countries. WHO works is related to the UN Decade of Action on Road Safety, which requires the development of road safety action plans by all signatory countries.

Previous and ongoing initiatives on the development of crash data management system and related road safety initiatives in Nepal are reviewed and included separately in Chapter 5.

4.2 International Initiatives on Road Crash Data Management

Selected international initiatives on the management of crash data and development of crash database system are briefly described in the Sections below. While some of the reviews are included in brief, others that are more relevant to the type of database system being proposed by this Project are relatively elaborate.

4.2.1 Road Safety Manual for Decision Makers and Practitioners

WHO (2010) (<http://www.who.int/roadsafety/projects/manuals/data/en/>) provides a comprehensive account of crash data systems, including their place in effective road safety management, their establishment and use. It is essential reading on this topic, particularly for those working within Low and Medium Income Countries (LMICs), who wish to establish or improve upon a crash data system. The work represents main resource material for the development of various modules on crash data management system.

Reliable and accurate data are essential for a variety of purposes, such as for advocating for road safety, identifying specific problems and risks, setting targets, formulating appropriate strategies, identifying contributing factors, developing road safety projects and monitoring impact. The manual focuses on the data systems used for road safety analysis and management. Road safety data, collected every day in most countries, cannot meet these objectives unless they are properly coded, entered in a system, processed, analysed, disseminated and used.

This WHO Good Practice Manual provides practical guidance for establishing data systems that will improve measurement of a country's road traffic injury problem, facilitate selection of evidence-based interventions, and allow for better evaluation of progress. It discusses the use of such data systems to develop policies and interventions and to assess prevention measures.

The manual presents a conceptual framework for data-led road safety management and presents steps for assessing the availability and quality of existing road safety data. It offers guidance both for making improvements to existing road crash data systems, and for the design and implementation of a new road crash data system.

The Manual lays emphasis not only on the importance of comprehensive data systems that cover not only deaths and injuries from road traffic crashes but also suggests the collection of other measures such as exposure to risk, intermediate outcomes and social costs. It is acknowledged that most countries are struggling simply to establish quality data systems to document deaths and injuries. The practical guidance relates to improving data quality and to improving the effectiveness of data systems therefore focuses mainly on data related to deaths and injuries. More specifically, it relies on the implementation of a crash database derived from police records. The Manual suggests a minimum data set and accompanying definitions for such a database.

This document is for guide only. It does highlight generally the need for good data and the types of data that may be needed. It does not get down to the “nuts and bolts” of building a database or the coding of crash types, but appreciates fully when one is out of the stage. Some of the issues relevant to database development covered by the manual include:

- Recognition of the importance of collecting accurate, reliable data on the magnitude of the road traffic injury problem;
- Highlights on the need for data systems to be put in place to collect the information needed to allow countries to develop evidence-driven road safety policies;
- Resolution to take a number of actions to improve road safety, including improvements to national data collection systems and international comparability of data.
- Need of reliable and accurate data to raise awareness about the magnitude of road traffic injuries, and to convince policymakers of the need for action.

Data relevant to road safety are collected every day in most countries, but for these data to be useful for informing road safety practice, they must be properly coded, processed and analysed in a computerized database system. Coding of the crashes is what is being ignored in most countries of the region.

The Manual provides practical advice for professionals working in road safety. It aims to help them develop or improve national or local mechanisms to systematically collect, process, analyse and use road crash data, with the ultimate aim of reducing road traffic injuries through data-led road safety management.

The Manual emphasizes that the road crash data systems should process information in a way that allows for the analysis at an aggregate level and facilitates data-driven action. At a minimum, a good road crash data system should:

- Capture nearly all crashes that result in death and a significant proportion of those that result in serious injuries;
- Provide adequate detail on the vehicle, the road user and the road/environment to assist with identification of causes, and selection of countermeasures;
- Include accurate crash location information;
- Provide reliable output in a timely manner to facilitate evidence-based decisions;

- Group road crashes into similar types requiring similar safety treatments.

4.2.2 Crash Data Management in Queensland Australia

In Australia, management of crash data falls under the jurisdiction of state and territory governments. Each state has their own system including crash codes which vary slightly. In the following, review of crash data management as practiced in the State of Queensland is provided.

- (1) **Data Collection:** Data are collected by the Queensland Police Services (QPS) at either the location of the crash or reported at the 'front' counter of a police station. Details concerning the crash (i.e. location and nature of the crash, prevailing weather, road conditions, contributing circumstances, number and type of units involved and any death, injury or property damage) are recorded using the Traffic Crash Report Form.

The information gathered is entered into the QPS's Police Service Database, called QPRIME, at the end of the reporting officer's shift, by the reporting officer or an administration person. Delays occur at data entry stage and a significant proportion of crashes have partial information only entered at this time and are modified at a later date by the police.

- (2) **Data Receipt:** The majority of data is received via weekly electronic load directly into the Queensland Road Crash Database. Notification and selected details of fatal crashes are received from QPS via daily emails.

Incomplete or additional data is obtained from CITEC Confirm (a software application developed by government owned IT Unit), directly from QPS reporting officers by phone, fax or email, from the QPRIME help desk or through TRAILS (licensing and registration software).

Data not loaded directly into the database are entered manually following the guidelines set out in the Database Management manual.

- (3) **Data Retrieval:** After loading the data, an audit report is generated which provides details of all crashes that were loaded into the system at that time. Minor validation checks are performed on the data at this time. The report is used to check and verify crash data loading procedures and alert staff to any crashes that fail the load procedure.

Following the audit report, crash report forms (new and modified) which were included in that week's load are then printed and bundled into daily workloads. Individual crashes are retrieved from the system using the unique crash number allocated to each crash by the Police.

- (4) Data Validation: The data are then subjected to a series of validation checks. These checks are in the form of both clerical and computerised checks and are designed to check for completeness, accuracy and consistency of information that has been supplied by the Queensland Police Service. A report, giving details of those crash records that fail any validation checks is generated as required. Clerical intervention is then necessary to resolve discrepancies in relation to the crash to ensure data are 'clean' prior to finalization and release.
- (5) Data Storage: Data are stored in the Queensland Road Crash Database System (QRCDS), maintained by Queensland Transport (now Queensland Department of Transport and Main Road - QDTMR). Data are kept in periods of one calendar month as a unit, which is then available for disseminations.

In 2002, a major extension to the data extraction tools was implemented. The system, WebCrash2, allows subscribers to run their own SQL queries and against the data, using web technology. An updated version, WebCrash 3, was implemented in 2006.

- (6) Data Backup: Data is backed up by QDTMR system nightly. Officers from the Office of the Economic and Statistical Research (OESR) of Queensland Government assist QDTMR with the monthly back up of the Geographic Information System.
- (7) System Operation: The system consists of a number of steps to receive and process 'raw' data to achieve 'clean' record data for dissemination.
- Road crash error reports are generated as required for those crashes that have been entered into the database during the day, either manually or electronically. The reports are available immediately, after the computer has completed the validation checks. Any data that requires clerical intervention is then investigated and reprocessed in a series of cycles until the data is considered 'clean'.
- (8) System Maintenance (hardware and software). Maintenance is carried out by Information Technology Branch of QDTMR.

Statistical codes are maintained by the System Administrator of OESR who has full authority to add/delete/modify codes as necessary to ensure the data are coded to the latest codes.

- (9) Data Dissemination: Crash data are disseminated from the database with a series of 'select' statements using Structured Query Language (SQL). As well, regular releases of data are made in the form of 'news releases' and reports. Data on main roads (national highways and state controlled road) are disseminated by the Data Analysis Unit Road Safety Division of QDTMR. Local Governments, other road safety related agencies, consultants and members of public may access road crash data from WebCrash. Both these database systems source crash data from QPRIME. These crash data are used by road agencies to provide crash statistics for accurate and timely analysis of road safety programs and for the development of new, effective road safety initiatives.

Standard crash reports are published in QDTMR's web site for general dissemination or public consumption of crash data. These reports are daily (fatal only), weekly, monthly, annually.

If a specific report such as those required by road safety engineers for identifying back spots or treatment of crash locations or for risk assessment a road crash, registration, licensing and infringement data request form is completed and submitted to the Data Analysis Unit.

4.2.3 Crash Data Management in New Zealand

New Zealand manages crash data using the custom-built software called Crash Analysis System (CAS). The CAS is an integrated computer system that provides tools to collect, map, query, and report on road crash and related data. It contains data from all traffic crashes reported by police. It provides a platform for the development and implementation of new road safety initiatives, making a huge contribution towards crash prevention.

The information provided by CAS is used to determine and analyse trends, which help direct recommendations around road safety funding allocations, target road safety programmes and monitor their performance.

CAS is a tool that manages, analyses and maps traffic crash and related data. It is a computer system in which people can:

- select crashes for analysis
- map crashes
- view images of the crash report diagrams
- locate and map crash clusters
- report on crashes or crash clusters
- monitor trends at crash sites
- automate the production of collision diagrams; and
- identify high-risk locations

Many organizations contribute to improved road safety through road crash prevention. Major users of crash data include the NZTA, NZ Police, local authorities, engineering consultants, Accident Compensation Corporation (ACC) and universities.

The CAS system is managed by the NZTA, but decisions around the system are made by a governance group comprising the NZTA, NZ Police and Ministry of Transport.

CAS brings three main sources of road safety data together: crash reports, diagrams of crashes, and road data, which includes road categorization and traffic flows. The crash data collection is based on the fatal, injury and non-injury crashes reported to us by the Police.

Crash reports include:

- Location of crash;
- When and how it happened;
- Who was involved;
- Type of vehicle drivers or passengers were travelling in at the time of the crash;
- people involved who were not in vehicles;
- Information about the crash environment; and
- A crash diagram.

The NZTA then codes this information according to the type of crash movement involved (e.g. overtaking or right-angle intersection collision) and the factors contributing to the crash (e.g. driving too fast for the conditions or failing to stop at a Stop sign).

Features in the mapping data includes state highways, motorways, arterial roads, all roads, railways and railway stations, rivers and lakes, built-up areas, cities, towns, places of interest, territorial authority boundaries, regional government boundaries, census blocks and area units, police station, area and district boundaries.

When crash map co-ordinates are calculated by CAS, all the boundary-based information is automatically calculated, along with the crash location in terms of RAMM and the State Highway route position. The latter two linkages allow CAS crash data to be used externally to CAS in other systems, and data from other systems to be linked to crash data.

The CAS processing team aim to load the majority of crashes into the system within three months of the date they receive notification from NZ Police. The team prioritizes fatal and injury traffic crash reports before non-injury ones. Within these priority groups, the team process crashes in the order they receive them from Police. Data may also be updated at a later stage as the team receives further details from Police (e.g., hospital updates).

4.2.4 Use of Tablets in Crash Data Management

For the past two years UK Police in Surrey have been trialing tablet systems for their daily activities in collecting crash data.

The Surrey trial is trying to take several steps forward and enter crash details into a hand-held device (a tablet). This would remove the need to use paper. The collected information is later entered into a computer base system. All entries have been done at the scene. Use of the software prompts the officer to complete all necessary details.

The use of hand held devices to replace pen and paper for on-site collection of data is not a new concept. Common examples are infringement notices issued by both police and compliance officers in most developed countries. The officers have a small hand held unit and a stylus which they key in the details on the vehicle and offence and an infringement notice is printed on the spot from a small belt attached printer and either left on the vehicle or handed to driver. Courier drivers no longer get you to sign paper for your goods; they have a small screen on a hand-held device that you sign with a stylus.

Unfortunately, NRCDS Project has severe time constraint and the collection of data is not in the scope of the works. There was no time to follow up on the UK progress with

this system. It was learnt that the system established was still in a trial stage. It may be important for the NIRTTP team to follow up on this project when the planned pilot project on the use of tablets for crash data collection begins later in the year.

In any event the design of what data is to be collected and how it is coded must be completed before any project of developing the use of tablets is commenced.

In Australia, most local councils use tablets in the field. The experience in the Fraser Coast Regional Council in using tablets for a vast array of tasks is not very encouraging. First they gave a lot of information to the officer in the field. They were very good for taking photos of damaged infrastructure; the GPS was auto on the photo and this information was sent straight to roads maintenance. For investigations, the information sent worked good for reference. Attaching information and photos at the site of the investigation and then being able to work on reports while still in the field was good. However, the issues were that the tablets were sensitive to heat and battery life would become very short. Sun glare on the screens made them impossible to read unless a shade is found or officers were in a vehicle. Reliability of information transfer was often compromised by breaks in internet connection. Training in use was fairly intense and not all officers were comfortable with their use. Finally working in the field is not an office situation and most off the shelf tablets are not very tolerant of heat, dust or rain.

There are laptops specifically designed for use in the field. Many mining companies use these devices and building sites, but they still have limitations plus they are not cheap.

What the results of the Surry Project or any other investigations in the use of tablets in the field say is yet to be found out. In the experience of this team, it is, however, not a sustainable proposal for the current collection of road crash data at this stage in the Nepal context.

While the use of advanced technology is favored and easily marketed, the reality needs to be checked to make sure that they work. Australia is still good at road safety without the use of tablets. The team is not sure why there is a need in Nepal to use tablets for crash data collection. Without implementing a trial project involving the use of tablets for at least two years, introducing tablets in hurry is considered to be highly risky. Police officers who are using paper forms since mid-1990s are found committing many mistakes in completing the forms. Forms are not completed properly. New police

officers lack training. There are no instruction sheets attached to paper forms. There are no systems in place for transferring these paper-based data into the computer system properly.

It is believed that the proper implementation of the existing paper based crash report form, training to the police officers, resourcing police officers for the revival of the current NPS crash database system (aggregated) to enable it to store more disaggregated crash data (at least by road and by location along the road) and improvement in the current form are more important than the introduction of new technology in the system. While the recommendation is to continue with the paper based form at crash scenes, it is recommended that the data transfer be web based.

4.2.5 Road Crash Data Management in LMICs

Baguley (2001) attempts to give an overview of the main current road crash statistics of developing countries, and highlighted the fact that these countries generate a highly disproportionate amount (85%) of the world's fatalities. The situation also tends to be worsening as these countries' vehicle fleets are growing rapidly, and efforts to improve safety are not keeping pace. However, methods applied in many of the developed countries have demonstrated that it is possible to slow or arrest this growth in road crashes. Dedicated safety workers are required to achieve meaningful reduction in road crashes who would carry out regular, in-depth analyses of patterns of crashes and then to target many of these crash site locations with various (low-cost) remedial actions that are likely to yield the most effective results.

For this purpose, Baguley suggests that the establishment of a reliable road crash database and analysis system is of paramount importance, and this must be made accessible to all those bodies able to contribute to crash reduction (like the police officers, highway engineers, vehicle engineers, education services etc.). Indeed, it is likely that an unreliable or inaccessible database will only lead to inefficient management of road safety. The paper has discussed the more important elements of such a system and illustrated these with selected examples from systems in use.

It is likely that an unreliable or inaccessible database will only lead to an inefficient management of road safety.

4.2.6 Review of Best Practice Crash Data Management Systems

Lundebye (2012) in his presentation on "Best Practices in Crash Data Management Systems - Examples from the Indian Sub-continent" gives overview of the good road crash data systems around the world which include countries like

- Tamil Nadu – India
- Kerala – India
- Himachal Pradesh - India
- Sri Lanka
- Malaysia
- Cambodia
- United Kingdom
- Australia
- New Zealand
- United Arab Emirates
- Oman
- Ghana
- USA – though fragmented at Federal Level

It is not unknown why different states in India are using different software platforms and why a country wide data base system was not created which would have allowed comparison in road safety performance of various states easily. At this stage, it is not known which level of government (national or provincial) in Federal structure would be responsible to manage crash data in the country but learning from India, it would probably be reasonable to have a centrally managed Crash Database System in Nepal.

Lundebye (2012) further argues that

- Good crash data system is the foundation of road safety management;
- There is no substitute for good crash data;
- Data is hard to collect and non-glamorous;
- There is a need, somehow, somewhere to start, sustain and evolve the whole process' and

- Several successes, proven processes and methodologies are available;

Establishment of crash database system is a costly process. The presentation by Lundebye (2012) provides the following cost figures involved in setting the system up and running.

- Vietnam country wide system \$2.5 million (WB funded)
- Indonesia integrated country wide system \$1.75 million (WB funded)
- Tamil Nadu, India \$0.6 million (WB funded)
- Malawi - \$0.8 million (SIDA funded)
- Ghana - \$0.3 million (EU funded)

Budget for the ongoing initiative (preparatory phase) in Nepal is meager and is expected to be less than 0.06 million. This budget does not provided for any additional activities / cost items necessary to collect data and create a meaningful database. The NRCDS Project only establishes database system and the real crash data that populates the system are not available for the past five years.

Off-the-shelf-systems are available and in use in many countries successfully. Following are some of the examples of such database systems.

- TRL, UK has developed MAAP Package targeting for LMICs;
- iMAAP Core and iMAAP Cloud developed by TRL/UK have been in use in some of the states of India successfully;
- Sri Lanka also uses iMAAP Core to manage its crash data;
- RSMS developed jointly by IBS (India) and TRL (UK) are also in use in some states of India;
- Viastat developed by Via is used in The Netherlands;
- Strada developed by Swedish Firm is used in Sweden;
- CAS developed by RTI is used in New Zealand; and
- WebCrash and RoadCrash2 are used in Queensland, Australia

Some of the relevant initiatives are reviewed further and documented in the later sections of this Chapter. These include the system developed in the State of Tamil Nadu, Kerala and Himanchal Pradesh.

The International Road Traffic and Accident Database (IRTAD) established by OECD Road Transport Research Programme is a mechanism for providing aggregated database, in which international accident and victim as well as exposure data are collected on a continuous basis. The database is currently used by 29 IRTAD countries around the world. For more information on IRTAD visit www.irtad.net. Similar database system needs to be established for LMICs or at least for regional countries having similar road, traffic and socio-economic conditions for the purpose of meaningful comparison of crash data /safety performance indicators.

4.2.7 Scaling up Action through Road Safety Data System

This document presented by ARRB (Turner, 2015) in India highlights the importance of what data needs to be collected for effective analysis of road crashes in these countries.

- Identify key crash types and locations;
- Diagnose causes of crashes;
- Crash data from Police and Hospitals;
- Know who the data will be used by and for what purpose;
- Who collects data;
- Who are the users (or who should be);
- Assess end user needs;
- Who, how, what for?
- Assess data systems;
- Data quality; functionality; access;
- Good data critical to effective road safety management
- Crash data / non-crash data;
- Know how data is used.

Answering these questions is essential before creating the database system. It provides clarity on what type of system is preferred to meet the needs of all stakeholders. The understanding helps decide what data to collect, how to store collected data, how to disseminate collected and analysed data.

4.3 Regional Initiatives in Crash Data Management

Some of the relevant initiatives implemented in the region are reviewed in order to provide comparison of the proposed system with these systems. These include initiative from India, Bangladesh and Sri Lanka.

As one of the closest allies in the region and with many similarities in road crash data occurrence environment (similar socio-economical, cultural background of the road user, similar vehicle fleets, similar speed environment and similar road construction design and operation environment, income, vehicle ownership etc.), there could be many lessons that could be learnt from some of the projects in India for formulating Road Crash Database System to be implemented in Nepal.

India has among the worst road accident records in the world and in 2013 close to 140,000 fatalities were recorded. In 2012, the rate of accidental deaths per thousand vehicles was highest in Bihar and West Bengal at 1.9 (each) followed by Andhra Pradesh and Himachal Pradesh at 1.5 (each).

The UN was kind enough to forward information in relation to two projects in India, one in Kerala and the other in Tamil Nadu. Neither of these projects was using MAAP, as the licensing cost for it was too high. They were using the Road Safety Management System (RSMS) developed by IBS, which is a software firm in Kerala. ARRB suggested to review the system developed for Himachal Pradesh which has topographical conditions similar to that in Nepal.

In the following sections, some of the features of the crash database systems or projects of the region are described. The review provides clues on what features are incorporated in these regional initiatives, tested and validated based on which similar features can be desirably introduced in the proposed system.

4.3.1 Road Crash Data Management in Bangladesh

The Road Traffic Accident database is being maintained and updated by Bangladesh Road Transport Authority (BRTA) on the basis of police MAAP (Micro-Computer Accident Analysis Package) information. BRTA and the Bangladesh Police have been working together in maintaining the integrity of the database and in promoting its statistical accuracy. The shortcoming of the database is that it is prepared on the basis of reported accidents only. It's a fact that there exist some accidents in the country side which are not reported to the police, making the database virtually incomplete.

However, it will invariably serve the purpose as it covers most and major parts of the accidents of the country.

Road Traffic accident data are collected by the Police working at thana level by filling in 'Accident Reporting Form (ARF)' one for each accident, which was introduced nation-wide in 1997. This form is written in Bangla and published by the Government of Bangladesh. ARFs are compiled at the Regional Accident Data Units (ADUs) maintained in six police Ranges and four Metropolitan Police offices. The ranges and metropolis offices are Dhaka Metro, Dhaka Range, Chittagong Metro, Chittagong Range, Rajshahi Metro, Rajshahi Range, Khulna Metro, Khulna Range, Sylhet Range and Barisal Range. The data so collected, are entered into an electronic database. called the 'Micro-computer Accident Analysis Package (MAAP)'. The customized software application (database) was developed by the Transport Research Laboratory (TRL), UK.

4.3.2 Road Crash Database in Kerala, India

The Kerala Database is considered to be a combination of both web based and desktop system. It took nine months to develop it. The web based system is used to capture accident data on the spot with the following features:

- Accident spot
- Police man with GPS and Accident Recording Form (ARF)
- Filling of ARF

Recording and reporting of the accident data is done in the following steps:

- Data Entry of First Information Report (FIR)
- Data Entry of Accident Record Form (ARF)
- Identifying the accident location from the digital map or from coordinated from GPS
- Printing of FIR in case of accidents

The database in the desk top is capable of doing a number of analysis required for use in identifying black spots along the road, it intersections and road safety performance report preparation such as but not limited to:

- Kilometer Analysis
- Collision Diagram Analysis

- Grid Analysis
- Graphical Analysis
- Cross tab analysis
- Node Analysis
- Reports (Safety Performance Reporting)
- High accident location identification analysis

4.3.3 Road Crash Database in Himachal Pradesh, India

Himachal Pradesh has chosen iMAAP and iMAAP Mobile Solutions for the management of its road accident data. Designed and developed by TRL specifically for developing countries ' situation, the UK's Transport Research Laboratory, iMAAP is considered to a powerful new software solution for the management, analysis and evaluation of road traffic crash data. TRL's iMAAP and iMAAP Mobile Solutions, which are based on the latest multiple platform technologies will enable police officers in Himachal Pradesh to use tablet computers and mobile phones, to collect real-time road traffic accident data at the scene of an incident.

The system will also provide road safety specialists with powerful analytical tools for identifying accident trends and cluster sights, enabling more efficient and effective road safety interventions to be developed and deployed. Ultimately, the system will support the Himachal Pradesh authorities in reducing the number of people dying on their roads.

Supported by the World Bank, the Project was launched in July 2015 and it is still under development process. It is being piloted in Shimla and Mandi districts only at this stage.

There are many common road safety problems across Nepal and Himachal Pradesh. Both Nepal and State of Himachal Pradesh have some unique road safety challenges as a result of its terrain and extreme weather conditions. Nepal cannot afford to have another MAAP Project following the failure of the first MAAP system in 2001, nevertheless the success of the pilot project would be of interest for further improvement at the time of the upgrade of the proposed NRCDS. All crash data from the current EXCEL based NRCDS can be easily dumped into iMAAP while collection of new sets of data can utilize iMAAP mobile solutions. This is possible without loss of information as the proposed crash coding system is largely based on UK Accident Report Form.

4.3.4 Road Crash Database in Tamil Nadu, India

Tamil Nadu Road Accident Data Management System (RADMS) commenced in 2008 following the identification of the absence of properly established accident data system in the State of Tamil Nadu India. It is an "off the shelf" solution for collecting and managing its road crash data. The project was funded by World Bank aided Tamil Nadu Road Sector Project and was completed in 9 months with further ongoing operational support for next 15 months after the full rollout of the system throughout the State.

Probably considered to be the most comprehensive and sophisticated accident data management project in this part of Asia, the system has the following key features:

- Tamil language;
- Involvement of multiple departments;
- fully web-based application;
- roll out in all 1350 police stations;
- interfacing with vehicle registration & driver license systems;
- Fifteen months of operational support after full rollout of the system in the State; and
- All institutional components in place for a multi-user sustainable system

Tamil Nadu Highways Department, Transport Department and Police Department worked jointly to establish the system. It utilizes Commercial-Off-The- Shelf (COTS) system.

It has been found that COTS framework has a number of advantages over the Commercial Packages including

- low risks;
- shorter time frame;
- proven solutions;
- value added features; and
- possibility of continual ongoing updates and enhancements using internal resources with full in-house technical support.

The Tamil Nadu System not only supplies total crash figures but it is aid to be also capable of identifying black spots with collision diagrams for investigation and

treatment. However, it is not known at this stage whether the database stores systematically coded crashes or simply crash types by broad groups. Attempts through correspondence to further investigate this issue which is considered to be vital for the type of database system this study proposes has not been successful. A copy of crash report form being used for the collection of crash data was requested but there was no response. A detailed study of the capability of the system and its features was of interest for this Project.

Albeit further investigation of this system could be recommended, it is not fully relevant to this project as the scope of the NRCDS Project exclude the consideration of any on-the-shelf system introduced by other regional agencies. The database system for Nepal is to be based on what data are available in the country and what type of system would be sustainable that provides simple solution for coding and storage system. Any crash forms need to be adapted to local context and customization of computer software being used elsewhere for Nepal situation would generally be costlier than the one being proposed in this Project.

Ideally NRCDS also needed to be the Project of this shape and size. Nepal has almost similar number of police stations involved in crash data collection. The initial work undertaken currently is expected to lay the firm foundation to take the Nepal Road Crash Database System in this direction. The additional features such as comprehensive crash coding system, automatic coding assignment system will make NRCDS better than the Tamil Nadu System if similar resources and timeframe would have been available to the Project.

4.3.5 Road Crash Data Management in Sri Lanka

Sri Lanka uses MAAP Crash data management software from Transport Research Laboratory (TRL), UK. Other Features include:

- Data centrally shared and analyzed;
- Successfully working since last 7 years; and
- Good local team and capacity building institutionalized

CHAPTER 5

CRASH DATA MANAGEMENT INITIATIVES IN NEPAL

5.1 Review of Road Safety Data Management related Regulations

In order to recommend requisite legal framework for crash database management it is important to understand the existing legal framework available for road safety in the country. Some of the relevant acts and regulations including the new constitution of Nepal are reviewed briefly in this section.

5.1.1 The Interim Constitution of Nepal 2063 (2007)

The Interim Constitution guarantees the fundamental rights of a citizen which includes to travel safely for accessing goods and services. The Interim Constitution was drafted to facilitate and manage the constitutional transformation peace process. In the Interim Constitution, there is no specific issue endorsed for the traffic management but safety implies traffic management and road safety. Article 30 (2) mentions the rights of workers, article 13 (d) infers that workers can form trade unions and engage in collective bargaining, which could include bargaining for the provision of safe travel.

Article 19(1) establishes the right to access property for every citizen of Nepal, whereby every citizen is entitled to earn, use, sell and exercise their right to property under existing laws. Article 19(2) states that except for social welfare, the state will not acquire or exercise authority over individual property. Article 19(3) states that when the state acquires or establishes its right over private property, the state will compensate for loss of property and the basis and procedure for such compensation will be specified under relevant laws.

5.1.2 Motor Vehicles and Transport Management Act and Regulations

The Motor Vehicles and Transport Management Act (MVTMA) 2049 (1993) and Motor Vehicles and Transport Management Regulation (MVTMR), 2054 have been promulgated to make transportation services safe, efficient and effective with a view to preventing motor vehicle crashes, enabling the victims of crashes to have compensation, providing for insurance and making transportation facilities available to the public generally in a simple and easily accessible manner.

The Act and Regulation makes provisions for traffic and transport management, vehicle emission, pollution control, road crash prevention and control, issue of driving license, route permit of public vehicles, parking places and bus stands, vehicle registration and renewal vehicle inspection and so on. It empowers DoTM to carry out its responsibilities stated in the Act.

MVTMA and MVTMR have enlisted some of the roads or traffic rules violations. These rules are keys to reduce the number of crashes.

- a) Driving a motor vehicle contravening the traffic signs or signals;
- b) Standing a motor vehicle at such place or time as may be prohibited for such standing;
- c) Turning a motor vehicle or using sound-signal at a place where such turning or sound-signal is prohibited;
- d) Driving a motor vehicle on the wrong side of a road;
- e) Driving a motor vehicle from the opposite side on a one-way road;
- f) Driving a motor vehicle of unworthy condition;
- g) Driving a motor vehicle in excess of the determined speed;
- h) Driving a motor vehicle at night without turning lights on;
- i) Driving a motor vehicle after consumption of liquors;
- j) Parking a motor vehicle at a public place in such a way as to cause obstruction to others;
- k) Driving a motor vehicle at a place or hour prohibited for such driving;
- l) Driving a motor vehicle without a number-plate;
- m) Driving a motor vehicle of which weight is more than the determined weight at a place for which the limit of weight of a motor vehicle is determined;
- n) Driving a motor vehicle without fastening the seat-belt or without using the helmet;
- o) In the event of determination of the number of people to be seated or kept in or the weight of goods to be loaded in a motor vehicle, driving a motor vehicle carrying passengers or goods exceeding such determined number or weight;
- p) Road test certificate issued for public vehicles;

- q) Refusing to accept a passenger by the driver of a public motor vehicle;
- r) Driving a motor vehicle by charging fares at a rate exceeding the fixed rate of fares;
- s) Driving a motor vehicle recklessly;
- t) Driving a public motor vehicle without obtaining the route permit; or
- u) Driving a motor vehicle without possessing the driving license;
- v) Unauthorized modification of color, seat, number, shape engine or chassis.

There is an opportunity to include the additional clause in the revised VTMA to mandate and empower NPS to investigate crashes, complete crash report form for each crash and store data both in the paper and electronic media (NPRCDS). Similarly, the Act should include clause to mandate and empower NRSC/MOPIT to maintain NRCDS for use by all agencies and individuals involved in managing road safety.

VTMR, Article 62 allows power to frame manuals as follows:

- a) The Department may, as required, frame and enforce manuals in relation to the operation of motor vehicles and the transport management, subject to the provisions set forth in the Act and these Rules.
- b) It shall be the duty of all the concerned to observe or cause to be observed the manuals as referred to in Sub-rule (a).

Therefore, in the transitional period of implementing constitution and requirement to promulgate a large number of Acts and Regulations for Federal Structure of Governance, it would be an appropriate action to frame the draft manuals to continue works in the collection of storage of crash data. Requirement to follow the procedure suggested in the proposed Crash Report Form Completion Guide, Crash Database Management Manual and Crash Data Users' Manual should be made in the MVTMR which is currently under revision.

Recommendations are also being made to include additional provisions in the ongoing review of MVTMA and MVTMR so that firstly, the number of road crashes be significantly reduced and crash data management would become less demanding from limited resources of NPS. Some of these issues recommended for resolution include:

- a) Penalties for traffic offences are significantly low as well as for repeated violations of traffic rules. These should be increased, made more scientific and indexed to CPI.
- b) Traffic Police personnel, the first enforcement agency, who witnesses the violation of traffic rules, have less punitive authority than ZTMO/DOTM (Zonal Transport Management Office). This is recommended for review.
- c) It is necessary to delegate judicial authority vested in the ZTMO/DOTM to TD/NPS. Better Obligations and duties of each agency need to be separated, well clarified and made legally binding.
- d) It may also be worth considering establish a traffic court for appealing against the decision of TD/NPS and ZTMO/DOTM.

Following improvements or amendments may also be considered in the revised MVTMR to improve road safety. This in turn would help reduce the burden of collecting crash report forms and managing crash data. The penalties/ fines (including suspension of driving license, impounding vehicles and imprisonment) for these offences should be such that these would work as real deterrence to making offences and therefore to reducing crashes.

- a) Annual inspection from DOTM on safety, road worthiness and exhaust emission level before renewing the vehicle registration;
- b) Committing crash by allowing unlicensed person to drive one's vehicles;
- c) Driving too close to other vehicles;
- d) Not driving in a lane;
- e) Driving motor vehicles on footpath or cycle lane;
- f) Hit and run;
- g) Ill-treatment of victims while vehicle crash occurs;
- h) Clarity in the number of allocations of passenger in public transport as per vehicle occupancy;
- i) Not giving priority at zebra-cross or crossing section to the pedestrians;
- j) Obstructing foot-paths;
- k) Obstructing street or roads on private ceremony such as marriage or similar other processions (other than those of historical or cultural significance);

- l) Overtaking on prohibited sections or sections with restricted visibility;
- m) Road test certificate issued for public vehicles and but other types of vehicles exempted;
- n) Parking by blocking traffic;
- o) Provisions of wheel-chair users' facility and access to footpath for people with special needs;
- p) Stopping/ parking private vehicle at bus stop or stopping buses and taxis at un-allocated stops;
- q) The duty of the driver to slow down when approaching a pedestrian crossing;
- r) The government should consider providing audible signals, tactile marking, engraved zebra crossings, pram ramps on kerb and gutter for easy access of wheel chair and warning signals at appropriate places;
- s) Use of a non-Nepalese license plate without permission;
- t) Use of falsified license plate or not using any license plates;
- u) Using the type of fuels which is not recommended;
- v) Using goods carrier vehicle for public transport;
- w) Vehicle causing excessive air pollution;
- x) Duty of the driver to report to Police any crash he/ she is involved and provide possible assistance to crash victims

Offences which are not mentioned in VTMA or VTMR or other traffic offences of criminal negligence types can fall under other acts such as *Muluki Ain* (Country Act), Public Security Act, Road Safety Act (under preparation) and other relevant laws and regulations.

5.1.3 Motor Vehicle Tax Act and Motor Vehicle Tax Regulation

Motor Vehicle Tax Act (MVTA), 2031 (1974) and Motor Vehicle Tax Rule (MVTR), 2034 (1977) were promulgated to manage modus operandi of levying and recovering motor vehicle tax under the prevailing law.

The MVTA has provided some categorized exemption vehicles for such as the GON, diplomatic missions, INGOs, Village Development Committee, Municipality, District Development Committee, social, religious or educational institute without profit-making as recognized by the GoN and a motor vehicle registered in the name of any

person or organization held by the GoN to have become unable to use because of its disorder or otherwise. Similarly, Government of Nepal may delegate the powers conferred to it of collecting Motor Vehicle Tax under this Act by the Notification in the Nepal Gazette to the Municipality and Village Development Committee.

The MVTR additionally provided that those vehicles ‘unable to use’ or ‘never been used’ can be made off the record and registration can be cancelled.

The provision of MVTA and MVTR is that the NPS can also get exemption for the vehicles to attend crash scenes and to perform other duties related to the enforcement of road rules and management of road traffic.

5.1.4 Public Roads Act

The Public Roads Act(PRA)2031 (1974) was promulgated to make provisions to classify all kinds of public roads and acquire lands required for the development, maintenance, expansion or improvement of the public roads and to collect development tax as a road externalities from beneficiaries such as landholders near the roads who benefit from public roads in order to provide safe, convenient and efficient operation of traffic for the best interest of general public.

The PRA defines the public road including all kinds of bridges, causeways, culverts, bi-cycle ways and footpaths prohibits any type of structure to be constructed within the boundary of the roads. The PRA empowers the government to acquire any land on a temporary basis for construction and upgrading of roads. Any buildings and other structures such as houses, sheds, schools, and temples are to be avoided wherever possible. The government is required to pay compensation for any damages caused to buildings, standing crops and trees. Compensation rates are negotiated between the government and the landowners.

The PRA is under review and PRR is under development. Therefore, there is an opportunity to include the requirement that road agencies need to make their roads safe and that road crash data are to be collected, analyzed and reported to general public consumption and for road safety managers. The provision then will mandate relevant agencies (NPS, MOPIT, DOR, DOLIDAR and other agencies) having stakes on road safety to develop and implement regular road safety activities including the collection, analysis and dissemination of road crash data based on NPRCDS or NRCDS.

5.1.5 Road Board Act

The Road Board Act (RBA) 2058 (2002) was promulgated to make necessary provisions for having the strategic roads repaired and maintained to make these durable, safer and efficient. Road Board also monitors if the expenditures incurred in repairing and maintaining roads are transparent as per the program.

The RBA establishes the Road Board to carry out routine, recurrent periodic and emergency repair and maintenance works of the road and to make arrangement for imposition on and collection of tolls from the motor vehicles plying on the road. The Road Board was established under the RBA with the aim of providing sustainable fund for planned maintenance of the roads.

The aim of planned maintenance is to keep the existing roads in serviceable condition, to reduce vehicle-operating cost and to provide comfortable ride to the road users. The Board is empowered to collect the tolls prescribed by the government through public notification in the Nepal Gazette. The Board provides fund for repair and maintenance of roads included in the integrated annual program prepared by DOR.

It is recommended that the Road Board Act empowers and mandates Road Board to allocate from its road maintenance adequate budget fund required for the timely repair and maintenance of road safety asset items along with the maintenance and repair of pavement asset. Road Board may also consider including in the RBA provision to mandate the management of fund for ongoing maintenance, operation and improvement of NRCDS for the benefit of road agencies to justify the expenditure on road safety works.

5.1.6 Local Self-Governance Act and Regulations

The Local Self-Governance Act (LSGA) 2055 (1998) aims to provide the opportunity for the local people to participate in the process of resource mobilization, development and distribution of the result of development process by the process of decentralization of powers in the country. Particularly, the Act provides opportunities to local governments to act autonomously to formulate plans, programs and implement projects involving the construction, upkeep and maintenance of local level infrastructure including roads.

The Act has facilitated devolution of power, responsibility, resources and means to empower local bodies to collect and mobilize the resources in an accountable and responsible manner.

The Act mentions that local bodies (municipalities) may impose parking charge (Article 144 of the Act) as prescribed at vehicles parking places managed by it. It can also arrange or cause to be arranged for bus parks and parking places in their areas.

The local bodies may also develop roads, bridges and culverts as needed within the municipality area (except those roads which are under the control of the GON) parking places of rickshaws (three-wheelers), horse-carts, trucks etc. within the municipality area. The local bodies similarly can prescribe the upper limit of the registration of pushcarts, rickshaws horse-carts and similar vehicles inconsideration with the requirement of the municipality.

Local Self Governance Rules (LSGR) 2056 (1999) state that municipalities may charge parking fees within their area as per Schedule 19 (Rule 147).

Both LSGA and LSGR does not mandate local bodies to collect road crash data, undertake safety analysis using these data and report safety performance of their roads and related infrastructure to the general public. It is recommended that these requirements be included in the LSGA and LSGR in the next revision opportunity.

5.1.7 Town Development Act

The Town Development Act (TDA) 2045 (1998) was promulgated for addressing concerns related to rapid urbanization. It is necessary to provide essential utility services and facilities to the residents of the town with planned expansion of development of new areas as well as reconstruction of existing areas in order to control haphazard development.

The TDA empowers the Government to form Town Development Committees (TDCs). TDCs can determine land use, construction norms for physical developments. TDC is empowered to monitor, control and prevent activities related to the developments that are detrimental to the community. It can run Guided Land Development (GLD) programs. It can order demolition of the building built contrary to the norms and impose penalties.

The TDA provides the legal basis for implementing town development plans. The Act empowers both the central and local government agencies to carry out land pooling projects. The Local Self Governance Act 1999 also provides TDCs and VDCs to develop and implement town development plans but it is not comprehensive enough as compared to the TDA.

No mention is made in the TDA about the safety standard requirements of roads and related infrastructure built by TDCs or VDCs. Monitoring and reporting safety performance outcomes by TDCs and VDCs should be made mandatory in the next revision opportunity for mandating TDCs and VDCs to provide for safer roads in the development plans. Use of crash data then becomes necessary in order to meet the requirement laid by the TDA.

5.1.8 Town Development Fund Act

Town Development Fund (TDF) Act 2053 (1997) was promulgated to provide legal framework for the establishment and operation of Town Development Fund (TDF). The fund provides support to TDCs with the fund required for various development activities and for the expansion of towns. The Act also allows TDF for supporting urbanizing VDCs.

TDF is established under the TDA. TDF Board established under the Act is a fully autonomous body and is responsible to operate and manage fund given to municipalities for the development of urban infrastructure including roads.

It is desirable that the Act include the provision that allows TDCs to use part of the fund for undertaking safety analysis, monitoring and reporting safety performance of the roads built using the fund provided by TDF Board.

5.1.9 Environment Protection Act and Regulations

The Environment Protection Act (EPA) 2053 (1997) and Environment Protection Rules (EPR) 2054 (1997) were promulgated to provide legal framework to protect natural and built environment to control environmental degradation with the proper use and management of natural resources. It takes into consideration of the triple bottom line principles that sustainable development could be achieved by the balanced development outcomes involving social, economic and environmental outcomes in totality.

The EPA requires that an Initial Environment Examination (IEE) or Environment Impact Assessment (EIA) be prepared for the proposed plans, programs or projects which may cause changes in the existing environmental conditions due to development activities or changes inland use. The relevant agency is empowered to grant approval for the IEE or EIA report only if it finds that no significant adverse effects are caused

to the environment. It can direct project implementing agencies to provide mitigating measures if required.

The EPR provides guidance on the environmental and social aspects of development projects including roads. It requires environmental assessment, either in the form of IEE or EIA impact assessment should be carried out for all potential projects that meet the criteria. Types of projects not requiring IEE, EIA or both are included in the Schedule of EPR. Most road projects including unsealed village roads results in significant environment impacts. IEE and EIA are usually prepared with the proposal of mitigating measures and monitoring mechanism.

It should be the requirement that each IEE and EIA related to roads should include road safety performance indicators and that these indicators be monitored regularly when completing Project Benefits Monitoring and Evaluation Study (PBME). This provision would require crash data.

5.2 Micro-computer Accident Analysis Program MAAP 1996

The database system created in 1996 under the DfID funded Road Maintenance Project (RMP) using sophisticated MAAP5 software from UK could not be sustained following only a few years of completion and operation of the Project. The system created with project-based approach did not have long lasting ownership to manage, operate and maintain it. It is possibly due, in part, to the absence of legally binding requirements for collecting and maintaining crash records for road safety analysis and, in part, due to the lack of ongoing funding support following the closing of the RMP. This could also have failed, in part, due to the lack of a responsible unit within the government agencies to look after the database (ownership). Further, there were not many road safety professionals in the country who understood the importance of road crash data in managing road safety. Many engineers and managers in the Department may not have realized the need and importance of continuing with the crash data collection and storage and no one needed and used crash data in the design and operation of roads.

It was further learnt during the discussion with the concerned road safety specialists that the MAAP5 software installed in the DOR's computer crashed and the 'one off' license purchased from the Project fund was lost together with the loss of all crash data collected in the past. DoR could not purchase the expensive software and entering crash data into the system was thus discontinued. DOR or any other agency was not obliged by law to maintain crash data. Professionals were not required to undertake road safety analysis.

5.3 Road Safety Management Capacity Study

Consia and TMS (2009) undertook road safety management capacity study in Nepal. The overall findings of the study were:

- There are ineffective performance management, weak implementation arrangements and fragmented interventions;
- There is an absence of clear priorities for action, based on strategic analysis of the problem;
- Proposed activities and interventions lack adequate finance, proper coordination and planning, and in some cases, do not adequately reflect good practice;
- There is also a serious lack of capacity, resources and skills within the agencies responsible for program delivery, and
- Responsibilities and accountabilities within and across agencies and levels of government remain unclear.

The study acknowledged that the NPS is the enforcing agency related to road safety such as speeding and driver's licence checks but the level of enforcements is not sufficient. The Department of Transport Management was identified as the right agency to manage road crash data but it has not to date taken the responsibility of collecting and analysing crash data. The Department is institutionally weak in this area and its other areas of responsibilities (vehicle route permits, licensing, and traffic management). There are many agencies operating to improve road safety but these are scattered and insufficient to make a substantial and lasting impact.

The Traffic Police have been enforcing traffic rules, maintaining RTA data and conducting road safety awareness campaign for road users regularly through its own budget and with private partnership. However, there is laxity in entry of the RTA data and no system of data transfer between the Police and DOR for accident analysis exists currently.

A lesson to be learnt from the last donor support program was the lack of local ownership of the process as the underlying reason for the apparent lack of the program's sustainability. The internal conflict may have been a contributing factor along with weak institutional set-up, and lack of training of staff. Further, the assistance was given over a too short time-span, which lead to a short-lived positive impact but without the necessary sustainability. The problem areas were:

- Weak institutional set-up;

- Support over too short a time and possibly spread too thin;
- No GON, Ministries/Agencies have ownership of the process; and
- Too few training programs.

The study recommended that these problem areas need to be addressed in the coming support to GoN on road safety. NRCDS Project therefore should address these problem areas.

5.4 Existing Situation of Crash Data Management

Following review is provided on existing situation on crash data management system in Nepal from the works undertaken by Nepal and Parajuli (2015).

Local Traffic Police Stations collect crash data and send these data to the Traffic Directorate at central level But the Stations do not maintain the systematic records of all collected crash data for long to enable time and space series data required for safety analysis. In case of fatal and serious injury crashes, these data can be verified by the hospitals but ‘light injury’ crashes could not be verified from the hospitals (Thapa, 2013). Traffic Police collects and compiles all data pertaining to road-crashes in Nepal through their network of local, district and regional offices (ND Lea Inc et al., 2008). In urban and strategic locations, Traffic Police personnel record all details at the site of the road-crashes, while in rural and remote areas; this responsibility is usually assigned to Police (ND Lea Inc et al., 2008). The primary information at the site may, thus, be in anecdotal reference to the crash. However, investigations of the crash-sites, including measurements, are performed by specialized team of the Traffic Police (ND Lea Inc et al., 2008).

Once the road crash is recorded by the police officers attending to the crash site, the information is transferred at the office of the local unit or district office of Traffic Police in the Road Accident Record(ND Lea Inc et al., 2008). The District Traffic Police Office again transmits their crash data to the Traffic Directorate at the Nepal Police Headquarters through their respective regional offices (ND Lea Inc et al., 2008).

The data completed in Road Accident Record forms are not transferred to computer database by the Traffic Police at present. These data are simply kept in hard copy in their respective local offices (ND Lea Inc et al., 2008) for some time and destroyed after the crash cases are resolved. The Traffic Directorate at Nepal Police Headquarters maintains consolidated statistics of road-crashes in Nepal segregated by five development regions and 75 districts and includes statistics such as age, gender, vehicle involved, and severity of injury (ND Lea et al., 2008). However, as these data are usually in consolidated form, they do not provide

information in detail which would otherwise be necessary for comprehensive analysis of road crashes. DOR informed that the Traffic Directorate at Nepal Police maintains all the crash data in their central computer database system called NRDS, along with other Police data. NRDS is database software based on Oracle but access to this system is restricted due to security and confidentiality issues. (ND Lea Inc et al., 2008).

There is no information regarding the verification, validation and uses of crash data for road safety management. Also, there is no information regarding how these data collectors are trained and what minimum requirements are there for data reporting, if any.

5.5 Nepal Road Safety Action Plan (2011-2020)

Nepal Road Safety Action Plan, which was prepared in 2013, highlights the weakness in the existing governance for implementing road safety program and systematic collection of road crash data. The Plan also recognises the problems with budgets and communication between stakeholders. It emphasizes the need for the collection of meaningful road crash data as follows:

- Improve the RTA database;
- Budget constraints, low priority and no-continuity to the programme;
- Weak coordination between hospitals, health-centres and agencies;
- Database system ineffective, unscientific;
- Database inaccessible, non-transparent;
- Improve accident data collection and research

Similar to the other documents, NRSAP also summarizes the current process with regard to road crash data collection. Traffic police collects and compiles all RTA data in Nepal through their network of local, district and regional offices. The Traffic Directorate at the Police Headquarters maintains consolidated statistics of RTAs in Nepal. These data are segregated by the five development regions in Nepal and includes statistics such as age, gender, vehicle involved and severity of injury. However, these consolidated data do not present the detailed analysis necessary for a comprehensive analysis of accidents.

5.6 Formation of National Road Safety Council (NRSC)

The following excerpts are based on the Nepal Road Safety Action Plan (2011-2020) (MOPIT, 2013), duly rephrased to adapt to changed context over the elapsed period, in order to provide

the background information on why NRSC has been recommended as the most appropriate agency to own and manage Nepal Road Crash Database System (NRCDS).

"The establishment of a central agency that can effectively coordinate all the stakeholders involved in road-safety is the basic requirement for improving road-safety in the country. This need arises from the fact that road-safety concerns almost all sections of the society and government. The existence of the National Road Safety Council in Nepal was initially headed by the Secretary of the Ministry of Labour and Transport Management. With the split in the Ministry NRSC is headed by the secretary of MOPIT. However, this Council was, and still is, dormant since its establishment. It was learnt that an Ad-hoc Committee was formed under the chairmanship of the MOPIT Secretary sometimes ago in absence of NRSC Act or proposed Road Safety Act to undertake policy decisions on road safety programs, but at this stage no one in the MOPIT knows its members and the Ad-hoc Committee meetings have not take place since long.

The establishment of a centralized body such as the NRSC is the option that most of the countries globally have been pursuing to coordinate road safety interventions. Some stakeholders have suggested designating a lead-agency to coordinate road-safety in lieu of the NRSC given Nepal's past difficulty in coordinating road-safety activities. Nevertheless, there is now unanimous consensus that coordinating through the NRSC is the best option for Nepal and this option was endorsed during workshop conducted in 31 January, 2012. The NRSC has been revitalized with higher authority to delegate and implement its various activities. To give it a legal standing, the NRSC is proposed to be backed by the Road Safety Act which is currently under development.

NRSC is expected to have the power to delegate its responsibilities to all relevant stakeholders and request regular reporting for monitoring the road-safety interventions and performance reporting.

NRSC is just a bunch of representatives of agencies having stakes on road safety. The proposed Road Safety Act is expected to define its members more precisely and the requirement to have a secretariat to assist in performing its daily activities. Currently, in absence of the Act, the NRSC has limited authority to implement or instruct to relevant agencies to implement interventions across the board but will nevertheless, in transitional period to set the pace to effectively coordinate and refine the activities proposed in the NRSAP. This has the impact on the institutional, legal and funding framework proposed in this Project for the sustainability of NRCDS.

The Council was expected to be operated at the minister-level and accordingly headed by the Minister of MOPIT with the Ministry's secretary acting as the member-secretary for the executive committee as it ensures higher priority that the council activities demands in terms of inter-ministerial coordination, budget provisions and manpower resource allocations. This is expected to take place when the Road Safety (NRSC Act) with the above institutional structure is enacted. The Road Safety (NRSC) Act is expected to have provision to either nominate or renew the chairmanship, membership of the executive committee on a rotating basis or annually and have the change published in the government gazette. The NRSC will have its own independent secretariat to execute its activities. The Road safety Act (NRSC) Act should also entrust the council to mandate the stakeholders, stipulate mandatory periodic and annual reporting on road safety performance and execute projects conducted under its programmes.

It is thus very important that the proposed Road Safety Act include all of these provisions and the mandatory requirement for all stakeholders to support the development, maintenance and operation of Nepal Road Crash Database System in the country. This is expected to resolve the sustainability of the NRCDS.

5.7 NIRTTP

Nepal India Regional Trade and Transit Project (NIRTTP) funded by the World Bank is currently implementing a number of programs for the development and improvement of transport network for improving Nepal India trade and transit routes. One of the programs has the objective to develop a framework for web based road crash data collection and management system for use by Nepal Police (Traffic Branch). It is currently in its planning stage. The Pilot Project will be implemented in the Kathmandu Valley and along the Birgunj - Kathmandu Road Corridor, the main freight route to the Indian border. Once successful, the Project envisages that the Government would expand the system and implement throughout the country.

NIRTTP's primary concerns are with freight transport, over loading and road safety and the collection of road crash data by the Nepal Police Traffic Branch (NPTB). They are planning a web base system by supplying tablets to Traffic Branch Officers. The crash coding will be based on the traffic incident form already used by Police and introduced in the 1990's under the MAAP5 project.

The NIRTTP is in its very early stages and are yet to engage consultants for the software design or tenders for tablets. As mentioned above, the initial aim is to do a pilot in the Kathmandu Valley and the Birgunj- Kathmandu corridor.

The Nepal Road Crash Data System (NRCDS) is the storage of road crash data collected from appropriate sources. The Project has already identified that the NPTB will be the primary source of data as this conforms to best practice in other countries. The form currently used by NPTB meets most of the requirements for analysis of crash data to identify black spots and to recommend treatments for the reduction of crashes.

The road crash data improvement component of NIRTTP is primarily concerned with the uniform, efficient, accurate collection of data and the long-term sustainability of doing this. The NRCDS Project (under RSSP) has already done a lot of work on what is current practice. The NRCDS is primarily concerned with what data is collected, the coding of this data, the storage of this data and the suitability for end users especially in relation to improving road safety, as well as the ongoing sustainability of data collection and storage system.

At a meeting with the representative of NIRTTP and NRCDS projects, it was resolved that NRCDS Project progresses over the next few months and that it will work closely with NIRTTP to avoid overlap and to assist in the data collection guide so as the end product would be of benefit to all users. The teams have agreed to compare the crash report form with the best practice data collection method and make necessary changes so that the data will be of most use in the analysis of Road Crash Data for safety analysis. The NRCDS Team will recommend changes to be made in the existing form. The NIRTTP Project will then trial the new form, duly uploaded in the tablets, collect crash data and validate the new crash report form and use of tablets.

Both project teams have high priority to deliver sustainable systems in the Nepal context. The issues related to the relationship between the two projects, the safe storage of data and safe back up of data were discussed at length during the initial phase of the Project. Following the outcome of the inception workshop, NRCDS Project is now delivered independent of the NIRTTP's Pilot Project on crash data collection.

5.8 Status Paper on Road Safety in Nepal

The Status Paper document (Thapa, 2013) highlights the need for a good database and the current lack of one in Nepal, problems with under reporting of data and inaccuracy in the data. The relevant issues raised include:

- Clear-cut analysis cannot be made with the available data (as mentioned above);
- Because of absence of dedicated lead agency for road safety, accident data base system is poor in the country;
- Considering a proper accident database system is to be the backbone of any road safety engineering;
- Collection of road accident information started in July 1995 with the help of Traffic Police Office (TPO). DoR helped the TPO to design their own simple Road Accident Data System for nationwide accident database, which basically provides accident statistics but do not provide the necessary detailed information for accident analysis.
- The Objectives of Pillar 1 are to set up a mechanism to improve capacity to manage road-safety.

In summary, in relation to the task of developing road crash database system, there have been recommendations made in the improvement of accident data collection and research. The following issues were identified in terms of the problems in achieving the above mentioned objectives:

- Weak coordination between hospitals, health-centres and agencies;
- Database system ineffective, unscientific; and
- Database inaccessible and non-transparent

5.9 Improving Data Management for Road Traffic Accidents

Department of Roads undertook the study in relation to the need to improve road crash data management and produced the report (N D Lea et. al., 2008) with recommendations to improve the system.

This document highlights the need for collection of accurate, reliable and meaningful data on road crashes. It also points out key data that needed to be collected. It raises issues relating to ownership, responsibility and funding. Major issues with conformity in processes in India and Nepal as well as underreporting are also identified. There are a number of recommendations made by the study. Three of the key recommendations are (1) recognition of road accident data as a prerequisite to road safety management, (2) use of GPS to identify crash locations and (3) improving collection and use of crash data. These are described further in the following sections.

5.9.1 Road Accident Data: A Pre-requisite to Road Safety Management

The experience of many countries has shown that it is perfectly possible to introduce measures that greatly reduce this important economic and human cost but that reliable data are needed to quantify the scale of the problem and to identify the most effective solutions. Collecting road accident data is not a “bureaucratic form filling” exercise because it provides the essential information that each country needs to tackle one of the most widespread and serious problems that it faces.

The essential role of collecting high-quality data on road accidents and on exposure in order to measure the scale of the problem and to devise effective countermeasures needs to be recognized. This recognition should extend from the national authorities to local authorities, the police officers and all those who, in all countries, carry the principal responsibility for recording details of road accidents.

Collecting good quality data on exposure can be expensive, but these data are essential in order to calculate accident risks reliably and then to develop optimal policies for reducing those risks. Better policies based on more reliable information will lead to fewer casualties, so the cost of data collection will be amply justified by the benefits of the resultant casualty reduction.

In the study “Cost of Road Traffic Accidents in Nepal” undertaken by DoR Road Connectivity Sector I Project (ADB Grant 0051-NEP) (N.D. Lea et.al., 2008), it was also concluded that accident data reported by police were inconsistent and inaccurate due to reporting limitations and that the actual crashes could be easily 30% higher than those reported by the Police.

For most purposes the database needs to be able to answer the following questions:

- Where accidents occur: location by map coordinates, road name, class;
- When accidents occur: by year, month, day of week, time of day;
- Who was involved: people, vehicles, animals, roadside objects;
- What was result of collision: worst severity of injury or property damage;
- What environmental conditions existed: poor light, weather, road surface condition; and
- Why or how did collision occur: collision type, driver fault type?

The more complete a traffic accident record and analysis system is the better is the potential for road safety improvement. Research activities in the area of crash data collection must include data file building and maintenance. Systems of software that provide access to the database are a major issue. A number of simple data access functions can interface the system data sets with statistical analysis package.

Much of the accident information available in police files is all too often incomplete and, therefore, has not been utilized to the fullest extent. Road Safety professionals such as highway engineers, traffic police personnel and road safety educationalists, who all endeavour to improve road safety, are handicapped in their respective missions due to non-availability of proper accident data. Road accident records are needed to provide facts to guide programs, including enforcement, education, vehicle inspection, emergency medical services, and engineering to improve streets and highways.

There is a need for better information of the circumstance of collisions, especially with regards to location in order to come up with a general picture of the data. More precise location data could help provide facts to guide programs including enforcement, education, maintenance, vehicle inspection, emergency medical services, and road engineering to improve streets and highways. Accident record keeping has to been given much priority by concerned government agencies. So far, there is no integrated database that accounts for accidents statistics for the whole country

The developed world, through experience, has realized that no single database will address all of the information needs of policy makers, as the range of questions is so diverse. Also, the resources are limited so that in anyone database it is possible to have large number of cases with little detail or few cases in considerable detail. The choice made depends on the nature of the research questions to be addressed and also the manner in which the database can be integrated with others to form a complete picture of accident causation.

During the visits to Kathmandu Metropolitan Traffic Police Office and some other districts, it became clear that the Road Accident Report Form developed in mid-1990's was more or less consistently used for reporting road accidents. This is a positive thing. However, the data in the filled Accident Forms are not complete and not transferred to a computer database by the Traffic Police at present and kept in hard copy in their respective local offices.

The Traffic Directorate at Nepal Police Headquarters also maintains consolidated statistics of road-accidents in Nepal segregated by five development regions (and districts) in Nepal

and includes statistics such as age, gender, vehicle involved, and severity of injury. However, as consolidated data, these do not provide data in detail necessary for comprehensive analysis of road accidents. DOR informed that the Traffic Directorate at Nepal Police maintains all the accident data in their central computer database system called NRDS, along with other police data. NRDS is database software based on Oracle but access to this system is restricted due to security and confidentiality issues.

As Traffic Police fills up the Accident Form in their office from the anecdotal description filed at the site, the above finding show that there is general laxity in correctly or completely entering all data at the office. The details pertaining to pedestrian casualties was most lacking in general with only 29% of the details filled up.

Some of the other details that were generally deficient or lacking in the filled Police Records were as follows:

- Name of the road or highway where accident occurred was not explicitly shown in the collision diagrams. However, direction and place location was indicated in all these diagrams.
- The reference to particular Form (Report No.) was not given in any of the samples.
- The absence of reference to computer Number is understandable, as currently Traffic Police do not have computerized RTA data at their local offices.
- The laxity towards correct and complete data entry in the Accident Forms, as discussed above, clearly underscore the need for proper training, orientation to police personnel in data entry on a continual basis.
- The fact that none of the samples of the Forms were reviewed by superior officers responsible, underscores the need for mandatory cross checking to rectify the errors, omissions during data entry.
- As discussed previously, numerous data entered in the respective spaces of the forms did not tally with either their anecdotal notes and/or collision diagrams. For example, 93% of the sample reviewed had reference to basic information in their anecdotal notes.
- Details regarding use of safety-features such as seat belts and helmets were not usually filled up in most cases. For four wheeled vehicles, this can be attributed partly to the fact that Traffic Police stopped the strict enforcement of the traffic rule mandating use of seat belts.

Currently, there is no permanent network arrangement between DOR and Traffic Police to collect the accident data from the latter agency for comprehensive accident analysis. However, during the late nineties, DOR Traffic Engineering & Safety Unit or TESU (now renamed the Road & Traffic Unit, RTU) had collaborated with the Traffic Police to collect accident data under the UK-assisted Road Maintenance Project (RMP). RMP had also installed TRL MAAP5 Accident Software at DOR TESU and Valley Traffic Police Office, VTPO (now the Metropolitan Traffic Police Division - MTPD).

At the preliminary stage and till modern technology such as GPS can be applied, manual customized maps should be used at the inception of the collaborative programme on accident data management between DOR and Traffic Police. These customized maps are a set of location maps of the area concerned that have national coordinates to assist and improve referencing the accident location, in addition to salient features, landmarks, ward number within the area in question. However, the grid coordinates should have accuracy to the nearest 10 m in order to be meaningful for accident analysis.

5.9.2 Use of GPS

This is the most popular method that road authorities and Traffic Police, globally, use to locate accident site. Since its inception, there have been a lot of technological advancements in portable GPS devices and their unit cost has also come down with wider use. DOR RTU has expressed its preference for a GIS based software for the accident data management, which is logical due to its efficiency, flexibility, accuracy, etc., compared to the manual referencing system and its compatibility with the central GIS based road network database maintained at DOR central office. This option is therefore logical as it is compatible and inherent part of GIS based applications.

At this stage, all local and district offices of Traffic Police will be equipped with mobile GPS devices. Traffic Police attending to an accident site will automatically input the coordinate generated from the GPS device in the Accident Form. In the initial period, vendors providing the portable GPS device should configure and set up the device according to the area where it is to be used. There should be provision for necessary training and instructions from the vendors to Traffic Police for using the GPS device.

5.9.3 Improving Collection and Use of Data

The design and operation of the national data collection system should not be “left to chance”. It should be reviewed regularly to ensure that it meets the requirements of various stakeholders while not imposing unrealistic burdens upon the data providers, i.e. the Police.

Naturally, police officers should be well trained to collect the accident data and make the best use of the national data collection system.

Accident data collection should explicitly be accepted as a very important task for police force and all those involved in the process, not something that they are implicitly expected to do in addition to all of their other responsibilities. The collection system should take account of the interests of data users, not just of the interests of the Police as data collectors.

Data on damage-only accidents should also be collected, at least on a sample basis, or made available via insurance companies. This kind of data is necessary to complete the accident severity from those with material damage but no human casualties.

Road safety is receiving increasing focus in international context, for example the EU target of halving the number of road accident deaths. It is desirable to move towards a common system for recording road accident data. This 'common system' would encompass all aspects, including the definitions of fatal, serious and slight injuries. The main advantage would be that data from different countries could be compared

If a significant and new road safety measure has been taken, then a programme for monitoring its effects should also be set out. The systematic assessment of the effectiveness of these measures will help future planning.

Traffic Police should give due priority to complete all data in the Standard Accident Form and superior officers should strictly crosscheck errors in data entry. In this aspect officers at accident sites should be instructed to accord due attention to enter data pertaining to pedestrian, passenger casualties, vehicle-damage only accidents. Traffic Police should also ensure that each accident form is referenced to aid cross checking and prevent duplication of RTA data.

A formal agreement in the form of memorandum of understanding to permit collaboration between DOR and Traffic Police for managing accident data management is one of the first prerequisite for effective accident reduction and prevention. This formal agreement should either be published in Government's gazette or reflected in necessary rules and regulation to make it legally binding upon these two authorities.

Additional funds should be allotted for manpower, computer logistics for effective management of accident data as discussed in previous sections. Similarly, adequate training to both Traffic Police and DOR is necessary to ensure effective accident analysis, reduction and prevention.

While DOR RTU is expected to do most of the analysis, specialist input may be required for more complex accident analysis. DOR RTU should plan to train its engineers at DROs in the aspect of accident analysis, reduction and prevention where the accident data management is decentralized at DROs in the long term.

Traffic Police should be responsible for computer-entry of the RTA data to ensure a sense of ownership, incentive over these data and restrict collection and compilation of RTA data to a single organization. They should also develop the capacity to analyse the data for their own planning, once it is available from DOR after they have put the data online.

DOR and Traffic Police should regularly interact (say monthly basis) to discuss the former findings on accident analysis and seek consensus on the same. These meetings should also include other stakeholders if necessary.

For comprehensive RTA analysis, using customized and strip maps or portable GPS devices should improve the system of referencing the location of accident. However, due to ease of data transfer and compatibility to more sophisticated GIS applications, DOR and Traffic Police should plan to introduce GPS technology.

5.10 Rapid Desk-based Study: Nepal Road Safety

Fletcher (2013) highlighted the lack of adequate police crash data in Nepal to evaluate any questions being asked by the funding agencies (including DfID) interested to contribute to better road safety outcomes in Nepal. The study was undertaken to investigate potential funding by DfID in road safety improvements in Nepal. In particular, the question related to the benefit of using road crash barrier was investigated, which, in fact, was the basis for the DfID grant to support RSSP's activities. The study found that

- There is generally a very poor evidence base to indicate the effectiveness of road safety measures from comprehensive evaluations done in Low and Middle Income Countries (LMICs). A key reason for this is the lack of adequate police crash data.
- Crash data reporting and collection systems in Nepal are reported to be poor. This means it is very difficult to get a clear impression of crash and casualty patterns across the country from systematically collected sources.
- The surveys also found that many more people, both poor and non-poor, are being killed and seriously injured in road crashes than police data indicate.

5.11 Road Crash Data for Local Road Network (LRN)

The practice of collecting crash data in the road network other than strategic roads and urban roads within Kathmandu Valley is very ad-hoc to this stage and in fact non-existent. The NRSAP is not even clear about the needs to include local access / service roads in the proposed road crash database system. MOPIT, DOR and DOTM seem to focus on road safety for strategic roads and other local roads of any major "political significance". There seems to be no clear cut policy directives on how to manage road crash data on local roads, which are public in nature. Nepal Public Roads Act and Regulations (under revision currently) are expected to define the scope of government agencies regarding public roads and road related areas for the purpose of identifying road safety issues and therefore the road crash database system under development. Until such regulations are enacted, NRCDS would not consider including road crash data in the local roads network (other than core network) in its system.

Initial consultation with DOLIDAR officials in connection with the creation of Nepal Road Crash Database System (NRCDS) revealed that DOLIDAR is progressing to manage road safety on the roads of its ownership independently of the policies on strategic roads and therefore the development and maintenance of road crash database system for strategic and local roads should be different. Officials claim that the road safety policies, guidelines, road safety notes, road safety audit process developed by DOR in mid 1990s are not applicable to LRNs and that different set of guidelines, road safety audit manuals and road safety notes are needed. This should not be the case technically, as otherwise, nodal points (e.g., intersections of local roads with DoR roads) will be left out of the NRCDS.

Local Rural Access Programme 3 Briefing Note – LRN Road Safety (DOLIDAR, 2013) was developed to address these road safety policy concerns. Needless to say, this document highlighted the lack of detailed crash data on these roads while mass casualties involving low income people are occurring on these roads.

The Briefing Note has clearly argued that there is an insufficient database available regarding accidents in rural roads, making it impossible to determine the types of accidents and their causes in order to address issues related to reducing potential of happening road crashes again. It is also not possible to scientifically prove the causes of road accidents in local roads. In fact, road safety engineers are having difficulties to obtain crash data even in national highways at this stage. The creation of road crash database for both local roads as well as for strategic roads has to be an action of high priority for the Government of Nepal.

5.12 Nepal Road Safety Action Plan (2013 – 2020)

Nepal Road Safety Action Plan (2013-2020) highlights the weakness of the governance for implementing road safety programs, data collection and problems with budgets and communication between stakeholders. It also highlights the need for the collection of meaningful road crash data.

- Improve the RTA database.
- Budget constraints, low priority and no-continuity to the programme.
- Weak coordination between hospitals, health-centres and agencies.
- Database system ineffective, unscientific.
- Database inaccessible, non-transparent.
- Improve accident data collection and research

Traffic police collects and compiles all RTA data in Nepal through their network of local, district and regional offices. The Traffic Directorate at the Police Headquarters maintains consolidated statistics of RTAs in Nepal. These data are segregated by five development regions (and districts) in Nepal and includes statistics such as age, gender, vehicle involved and severity of injury. However, these consolidated data do not present the detailed analysis necessary for a comprehensive analysis of accidents.

The ADB assisted Road Connectivity Sector I Project had studied accident data management in 2008 and proposed the indigenous development of software for accident data analysis. However, no progress has taken place regarding these studies.

5.13 Best Practice Crash Data Management

A review of the selected international, regional and local initiatives in road crash data management front reveals a very similar method of collecting information on road crash in most countries. These are internationally accepted best practice in data collection, coding and storage system and will be followed in the development of NRCDS as well.

Police are the main collection agency as they are the legal body responsible for ensuring the safe operation of the road system as well as the legal entity that is trained to investigate situations where there is loss of life, serious injury or property damage. So the collection of road crash data falls naturally into their duties.

The road crash data is supplemented and or validated by the collection of data from other agencies, such as emergency services and hospitals as well as from other government bodies responsible for road details, vehicle and licensing information.

The most common method of collection is the simple data survey form, or crash report. These survey forms are designed to collect sufficient data to meet the needs of the multi end users of data. The police need evidential proof, educationalists need behaviour, and age and sex information, road safety engineers need road information, types of crashes and location.

The design of the crash report form is very important both in the amount of information collected, but also that the information is easily interpreted. There must be consistency in the way data is collected and how the forms are filled in. Most crash reports require the officer to complete a crash diagram and Police are usually trained in how to indicate vehicle movement and directions and type. The data section of the form will have sections that require an understanding of crash types, that is head on, and the proper definition of what crashes fit into this category.

Finally, the forms proposed and/ or approved by responsible agencies have questions that are designed to check that the information has been collected correctly, and that there are validating questions. For example, if the officer has indicated that it is a head-on type collision, the simplest validating questions are the direction of travel of each vehicle before any maneuver was in opposing (or opposite) directions. The next check question was: where was each of the vehicles damaged in this crash, then the maneuver of each vehicle. Clearly, reversing or overtaking would be maneuvers which would not result in a head on. Lastly, there must be a good diagram of the crash site showing as much details as possible, for which police officers must be trained.

The next part of most systems is the entry of data from the paper form to a computer system. The investigating officer does this in most developed countries. They are the one who attended the crash scene. If something was missed or has to be checked they are the most appropriate officers to do this, as it is fresh in their mind. In developing countries, because of the limited or no access to computers in small stations, the form may be entered at divisional or regional offices. In developed countries, all data is retained by the police. They have the legal duty of investigating criminal negligence, non-compliance in licensing or registration or prosecutions in relation to drink driving or dangerous driving and so on. The bulk of the data is transferred to another authority, often roads related, for their investigation and analysis.

One of the most important best practice steps is the safe storage of all the data. Crash data must have at least three years of continuous collection before proactive action can be taken with confidence based on the information collected at the crash sites. In no system is action taken without the technician or engineer reviewing the original Police data and information for a site. The collection of data simply allows government agencies to be proactive in identifying “Black Spot” on the road network and in taking measures to reduce risk to life and cost to the community. With limited funds, this method achieves better results by addressing those sites first.

This practice of collection of data and the use of data is fairly standard around the world. Road safety has been a growing concern since around the 70’s in most developed countries as the ownership of vehicles in those countries expanded around that time, more people were being killed on the roads and governments of all persuasions acted to reduce this loss in their communities for both humanitarian and economic reasons. In developing countries ownership of cars is increasing recent times and awareness of road safety is also increasing.

The concern at present is that the overwhelming majority of people dying on the roads are in the low-income countries like Nepal, where vehicle ownership is very low. So, the importance of data collection now is that the carnage is only going to get worse as more people become vehicle owners. Without the collection of data, the policy makers, educationalist, engineers do not know what the real problems are and what the perceived problems are.

In the Nepal context, the aim is to just start to collect data. The first stage of this process may not be the world’s best system. It may not involve any high-tech or high cost solutions. The first step that must be taken in the Nepal context is to start collecting sufficient data and keeping it. This project only recommends ways of doing this in relation to current practice but does not create the data. Crash data are simply not available to populate database system

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CHAPTER 6

POLICY GUIDELINES

6.1 Policy Statement

As an apex body in the country National Road Safety Council (NRSC), has a responsibility to oversee Department of Roads (DOR) and Department of Local Infrastructure and Agricultural Roads (DOLIDAR), who design, construct, maintain and operate roads in order to promote safe and efficient travel for all road users. NRSC has also the responsibility to coordinate with the Nepal Police Service (NPS) within the Home Ministry and Department of Non-communicable Disease within the Ministry of Health and as well as with the Ministry of Education in managing road safety activities in the country.

NRSC is committed to creating and maintaining a crash database in an objective, transparent and timely manner. The database will be simple to use, cost effective (low maintenance and operation cost) and easy to manage. This policy will ensure the Nepal Road Crash Database provides a factual account of all information including any infrastructure interaction with road users involved in all road crashes, which can be used by respective road agencies to improve safety.

The Nepal Road Crash Database is a system of objectively storing crash data collected during crash investigation undertaken by the competent authority. Apart from Nepal Police Service (NPS), investigation of each fatal crash and some high profile serious injury crashes are also undertaken by relevant road agencies. This is done so in order to establish the causal factors of a road crash to determine if there were any road factors or road infrastructure characteristics, which may have contributed to the crash cause or severity.

The crash investigation by road agencies is conducted in parallel and independent of any police investigations to ensure integrity of road agencies' crash investigation findings. NRSC is committed to develop a separate policy on fatal and serious crash investigation to guide road agencies for undertaking crash investigation

6.2 Defining a Crash

A road crash, for the purpose of this Policy, is a crash reported to the NPS which resulted from the movement of at least one road vehicle on a road or road related area and involved death or

injury to any person, or property damage. Note also that to qualify as valid, crashes must meet the following criteria:

- The crash occurs on a public road, and
- A person is killed or injured, or
- At least one vehicle was towed away, or
- The value of the property damage is NPR 25,000

The crash must also be determined to be "In Scope" in accordance with the Nepal Road Crash Database Management Manual.

"Out of Scope" crashes include road crashes resulting from suicidal attempt and medical conditions (e.g., heart attack, stroke) while driving.

6.3 Sources of Road Crash Data

Road Crash Data records collected during crash investigation by NPS will be the primary source of information to create Nepal Road Crash Database. Crash investigation report prepared by road agencies and the medical report from hospitals can be used to augment or update crash data.

The investigation of serious injury crashes will be limited to those crashes that have been brought to road agencies' attention by the Nepal Police Service (NPS) crash investigation officer (as a result of potential road contribution). Additional serious injury crashes can also be investigated at the discretion of the Chief Executive of road agencies if these are of high profile nature and have got wider community interest.

A copy (out of three) of all crash record forms completed by NPS at crash scene or later at Police Stations or District Police Offices shall be sent to Traffic Directorate with the second copy to NRSC within a week of crash scene attendance. A copy of crash investigation reports shall be mandatorily submitted by road agencies (DOR or DOLIDAR) to NPS and NRSC each within three months of crash. NPS and NRSC shall be responsible to update crash data in their database system based on the findings of crash investigation in case of discrepancies.

6.4 Ownership

NPS shall be the owner of Nepal Police Road Crash Database System (NPRCDS). NPS shall be responsible to enter crash data from the Crash Report Form and manage (NPRCDS). NPS shall send crash data from its NPRCDS to NRSC after removing sensitive information such as personal information or vehicle registration number that could be used to identify crash

victims. NRSC shall be the owner of Nepal Road Crash Database System. NRSC shall be responsible to further test, validate and confirm coding of data sets and enter only clean data in the created Nepal Road Crash Database required for safety analysis purpose. NPS shall not be responsible to disseminate crash data. It is not responsible to maintain and manage crash database for use in road safety analysis.

NPS continues to enter raw crash data in their database system or keep records of hard copy as required by law in accordance with the existing system if required in addition to NPRCDS.

6.5 Objective

The policy objective is to support the achievement of NRSC's road safety goals by:

(a) For all crashes

- Attending on time (response time depends on nature of crashes, accessibility, availability of resources but not to be unreasonably delayed) all crash scenes that are reported to Police (nearby local police stations) and completing crash record forms (using tablet where available or paper form) at the crash scene;
- Sending the completed forms as soon as possible but not later than seven days to District Police Offices (DPOs);
- Forwarding verified crash record forms to Traffic Police Directorate (Naxal, Kathmandu) within 14 days;
- Advising road agencies of the fatal crashes within seven days of occurrence for their consideration to undertake independent investigation; and
- Sending copies of all paper road forms to NRSC within seven days of attending crash scenes.

(b) For fatal and high profile serious injury crashes

- Ensuring crash investigations are timely and undertaken within fourteen days of road agencies being advised of the crash, in order to identify the involvement of possible road factors;
- Identifying, if warranted, provision of short term or urgent remedial treatment implementing measures to minimise the occurrence of a similar event;
- Producing a crash investigation report within 60 days of the road agencies being advised of the crash. This report will then be circulated to enable peer review;
- Providing a consistent road crash investigation framework for different road agencies and ensuring that experienced crash investigation officers (must have at least 5 years

of experience in crash investigation or road safety engineering or traffic engineering or relevant road design) are assigned to undertake crash site investigations;

- Ensuring that appropriate remedial actions are programmed in a timely manner; and
- Assisting with the reduction in the frequency and severity of fatal and serious injury crashes on strategic roads (DOR) and roads defined as core local road network (DOLIDAR).

6.6 Scope

Nepal does not have its clear policy yet in regards to developing, owning and managing the Nepal Road Crash Database. In fact, what constitutes a road crash and which agency should own road crash database is also not clear. The scope of this document is to provide a policy framework that forms the basis for developing Nepal Road Crash Database System.

In order to support the identification of potentially hazardous locations on roads and to enable road agencies to develop and implement appropriate safety measures and to assist other agencies responsible to manage road safety in making informed decisions on managing road safety (education and awareness campaign as well as post-crash response management), NRSC shall create, maintain and manage the Nepal Road Crash Database based on this Policy.

6.7 Rationale

The policy is consistent with the strategic priority of the NRSC to provide safe roads, safe road environments and safe management of traffic as mandated by Road Safety Action Plan (2013-2020) endorsed by the Government.

6.8 Applicability

This policy applies immediately to all strategic roads managed by DOR and roads defined as core local road network by DOLIDAR.

6.9 Road Crash Database Management

Trained crash database officers from NPS will enter crash data; manage the NPRCDS in accordance with Nepal Road Crash Database Management Manual (NRCDMM). The management framework shall be based on the principle of sustainability. Trained crash database officers will verify crash data received from NPS, compare with the data from the copy of crash report form, test, validate and confirm coding of data sets and retain only clean data in the Nepal Road Crash Database required for safety analysis purpose. System Analyst engaged by the NRSC shall be responsible to analyze crash data, prepare daily, weekly, monthly and annually crash reports and disseminate these through NRSC/ MOPIT web site for

public consumption. Request for specific reports from road agencies, road safety professionals shall be managed by NRSC. NRSC shall develop crash data request form for making requests based on NRCDS Users' Manual.

6.10 Road Crash Data Use Management

The Nepal Road Crash Database Users' Manual (NRCDUM) will guide use of crash data.

The access to Crash Database will be limited to trained NRSC officers or any other officers approved by NRSC.

Detailed crash data required for safety analysis will be made available to all interested parties upon request. The request shall be made using the form duly approved by NRSC after the payment of fees. All internal and external stakeholders are required to pay a fee as determined by NRSC time to time for its service to provide crash data.

6.11 Monitoring and Reporting

DOR's Road Traffic Unit will analyse, monitor and report on the road safety performance of key (or all) strategic roads quarterly. DOLIDAR's Road Safety Unit will do the same for their core road network. Similarly, other agencies such as NPS, DOHS will monitor and report the progress on road safety outcomes. This system makes relevant agencies accountable on road safety delivery and at the same time help raise awareness to the community how Road Safety Action Plan is delivering its expected road safety outcomes in the country.

6.12 Consultation

The following agencies have been consulted in connection with the formulation of this policy.

- NPTB's representatives;
- DOR's representatives;
- DOLIDAR's representatives;
- DOTM's representative;
- DOH's representative;
- National Trauma Centre's representative; and
- And other selected major hospitals' representatives.

6.13 Review

NRSC is responsible for the annual review and update the policy to maintain its currency.

6.14 Related Documents

The following documents are related to the implementation of this Policy.

- Nepal Road Crash Report Form;
- Instruction Sheet for completing Nepal Road Crash Report Form;
- Nepal Road Crash Database Management Manual; and
- Nepal Road Crash Database Users' Manual.

CHAPTER 7

IDENTIFICATION OF GAPS AND IMPROVEMENT NEEDS

7.1 Introduction

Currently, there is no meaningful or useful Road Crash Database System in Nepal. Data collected and published by Nepal Police Services (NPS) is an aggregated report, which is not useful for safety analysis. The data is collected on an outdated crash report form introduced in 1996, which has no instructions for its use, no supporting documentation and no procedures for collection and retention of data. The following are the gaps identified in the current system and the minimum requirements for the collection of data for Nepal Road Crash Database System (NRCDS).

7.2 Ownership

During the consultation with Nepal Police the Project team was unable to establish any actual policy or procedure that gave instructions on the use or storage of road crash data that they were collecting. The Police were only keeping hard copies of the crash reports for court procedures, as they had been instructed to do so by the court system, as this was a good form of evidential proof. As for all other data they were only entering totals into a system for reporting. This data was not stored down to the individual crash level. Other than the forms retained for court deliberations, all forms (in most cases) were just discarded. Even the court related forms were only kept until after the court cases and were also discarded soon after the closing of the cases.

There were some isolated cases where the senior officers who had been involved in the 1996 MAAP project, knew the importance of the data and were instructing staff to store all crash reports. Also on more than one occasion different senior officers made the same comment “we know that the individual data is important, but no one wants it.”

So the very first issue is the resolution on the ownership of the data and an instruction that the data needs to be collected for that owner. As the data is required by many end users, it is recommended that the National Road Safety Council (NRSC), which is the apex body for the country's road safety management, should own the road crash data. However, as the sole collector of the crash data, NPS has ongoing responsibility to maintain and manage its database

system, herein identified as Nepal Police Road Crash Database System just to differentiate between the two database systems.

As an apex body in the country the National Road Safety Council (NRSC) has the responsibility to oversee the Department of Roads (DoR) (under MoPIT) and the Department of Local Infrastructure and Agricultural Roads (DOLIDAR) (under MoFALD) design, construct, maintain and operate roads in order to promote safe and efficient travel for all road users. NRSC has also the responsibility to coordinate with the Department of Non-communicable Diseases within the Ministry of Health and Nepal Police Service (NPS) within the Home Ministry as well as with the Ministry of Education in managing road safety activities in the country.

It is the recommendation of this Project that the National Road Safety Council (NRSC) as the apex body should be the owner of the system. This fills the gaps on the ownership of crash data that would be used by all road safety professionals. Nepal Police should continue to complete the crash form and enter the data from the form into the database system using Smart Crash Data Entry Screen. NPS will be the key owner of the crash database system. The system owned by NPS has been identified as Nepal Police Road Crash Database System (NPRCDS) and the system owned and managed by MOPIT is simply called Nepal Road Crash Database System (NRCDS). Both agencies will use the same database system. The NPS will hold data including sensitive personalized information and NRSC without it. Personal information is not important for road safety analysis, planning, programming and project delivery.

7.3 Responsibility

As mentioned above the Nepal Police Services was collecting data for only two reasons, court and totals report. There was no formal allocated responsibility, it is basically a chain of command instruction and a “sense of duty” to do so.

As pointed out in Section 6 the responsibility to collect data should fall to the Nepal Police. The suggestion of this is consistent with best practice around the world, as the police departments are the body that are charged with the responsibility of keeping roads safe for all users through enforcement and other activities. They are also charged with the responsibility to investigate incidents when there is loss of life, serious injury and property damage. Thus police officers are generally trained in investigative procedures.

So the recommendation of this Project is to continue give the responsibility of the collection of road crash data and managing in the first instance road crash database system to the Nepal

Police Services. As laid out in the Policy Guidelines, this responsibility will be for all crashes with the task and time assigned to the process:

- Attending on time (response time depends on nature of crashes, accessibility, availability of resources but not to be unreasonably delayed) all crash scenes to be reported to Police (nearby local police stations) and completion of crash record forms (using tablet where available or using paper form) at the crash scene;
- Sending the completed forms as soon as possible but not later than seven days to District Police Offices (DPOs);
- Forwarding verified crash record forms to Traffic Police Directorate (Naxal, Kathmandu) within 14 days;
- Entering crash data from the crash record form in NPRCDS;
- Advising road agencies of the fatal crashes within seven days of occurrence for their consideration to undertake independent investigation;
- Sending crash data entered into NPRCDS weekly to NRSC's NRCDS;
- Sending copies of all paper road crash forms to NRSC within seven days of attending crash scenes for checking, validating and confirming correctness of crash codes if required for safety analysis by road agencies and other road safety professionals.

7.4 Accountability

With the assignment of the responsibility for data collection and management of NPRCDS to the Nepal Police Services, the question remains: who is accountable to manage this data? Police are only responsible for the collection of data and are accountable for the purposes they currently collect it for court and totals reporting to their Headquarters. The recommendation has only added two extra responsibilities to their task, what crashes they report and the forwarding of a copy of that report to NRSC, sending crash data weekly to NRSC's NRCDS in addition to managing their own database system (NPRCDS).

The NRSC has been proposed to make accountable for the management of these road crash data following the initial entries of crash data in NPRCDS. As these data have been received by NRSC from NPRCDS as well as in the raw form in paper crash reports, the NRSC is now accountable to do something with this raw data that are required for safety analysis purpose.

Trained crash database officers engaged (or outsourced) by the NRSC will verify crash data obtained from NPS, manage the database system in accordance with Nepal Road Crash

Database Management Manual (NRCDMM) for the purpose of safety analysis. The management framework shall be based on the principle of sustainability. NPS is responsible to maintain and manage NPRCDS, also in accordance with NRCDMM.

The recommendation of this Project is that the NRSC is the accountable institution for the management of the road crash data to be used for safety analysis. Traffic Directorate of NPS is the responsible agency to enter the data from the completed Crash Report Form and is accountable for the supply of crash data for court cases, insurance or litigation purposes as well as managing enforcement of traffic rules for better safety outcomes. The smart data entry form developed by the Project will automatically code crashes and the information will sit in NPRCDS as they are entered. In this way the chain of command and accountability is maintained within the NPS and the TD/NPS is ultimately accountable for NPRCDS. NRSC gets crash data together with hard copies of report forms from NPS to create NRCDS of its own. NRSC needs to provide adequate resources (including dedicated staff - database operators, road safety engineers and system analyst) to manage NRCDS. These resources could be employed in any manner: either as teams within the government or outsourcing of checking data coding and data entry activities to an external agency either by line of management or contractual agreement to the NRSC.

7.5 Sustainability

Previous attempts to collect data, in particular the MAAP project in 1996 revealed that insufficient emphasis was placed on the protection of data collected and the ongoing collection of data. After a relatively short period of time the system failed and the collected data was lost. The only item that has survived has been the current crash report form used by the Nepal Police Services.

This topic of sustainability is discussed at length in Chapter 3. The nucleus of the concept is to put in place Policy and Guidelines, Responsibilities and Accountabilities, simple IT systems that are easy to use and manage, economically viable, and finally a Management Manual that will attempt to give ongoing guidance to those who have been made both responsible and accountable.

This project cannot deliver a “magic pill”, “here it is and everything will now be better and look after itself”. This project can only deliver recommendations, guidelines and some simple IT platforms to get the important process of collecting meaningful data started. Ongoing data collection, management and funding will be required; so all the items mentioned must be addressed and acted on to achieve sustainability.

Every aspect of NRCDS is interrelated and all of them must be addressed to achieve sustainability. With NPRCDS sitting with TD/NPS and NRCDS sitting with NRSC/MOPIT, each system having appropriate data back-up features, it is believed that the system will be sustained and data will not be lost as NPRCDS and NRCDS complement each other.

A range of recommendations on institutional, legal and funding fronts have been made to ensure sustainability and continuity in collecting crash data report form. For sustained operation and management of crash data, it is important that there is a need to establish good working relationship / mechanism established between MOPIT and NPS. Formation of Road Crash Data Governing Group made of senior officers from TD/NPS, NRSC/MOPIT and Non-communicable Disease/ DOH or Hospitals may be considered within the NRSC framework.

7.6 Uniformity

Currently the Nepal Police Services attend crashes and collect some data. Major issues in maintaining uniformity in the collected data are: what crashes are attended and how much data are kept. Absence of instruction sheet to assist police officers to complete road crash report form and training on crash investigation are other issues for wide variation in the way crash report forms are completed. Consultation at various police offices and at different levels of management revealed that there is no steadfast, consistent system in place in relation to road crash data. There is no clear process and there is inconsistency in the quality of the forms that were able to be collected. There is inconsistency across the board and this is a major issue for the collection of road crash data.

The problem to most of the issues in relation to collection and retention of data may be solved by the resolution on the responsibility and accountability as recommended in Section 7.2 and Section 7.3 above.

Consultation with the Nepal Police Services revealed that there would be a willingness of the service to begin operating along the lines of the recommendations of the Project. If this is so, collection of road crash data that is currently not being captured or retained, may be able to be done so with the help of NPS before any formal ratification of recommendations made in the Policy Guidelines. This will begin the important process of building some history into a Nepal Road Crash Database. Making TD/NPS responsible and accountable institution to enter crash data from paper form (or tablets) will ensure uniformity, consistency and completeness in the collected crash data.

But until those policy directives / guidelines are put in place there would be willingness by the Nepal Police Services to start operating along those guidelines. The daily loss of data can be prevented if the process of data transformation and entry could be started and the building of history, which is needed for creating a useful database, will begin.

The recommendation is that senior officers are approached and their support is sought before any policy or guidelines are put in place. It is recommended that as many crashes as possible are attended in all divisions / districts/ police stations, the current crash form is completed as much as possible at each crash site and a copy of these forms are sent to a central location for storage and entry in the computer system.

It is believed that the Nepal Police Services will be willing to give as much assistance as possible not just because of their sense of duty but their involvement in the daily carnage on Nepal's roads. Also, more than one officer who were consulted made the following type of remark, *"we know that data is important, but nobody wants it"*. With NRSC/ MOPIT made accountable to manage NRCDS for crash data dissemination for safety analysis, there would be a top government agency wanting crash data and NPS is expected to be encouraged to complete crash report forms.

It is important to note that crash data for effective analysis needs to have at least three years of history. Best practice recommends five years of history. The reason for this is an "averaging effect". If in a relatively short period of time, there are series of serious crashes at the same location it may be incorrectly interpreted that this location is performing worse in relation to other similar locations. It's not that such locations are not to be investigated, there may be some unusual circumstances that may be addressed, but identification of true "Black Spots" needs a history of data and the comparison of like for like locations.

So this Project recommends that an interim procedure be developed with NPS as soon as possible to stop the loss of historical data.

It is noted that the NIRTTP will soon be commencing their pilot project and they will be involved in consultation with the Nepal Police Services in relation to the collection of road crash data. There may be the opportunity to introduce this interim procedure during their consultation process. This possibility was discussed at the stakeholders' workshop in March and focused group's workshop in June 2016. There was common consensus among most stakeholders that the current practice of completing crash report form should continue and that measures (such as developing instruction sheet - how to complete report form and training) should be introduced for maintaining uniformity and consistency as soon as possible.

7.7 Retention

In the situation of a fatal or serious injury the general rule is that the crash report is kept for legal use in the court system. But once the trial is over the form in most cases is not filed or retained. There was one exception where a senior officer had given instructions that all crashes should have a form filled in and that form is retained.

Some raw data is entered from the forms into the NPS data system and these numbers do give an overall picture of issues that Nepal faces in addressing the carnage on its roads. But all the information is not entered and the forms are not retained. Thus, identifying actual locations or contributing circumstance to crashes at those locations or drivers and so on, is not possible from the aggregated data retained by NPS. Road safety engineer need data that are road, location, type (code), contributing factors specific so they are able to suggest appropriate countermeasures. MOPIT or relevant road agencies need these data and therefore MOPIT or road agencies should own and manage their own Crash Database System, taking data from the "parent" source NPRCDS.

In most developed countries, the police officer that attends the crash also enters all the data from the crash report into a computer-based system. The reason for this is that the person who attends the crash is more likely to identify a question that has not been completed correctly on the crash report form. It also means that there is a line of command in supervising the completion of reports as well as the ability to directly check with officers if something is not completed.

There are 1016 individual police stations (temporary police stations excepted) in Nepal and in theory the smallest of the posts may have to respond to a crash and complete a crash report form. Not all the stations have access to personal computer or the internet. The paper crash report forms being sent to district police office (or regional or central police headquarter) may be the only solution (unless all police stations are given tablets, personal computers and access to internet) for this Project to start entering data.

If NPS, at these locations, were entering this raw data into a computer base system it is believed that this would have many efficiency and accuracy advantages in the collection of data. When the NPS are entering data, they will be immediately aware if data has been missed or there is confusion of details on the crash report. As it is the police officer entering data for other police officers there is already a clear line of communication between these officers as well as a clear line of authority. If all the crash reports come to one central location for keying and this centre is another government agency or even outsourced, there are no clear lines of communication

between the police officer who completed the crash report form and the data entry staff now keying the raw data into a computerized system. It will be an extremely difficult task to check unclear details on a crash report for these staff that are not connected in any way with the original police officer.

The above suggestion that the raw data is keyed into a computerized system was discussed at the March Workshop where all stakeholders were present and it was the clear expression that NPS would be happy to undertake this task provided resources are made available to them.

So, the recommendation of this Project is that, regardless of the type of model chosen by those responsible and accountable stakeholders, the raw data is keyed into a computerized database system by TD/NPS. This procedure will have clear guidelines set out in the NRCDS Management Manual to create a process in which there is no possibility of the loss of data in the future. Training on entering data is also very much essential.

7.8 Quantity

There were inconsistencies from office to office on what was collected and how much data retained. As mentioned earlier, some offices only kept crash forms for those crashes going to court and then disposed of all others after only noting a few data for headquarters reporting. Some offices attend minor crashes but did not complete a form, yet others had been instructed to keep all forms and attend all crashes. There is a lack of clear instruction to NPS local stations and not a lack of duty. The officers consulted know the importance of quality and completeness in the crash set data and yet they do not have clear instructions, procedure or policy to complete the crash report form.

The recommendation is that the Government (in this instance NRSC) give a clear directive, as set out in its responsibility as above to NPS to attend all crashes as defined in the policy guidelines, fully complete a crash data report form for each crash and forward the copy to TD/NPS for entering into the NRCDS which NRSC will receive for its NRCDS.

Apart from the gaps in the quantity of data collected in the individual form, underreporting of number of crashes is also compromising the quantity of the crash data. While it is not possible to capture 100% of crashes occurring in the country, strategy needs to be devised which helps at least fatal, hospitalisation and injury types of crashes are not left out. Capturing all types of crashes including involving property only damages (even the near misses) is desirable for safety analysis, in reality this is not always possible. A trade off between the available resources level of efforts that can be put for collecting these data could outweigh the benefits in having

these data in the database system. Many countries including in Australia (Queensland and other states and territories), most PDO types of crashes are not attended by Police and on-line self reporting system has been implemented recently.

7.9 Quality

The crash report form used by the NPS is the form that was introduced back in 1996 under the UK funded MAAP project. During the consultation, it was learnt that, in the design process of this form, there was a directive to keep its size at two pages. One solution that was adopted was the reduction in font size, the second is the area allowed for detailed diagrams and a third, which is not as obvious, was the deletion of questions or instructions. These three things have compromised the quality of the data collected in this form.

A road crash report is a survey form. It is a form designed to collect information that is required by end users to be able to understand a situation and to be able to make decisions based on the scientific collection and analysis of data.

The problems associated with the current form means that even if the form is completed in full, the data may still not be accurate and thus the final database is compromised. A quality survey form should have validating questions within it and these are what may have been removed in order to keep it short. Validating questions basically collect the same piece of information but in a different way. The common response to this is “why do you need it twice or even three times? The reason is to pick up errors in the collection of data or in the completion of the form.

A survey form should also avoid subjective questions and only use objective questions. An example of this in the form is about road condition: “1 – Good and 2 – Damaged”. This is a subjective question and what one person considers a good road and what another may consider a damaged road is based on their opinion. Objective questions are a “Yes” or “No” possible answer, for example, “Does road surface has potholes?”

This process in the crash report form will be covered in greater detail in Chapter 10 which describes the management of NRCDS. The underlying principle to the design of the crash report form is to ask the correct questions to get accurate data. If a question has two possible answers and there is no validating question to establish what answer was given, the data is flawed and thus the database is flawed.

In order to have a quality database, the data collected must be of quality. To collect quality data, the tool or system used, either survey form, interview or tablet program, must have a quality control check in its design.

The recommendations of this Project to resolve this gap are:

- Resolve to commence the use of new crash report form as recommended by this Project. The new form would provide consistent and cleaner data set and at the same time would require less number of people for data validation and entry;
- Use the "Smart Data Entry Screen" developed by the Project for entering data from both old and new forms. The only difference is that entries from the older (existing) form require higher level of manual check (using crash scene diagrams of the form) than the new form (as the new form has additional questions and validation mechanism);
- Commence and complete the initiative to undertake pilot project under NIRTTP. A component of the NIRTTP intends to supply tablets to police officers to collect crash data and train police officers to use tablets with new form. It is understood during the initial consultation that the pilot project would be limited to the roads in Kathmandu Valley and Kathmandu-Birgung freight corridor. This Project is very timely and would be able to test and validate new form;
- Create a manual that accompanies the form with instructions and definitions;
- Upon the completion of pilot project, set up a new "Capacity Enhancement Project". The new project, among others, should, purchase tablets for all 1016 police stations and all 75 district police offices across the country, desk top computers as required (with spares to replace them over time). The project would also involve TOT training to selected NPS officers, on-site training to undertake crash investigation, training to use new form and the tablets. Each police station should keep a copy of crash data collection manual (instruction sheet) so that new officers deputed at local stations can learn how to use crash report form;
- Translate forms, manuals, instruction sheet to complete the form in Nepali language;
- Roll out training in the NPS in the use of the crash report form.

Not all 1016 police stations can be equipped with tablets, computers and internet access under this Project. The question remains how the issue of web based data collection and storage system could be implemented under the NRCDS Project as expressed by some of the key stakeholders in March Workshop.

Funding may be available for piloting most of the recommendations made above in the current NIRTTP. The NIRTTP pilot project will come across the same problem as this Project along

the idea of implementing web based data collection system and use of tablets. The tablet is just an electronic form which puts the data into a computerized system but it will have to also ask the correct questions to get the correct information for the database.

7.10 Location

The crash report form in use has a section for identifying the location of the crash based on a series of maps. But these maps have long ago disappeared and this section is not completed. There appears to be a section for coordinates, but again this section is not completed. Therefore, the location comes down to the first two diagrams on the crash report form. The officer draws a small map giving approximate distance to an intersection, a landmark or a town/village. The officer indicates distance to the intersection and distance to village or town in either metres or kilometres. There is no designated area to indicate the name of the road (or number) the crash was on or the intersecting road. This must be indicated in the diagram and there is no instruction to do so. This system is very inaccurate, and the inaccuracy is likely to increase further away from the town or village. Identifying clusters in crash data will be extremely problematic with these data sets.

Within the Kathmandu Valley or indeed in most towns where the crash is at an intersection it will be possible to identify location within a reasonable level of accuracy. But as one moves onto sections of a rural road or major connecting roads the precise location will become very unclear and identifying black spots on the connecting road systems where some of the major fatalities happen will be next to impossible.

Identifying location of crashes along with the coding of crashes is the basis of any road crash database and its usefulness in identifying clusters and suggested remedial works. The location detail of crashes in the current data collection system is the weakest link in the chain.

This Project has had the constant theme of KISS (Keep It Simple and Sustainable) and thus avoiding introducing costly technology or ongoing costs of maintenance and training has been an underlying theme in any recommendations. But in this case it is strongly recommended that GPS technology be introduced to collect Latitude and Longitude at the crash site when the Nepal Police Services attend the crash.

There are two relatively inexpensive solutions for this. Any basic smart phone may download any number of applications that pinpoint Latitude and Longitude of the phone at that point in time. A requirement of police officer attending a crash scene to have a smart phone could resolve this problem easily. The other alternative is an inexpensive hand held GPS unit that

only supplies Latitude and Longitude (these are available from any hiking shop and therefore easily replaced). They are water proof, dust proof and shock proof and ideal for the field at crash sites. The inclusion of Latitude and Longitude details will aid in the compatibility with the future GIS applications that will be used as well as in clearly identifying clusters on the road network.

The recommendation of this Project is that the crash report form be modified to include more details of location and a means of identifying Latitude and Longitude is applied and entered on the forms by police officers. For the police officers to enter Latitude and Longitude on the current form they need to have a smart phone and use of smart phone applications or be supplied with a small GPS device.

7.11 Validation

The earlier section on data quality talked about validation of data. This was about validating data that had been collected. This section talks about the validation of the quantity of data collected.

One of the issues that any database has, including a road crash database, is the issue of under reporting. That is about not capturing all the crashes or specific data that are required to be collected and therefore the total crash figure is a number somewhat less than what is really occurring.

The issue of under reporting of crashes and fatalities is not unique to Nepal, but there may be an extreme issue of under reporting in the Nepal context.

The historical data of fatalities for Nepal has a wide variance in reported totals anywhere from 1800 per year (5 per day) to World Health Organization's numbers of over 5000 per year (14 per day). Nepal Metro Police supplied a figure of just less than one fatality per day in the Kathmandu Valley alone. If there are 1800 fatalities in total for Nepal this means Kathmandu Valley Metro represents 20% of that figure, yet is only 4% of the districts and around 15% of the population. This could be true as vehicle numbers will be higher in this concentrated area. But at this point in time no one knows why.

The other question is how the number of crash data could be validated. Data are needed to be collected from other sources and get these data connected to the road crash data collected by NPS. These other sources could be hospitals, trauma centres, offices of chief district officers, emergency services and the NPS's call centre. These sources would keep information and their total crash data reports could give a second tally on incidents.

Hospitals are an important source of crash data. There are two important aspects of collecting hospital data in relation to road crash data. One is getting some measure of the number of injuries in relation to road trauma and thus an understanding of the under reporting of crashes that may be occurring. The second is correct recording of the number of fatalities caused by road trauma, another form of under reporting. The UN definition of fatal crash is any crash that results in death of crash victims within 30 days of the crash (adopted for this Project).

During consultation, the project team could not establish if there was a clear link between hospitals and police to update the crash report if the road crash casualty passed away after being admitted to hospital. The team also could not establish if there were clear records of why the casualty had been admitted as in, was it a result of a road crash. The team did not establish if all hospitals were keeping any data on road crash trauma and if this data was being collated, was it being sent to any higher or centralized agency.

The under reporting of fatalities is a serious issue. Cooperation between NPS and the Health sector needs to be strengthened and a procedure developed to efficiently collect related data from the health sector to improve the reporting of fatalities. It is believed that there are gaps in the systematic process and information on deaths from the hospital may not have been used to update the crash data collected at crash scenes.

The only recommendation within the scope for this Project would be to create a unique identification number for each crash. Police supply this number to the hospital at time of admissions of casualties. Then it is simple for the hospitals to follow up with data to the NPRCDS at a later date so as information of deaths is updated for each crash. Specific procedure for the flow of information and update of cases of death in hospital needs to be developed and agreed by all parties involved in crash data management.

It is also recommended that ways of collecting data from other sources (hospital, insurance companies, district police offices, VDC, DDCs) be explored to help reduce the cases of under reporting in road crashes.

7.12 Storage

Storage of data is of paramount importance in the sustainability of the road crash database. As evident from the review of previous projects when issues occurred, such as funding or viruses or hardware breakdown, no plan had been put in place to save the data that had been collected. For instance, a very small amount of crash data from the five-year period of MAAP system has been found.

A database management manual, which is produced by the Project specifies details on the crash data backup process. The specification of the computer hardware has been supplied to MOPIT after consultation with IT specialists. The NRCDS Management Manual that has been developed covers the requirements of backup procedures. In brief, it is a process of daily backup of the all data in the road crash database, electronic back up of all manuals and procedures as well as the possible off-site storage of data. The details about the Government Integrated Data Centre (GIDC), which, may be used to store data for back up, are yet to be investigated by MOPIT.

The gap identified in this Project and recommendation to fill this gap is the development of the NRCDS (Nepal Road Crash Database System) Management Manual. The procedures set the Manual should be followed without fail to ensure the safe survival of data in any occurrence. Gaps in back up data storage are critical and needs to be addressed seriously.

With the proposal to create NPRCDS and NRCDS, multiple copies of crash data storage are created. However, storing data in standalone PCs is not the best practice, As the data grows, PC based storage will not be able to handle all data. The recommendation to create this gap is to plan to switch to central server system with NPS with further back up by GIDC.

7.13 Dissemination

There is no use of collecting, validating, checking and coding of crash data if it cannot be given to those who wish to use data to solve problems associated with road crashes. The scope of this project is minimal in relation to data dissemination.

This project does not create the database that can be used for safety analysis or performance reporting. It creates only the dummy database with crash data used for testing and validation. These data need to be removed from the real crash database which should start entering data from a date decided by MOPIT. The date from which crash data should be collected and entered into the database system needs to be decided by MOPIT and advised to NPS. From this date onwards, crash data needs to be collected on an ongoing basis capturing the whole 1016 stations and the entire country.

The scope of this Project is limited to the supply of a users' manual and improve the usability of the data. Users' manual contains all information that is required for end users to request for data from NRSC/MOPIT. Keeping with the KISS principle, off-the-shelf software EXCEL is being used to create data storage. The primary reason for using EXCEL is compatibility and ease of use. Most practitioners, if not all, requiring data for analysis will be comfortable in

receiving data in an EXCEL format. Also, most if not all programs will accept data in an EXCEL format.

7.14 Summary

In order to move towards solving its road safety issues Nepal needs to develop a Road Crash Database System (NRCDS). There is no meaningful or useful road crash database in Nepal as yet. In developed countries, such as Australia, there are still competing forces for the allocation of limited funds to different road safety issues. 70% of funds are allocated to "reactive" projects based on scientifically collected and analyzed crash data to respond to crashes that are occurring or had occurred in the past. Only 30% of the road safety fund is allocated to implement recommendations from Road Safety Audits (Note that audits produce "pro-active" projects) which are meant to reduce the likelihood of crashes. The reason for funds being allocated this way is better utilization of scarce funds in reducing the number of crashes (and/or the severity of crashes). Funds are applied to locations where crashes actually are occurring (locations which have a history of issues). Spending money on the locations that are considered to be potentially hazardous and locations where crashes could occur any time in future based on road safety auditor's assessment of risks of road crashes should be given less priority than at the locations where people are being killed.

Following are the recommendations that are required to start a meaningful Nepal Road Crash Database System:

1. National Road Safety Council (NRSC) as the apex body should be the owner of the data, and be funded appropriately to perform the tasks required for the Nepal Road Crash Database System. NRSC is also accountable for the management of the Nepal Road Crash Database.
2. Responsibility of the collection of road crash data falls to the Nepal Police Services (NPS).
3. NPS should also be made responsible to maintain NPRCDS. NPRCDS should be the primary source of any crash data including for the NRCDS. DOR, DOLIDAR, MOH, MOE can have access to NRCDS but not to NPRCDS.
4. An Interim procedure should be developed with NPS and implemented as soon as possible to stop the loss of historical data.
5. NRSC together with NPS should resolve to commence the use of new crash report form as recommended by this Project.

6. Any decisions or actions taken in relation to development of a Nepal Road Crash Database must always address the issues of sustainability.
7. The Pilot project under NIRTTP should be started as soon as possible to give continuity to this Project. This include
 - a. test and validate new crash report form;
 - b. create a manual that accompanies the form with instructions and definitions;
 - c. set up "Capacity Enhancement Project" upon the completion of pilot project. This Project should target both NPS and NRSC/MOPIT. The Project is further elaborated in Chapter 15;
 - d. develop project which should include Training of Trainers (TOT) to offer training to police officers at local police stations to undertake crash investigation and the use new form and/or the tablets.
 - e. look into ways of collecting data from other sources to help reduce underreporting.
8. Alternatively, RSDP II (under conceptualization) could include Capacity Enhancement Components which should contain all of the recommended measures to establish Crash Database System in the country.

CHAPTER 8

CRASH REPORT FORM

8.1 Introduction

Data relevant to road safety are collected every day in most countries, but for the data to be useful for informing road safety practitioners, sufficient data must be collected, coded, validated and stored safely in a computerised database system.

Consistent with the overall aim of the Nepal Road Crash Database System (NRCDS), a theme of “Keep It Simple & Sustainable” (KISS) has been followed. The existing system of collection has been examined. There are some major issues that need to be resolved to develop a “best practice” database system. While the resolution on identified issues can be made gradually over time, the current practice of collecting crash data should continue in the best possible manner. The gaps in data collected are covered separately in Chapter 7.

8.2 Crash not Accident

The use of the word “accident” with its connotations of being an unavoidable event, weaken the resolve to intervene in order to reduce crashes and the resulting harm. Evans (1991) argues that the word “crash,” indicates in a simple factual way what is observed, while “accident” seems to suggest in addition a general explanation of why it occurred.

Road safety recognizes that crashes, and their consequences, are multifactor events. Ogden (1996) indicates: “An approach based in notions of cause and blame is simplistic in the extreme”. In short, crashes have factors not causes.

So please note from this point onward the word “crash” will be used and substituted in place of “accident”. However, the use of term "accident" is continued when it refers to the resources that use the term "accident".

8.3 Nepal Crash Report Form

The Crash Report Form (CRF) used by the Nepal Police Services is the form that was introduced back in 1996 under the UK MAAP project. The form does not have sufficient questions and is completely reliant on all sections being completed and diagrams being supplied. In one of the sessions of consultation, a senior officer who worked on the MAAP project suggested that when the form was designed they had to keep it at two pages in length

and to get as much as possible on those two pages. Their solution was to reduce the type size and remove some "unimportant" questions. Closer examination of the form reveals that this decision has compromised the data collected, with important questions not being asked.

A copy of Nepal Road Crash Data Form currently in use is included in Appendix 1. Selected examples of Crash Report Forms used in the region and overseas are also included in Appendix 1 to allow for comparison and to suggest improvements in the CRF.

A road crash report is a survey form. It is a form designed to collect information that is required by end users to be able to understand a situation and to be able to make decisions based on the scientific collection and analysis of data. The information from the report form is used to generate the types of crashes (groups, subgroups and DCC codes).

The problems associated with the current form means that, even if the form is completed, the data may still not be accurate and thus the final database is compromised. A survey form should have validating questions within the form and these are what may have been removed. Validating questions basically collect the same piece of information but in a different way. The common response to this is "why do you need it twice or even three times?" The reason is to pick up errors in the collection of data or the completion of the form.

For example, the survey form may ask the driver's starting point and intended destination, time they started driving, the form then asks direction of travel of the vehicle, intended maneuver of the vehicle, the orientation of the road, what road the crash occurred on and finally the geo-coordinates of the crash location. This is a total of 8 variables from 8 questions and yet two questions could give almost the same information.

The geo-coordinates and the direction of travel may give all the information needed, but what if the officer indicated the incorrect direction of travel, the start point and end point of trip would indicate this and a correction could be made. What if the geo-coordinates were incorrectly entered, what road the crash was on will help to correct this but another question, nearest landmark or intersecting road will narrow down the location and help correct the error. Also, questions about being at an intersection will correct geo-code errors and intentions like turning right will also help. The form also asked what time the driver started their trip, note we know what time the crash occurred, we know where they started, therefore distance travelled, this question adds objective information about fatigue to a subjective question the police officer marks on the form later. The questions on a survey form are very interrelated and help to validate the data collect.

While inclusion of additional questions in the survey form to get the same information improves data integrity and accuracy, there needs to be a trade off. Police officers are currently completing the form which adds extra load to their duties. Too many question and too long survey form may limit the ability of police officers to correctly complete it in the constrained duty environment.

In the previous section the terms subjective and objective questions were mentioned. Subjective questions are based on personal opinions, interpretations, points of view, emotions and judgment. It is often considered ill suited for scenarios like decision-making or investigation. Objective questions are fact-based, measurable and observable. A crash report form is a scientific means of collecting data in relation to the crash. It should avoid subjective questions so as data collected is fact-based and measurable.

An example of subjective question would be “Was the street lighting good?” or “Was the road in a good condition?” Both these questions are subjective because the answers are based on the opinion of the person completing the form. The only time these questions could be asked would be if the survey was asking a street light engineer about the street lighting or a road surface engineer about the road, because then their opinion is based on fact, their expert opinion and experience.

The process of coding crashes to get DCC will vary in labour intensity depending on the quality and accuracy of the Crash Report Form. The quality of the current crash report is such that the time to code crashes will be very long for each report without changing it. The data entry process will be labour intensive and costly as the officer entering the data from the survey form to computer requires close examination of the crash site diagram. By improving the form, not only the quality of the data collected will be improved but also manual process of coding crashes and thus the ongoing costs will be reduced.

The recommendation of this Study is thus to set up a project as soon as possible to develop web based crash report form, test that form, and create a manual that accompanies the form with instructions and definitions and roll out training in the NPS in the use of the crash report form.

8.4 Why Code Crashes?

The raw data collected on the crash report needs to be coded into groups of relevant and useful parcels of information. Crashes with similar characteristics are grouped under a code (DCC: Descriptive Crash Codes). These groups along with location create clusters that practitioners

will be able to analyse. The data form has also collected contributing factors, which becomes part of the practitioner's information for analysis.

All road crash data has patterns, patterns that indicate behaviour, road condition, road design and vehicle issues, which lead to the crash. Most crash types have tried, tested and true remedial actions or solutions to reduce the number of crashes and also to reduce the severity of crashes.

In the following sections the current crash report form is reviewed and opportunities for improvement highlighted. Suggestions for improvement are based on the forms used regionally and internationally. Recommendations on changes have been made where necessary. The set of new crash report form questions will allow for an expansion of in the set of Descriptive Crash Codes in the future.

Following the series of consultation including two workshops, a final list of DCC has been prepared for Nepal's situation and is included in Appendix 2. This set of DCC are possible if the majority of questions are completed on the current Crash Report Form, and if the crash diagram is completed.

8.5 Review of Crash Report Form Sections

8.5.1 Police Information

This is information such as officer, rank, station and division. This type of information is useful for collating into areas of responsibility and reporting.

Suggestions have been made to remove computer number and report number and replace these with a unique crash identification number (CIN). Also, suggestions have been made to add station ID and district ID in the form.

It is understood that there are a total of 75 districts and 1016 permanent police stations in the country. This excludes temporary stations. Accordingly, the form will need a 4-box entry field for station IDs and 2-box entry field to enter district IDs.

On the Current Crash Form, there is a question about Hit & Run, at present it is not defined. The recommendation is that this refers to any crash event where a driver or a driver and vehicle leave the scene of the crash and no details are available to Police at the time of the Crash Report. The crash may be any type for example Hit Pedestrian and run, Hit Parked Vehicle and run and so on. It will be recommended that this information be added to the database at a latter stage if police are successful in finding out the details of the driver and

vehicle. Because this field relates to Police investigation it is best suited to be in this group of questions.

Any final changes in these details require consultation with NPS. The suggested changes are summarized in Table 8.1.

Table 8.1:Police Information

Existing CRF		New CRF	
Sec.	Section /Selection	Sec.	Section/Selection
1	Report No.	1	Crash Identification Number (CIN)
2	Computer No.	2	Police Station
3	Police Station	3	Station Number
4	District	4	District
-	Witnesses (Name, Age, Address, Signature)	5	District Number
-	Reporting Officer Name and rank	-	Witnesses (Name, Age, Address, Signature)
26	Hit & Run	6	Hit & Run
	1. Yes		1. Yes
	2. No		2. No
-	Reviewing Officer Name Rank	-	Reporting Officer Name and rank
-	Action Taken / Recommendation	-	Reviewing Officer Name Rank
		-	Action Taken / Recommendation

8.5.2 Numbers and Severity

This information indicates the severity of injuries and the number of people and vehicles involved.

Recommendation has been made to introduce minor changes to the words “accident” to “crash” and “damage” to “property”.

This has been discussed at the workshop and following definitions of Fatal, Serious, Minor and Property. Suggested definitions, which are consistent with the proposed policy guideline for crash data management, are:

- Fatal is death within 30 days of crash;
- Serious is admission to hospital overnight;
- Minor is treated at scene or taken to hospital, but released same day;
- Property is damage that exceeds NPR 25,000.

A comparison of the current and new form contents is shown in Table 8.2. As one can see there are virtually no changes in this category of information.

Table 8.2: Numbers and Severity

Existing CRF		New CRF	
	Section /Selection		Section/Selection
5	Number of vehicles involved	7	Number of vehicles involved
6	Number of driver casualties	8	Number of driver casualties
7	Number of passenger casualties	9	Number of Passenger casualties
8	Number of pedestrian casualties	10	Number of pedestrian casualties
9	Accident severity	11	Crash severity
	1. Fatal		1. Fatal
	2. Serious		2. Serious
	3. Minor		3. Minor
	4. Damage		4. Property

8.5.3 Time

Time is both a data variable that is used to group reporting, for example number of crashes over 5 years, but it is also a contributing factor, more crashes at a certain time of day or time of year.

The information in the current form is adequate. No changes have been suggested as can be seen from Table 8.3

Table 8.3: Time Details

Existing CRF		New CRF	
Sec.	Section /Selection	Sec.	Section/Selection
10	Day	12	Day

11	Month	13	Month
12	Year	14	Year
13	Day of week	15	Day of week
14	Time (24 hours)	16	Time (24 hours)

8.5.4 Junction Type

Only one small change is recommended in the new form. “Not a Junction” is worded to “Section of Road”. The current form only uses diagrams and this is good but the new form should include word description as well to provide better clarity. The CRF completion instruction sheet should guide the officer when the crash is in a junction or in a section. The recommended definition for “in a junction” will be “within 20 meters of junction.” A further clarification of this is the nearest curb of the nearest intersecting road to the collision point is within 20 meters. The comparison between the existing form and new form can be seen in Table 8.4.

Table 8.4: Junction Type

Existing Form		New Form	
Sec.	Section /Selection	Sec.	Section/Selection
15	Junction Type	17	Junction Type
	1. Not a Junction		1. Section of Road
	2. Cross Road		2. Cross Road
	3. ‘T’ Junction		3. ‘T’ Junction
	4. Offset Junction		4. Offset Junction
	5. ‘Y’ Junction		5. ‘Y’ Junction
	6. Roundabout		6. Roundabout
	7. Other		7. Other

8.5.5 Traffic Control

Traffic control is a contribution factor and only change is “Operating Traffic Signals”. This can be seen from Table 8.5.

Table 8.5: Traffic Control

Existing CRF		New CRF	
Sec.	Section /Selection	Sec.	Section/Selection
16	Traffic Control	18	Traffic Control
	1. None		1. None
	2. Centreline		2. Centreline
	3. Ped Crossing		3. Pedestrian Crossing
	4. Police		4. Police
	5. Traffic Signals		5. Operating Traffic Signals
	6. Stop Sign		6. Stop Sign
	7. Give Way Sign		7. Give Way Sign
	8. Other		8. Other

8.5.6 Collision Types

This variable is the first step to grouping crashes into Descriptive Crash Codes (DCC). This section of the form is critical and requires major changes to collect the data better and to be able to group collision types better into DCCs. Before specifying collision types on the crash report forms, the set of collision types that are required for clustering need to be defined as shown in Table 8.6.

Table 8.6: Collision Type Definitions

Code	Group	Definition
0	Hit Pedestrian	This is a collision involving a pedestrian and vehicle.
1	Vehicles from opposing directions – Head On	This is a two-vehicle crash, where the vehicles were travelling in the opposite or opposing direction before their intended manoeuvres. Neither vehicle is parked. This excludes a head on if one vehicle was performing an overtaking manoeuvre.
2	Vehicles from one direction – Rear End	This is also a two-vehicle crash, where the vehicles were travelling in the same direction before their

		intended manoeuvres. One vehicle will be coming from behind the other vehicle. Note the vehicles involved have remained on the correct side of the road. Neither vehicle is parked. This excludes a rear end if one vehicle was performing an overtaking manoeuvre.
3	Vehicle from one direction - Side Swipe	This is also a two-vehicle crash, where the vehicles were travelling in the same direction before their intended manoeuvres. Both vehicles were travelling side by side. Note the vehicles involved have remained on the correct side of the road. Neither vehicle is parked.
4	Overtaking	This is a two-vehicle crash, where the vehicles generally are travelling in the same direction before their intended manoeuvres. One vehicle will be coming from behind another vehicle and is performing an overtaking manoeuvre. The collision may occur with the vehicle being overtaken or another vehicle. Neither vehicle is parked. This includes a head on if one vehicle was performing an overtaking manoeuvre.
5	Intersection - vehicles from adjacent approaches – At Angle	A two-vehicle crash, where the vehicles were travelling from adjacent or at an angle to each other, for example at right angles at a cross road, before their intended manoeuvres. These codes are only applied at intersections. Neither vehicle is parked.
6	Out of Control On/Off Road	A single vehicle crash, where the vehicle loses control or overturns during their intended manoeuvre. The vehicle may come to rest either on or off the road and may either hit or not hit an object.
7	Hit Object On Road	A single vehicle crash, where the vehicle hits an object on the road during intended manoeuvre. The

		vehicle may come to rest either on or off the road after hitting the object that was on the road.
8	Manoeuvring	These are either one or two vehicle collisions that occur when a vehicle is performing a parking manoeuvre, leaving a driveway onto the road, leaving the footpath onto the road or reversing against the direction of traffic on the road. (May involve parked vehicles.)
9	Passenger or Miscellaneous.	<p>Passenger involves injury only to the passenger. It relates to the passenger falling inside the vehicle, falling of the top of a vehicle, falling from the side or back of a vehicle, or falling out of the back of a vehicle.</p> <p>Misc. applied to less common crashes such as hitting a Train, hitting a Rail Crossing or a Runaway Vehicle.</p>

There is no one on one relationship between the definition of collision and the question asked in the crash form for collision type. Coding into collision types actually comes from multiple questions on the crash report form.

The types of collision based on the definitions recommended in Table 8.6 as per best international practice are consolidated to seven broad groups in the new form from 11 groups adopted in the current form. The suggested change is expected to simplify the

Table 8.7: Collision Types

Existing CRF		New CRF	
Sec.	Section /Selection	Sec.	Section/Selection
17	Collision Type	19	Collision Type
	1. Head On		1. Hit Pedestrian, one vehicle and one or more pedestrians.

	2. Rear End		2. Two or more Vehicles Collision (neither vehicle is parked, no pedestrian involved.)
	3. Right Angle		3. Vehicle Overturns on Road
	4. Side Swipe		4. Vehicle Runs Off Road.
	5. Overturned Vehicle		5. Hit Object On or Off Road (Includes parked vehicle.)
	6. Hit Object in Road		6. Passenger Injury (Falling off or In a vehicle, boarding or alighting vehicle when injured.)
	7. Hit Object off Road		7. Other
	8. Hit Parked Vehicle		
	9. Hit Pedestrian		
	10. Hit Animal		
	11. Other		

Head On, Rear End, Right Angle and Side Swipe

Head On, Rear End, Right Angle and Side Swipe are replaced with “2. Two or more Vehicle Collision”

The CRF asks the police officer to select a collision type, but the officer can only observe the collision result. For example, the vehicles are front to front, appears to be a head on, they are front to rear, appears to be a rear end. This is a very difficult distinction, “collision type” vs. “crash type” vs. “Descriptive Crash Code”, it is important that the police officer is not defining the “Crash Type”. The officer should only be collecting information. The police officer and the Nepal Police will need to establish fault but the purposes of crash data collection is to establish “why” the collision occurred. This section of the form, which asks “Collision Type”, will require extensive consultation with NPS and road safety professionals to set the correct questions that gather information that is suited to police outcomes and crash analysis outcomes.

In the interim, definitions of the terms used on the current Crash Form need to be supplied to police to assist them in the completion of the form. The Data Entry Screen has also been

designed to define crash types or Descriptive Crash Codes on vehicle, pedestrian and passengers' actions, movement and manoeuvres.

Overturned

Overturn is replaced with “3. Vehicle Overturns on Road” but they would be coded as definition “6. Out of Control On/Off Road”. A vehicle overturning on the road is an indication it is out of control for some reason, the vehicle that leaves the road has for some reason lost control on the road, both these happening at the same location may be an indication of an issue with the road like design, surface etc.

Hit Object On Road

Hit object on road is retained, as there is the need to know about activities on the road that result in a crash. Objects will be listed to give an indication of what situation may be leading to crashes. This code tends not to relate to clusters because the objects are not all fixed objects, such as animals, loads falling off vehicles, roadwork, water across road and parked vehicles. So analysis of this data is more about behaviour, allowing animals to roam on the road, poor loading practices and poor traffic control around roadwork. Where clusters may be indicated is if there is regular flooding at a location and this requires attention, or parked vehicles being hit at the same intersection and this may be the behaviour of parking too close to corner.

Hit Object Off Road

Hit object off road is removed. Crashes that leave the road and hit an object will still be captured in “4. Vehicle Runs Off Road”. The object will also be captured in the object list. But the analysis here is about identifying vehicles leaving the road and addressing that issue. The secondary analysis is the object they hit which may or may not be an issue. For example, hitting a vehicle that was parked off the road on private property is not the issue, the vehicle running off the road is. Running off the road and into a river on the other hand is both “why the vehicle ran off the road” and the object, “the river” are issues.

Hit Parked Car

Hit parked car is removed. If the crash is a vehicle hitting a parked car, this is “Hit Object On Road,” if the crash is hitting a vehicle parked off the road this is “Vehicle Runs Off Road”.

Hit Pedestrian

Hit pedestrian has been retained but has been relocated to the top because of its importance. Moving it to the top of the selection may help to highlight the most vulnerable of road users and they maybe more so in the Nepal Context.

Hit Animal

Hit animal is removed as it is either captured in “hit object on road” or “vehicle runs off the road”.

Passenger Injury

Passenger Injury is added because no vehicle is damaged and it relates to passengers’ behaviour of hanging onto the side or back of a vehicle or sitting on top of the vehicle or on top of a load. It may also be the behaviour of the vehicle operators in allowing the passenger behaviour. In either circumstance, in the Nepal context this group of crashes is important.

Other

At present there are three crash types not captured and do not fit into the other definitions. These are, “Runaway Vehicle”, “Hit Train” and “Hit Rail X-ing”.

Runaway vehicle is related to behaviour and / or vehicle maintenance. Nepal has very little train line at present but there is a plan to build more and it’s an opportunity to add the codes now.

It is hoped that any codes that may be important and not captured are added in the stakeholders' workshops.

8.5.7 Movement, Weather and Light

Section 18, movement, on current form is important and also requires a few more details but it belongs with road details in the “Location section”.

With weather a few variables are added or changed to give a better scale of atmospheric conditions and visibility.

Lighting is changed to give a better scale of Day to Night, but also if streetlights are present and working or not.

Table 8.8: Weather & Light

Existing CRF		New CRF	
Sec.	Section /Selection	Sec.	Section/Selection
18	Movement	20	Weather

	1. 1 Way Street		1. Clear
	2. 2 Way Street		2. Overcast
			3. Raining
19	Weather		4. Fog
	1. Fair		5. Snowing
	2. Rain		6. Smoke and/or Dust
	3. Fog	21	Light
	4. Smoke / Dust		1. Daylight
20	Light		2. Dawn or Dusk
	1. Daylight		3. Darkness (no street lighting)
	2. Night (Unlit)		4. Darkness (street lighting but not working)
	3. Night (Lit)		5. Darkness (Working street lighting)

8.5.8 Road Characteristics

On the current form, there are five sections that relate to the road characteristics (or condition). A redesign of the form would regroup these and edit them.

There is missing information as to in which direction is the road inclined, which way does the road curve bends and these have been added.

Conditions that would be likely in Nepal context are missing, ice and snow.

Also, the current form has questions like “Is the Surface Good or Damaged?” this is subjective and thus the answer is not measurable. As previously discussed subjective questions should be avoided.

Table 8.9: Road Characteristics (Description)

Existing CRF		New CRF	
Sec.	Section /Selection	Sec.	Section/Selection
21	Road Character		Road Description
	1. Straight + Flat	22	Horizontal – the road is?

	2. Curve only		1. Straight
	3. Incline only		2. Curved Right in what direction
	4. Curve + Incline		3. Curved Left in what direction
	5. Bridge (Name of River)	23	Vertical – the road is?
22	Surface Type		1. Flat
	1. Asphalt		2. Inclined in what direction
	2. Gravel	24	Structure
	3. Earth		On a Bridge (supply river name)
23	Road Condition	25	Construction
	1. Good		1. Sealed Surface
	2. Damaged		2. Unsealed Surface
24	Surface Conditions	26	Condition
	1. Dry		If sealed surface,
	2. Wet		1. Is surface unbroken
	3. Muddy		2. Is surface pot holed
	4. Flooded		3. Is surface rutted / corrugated
25	Roadwork		4. Is surface uneven (e.g. previous repair work)
	1. Yes	27	If unsealed surface,
	2. No		1. Gravel
			2. Earth
			2. Is surface pot holed
			3. Is surface rutted / corrugated
			4. Is surface uneven
		28	Current temporary conditions
			1. Dry
			2. Wet
			3. Muddy

			4. Flooded
			5. Icy
			6. Snow covered
		29	Is there Roadwork?
			1. Yes
			2. No

8.5.9 Location

Location is the most critical variable and unfortunately one of the weakest in the current crash forms and processes. Improvements in this area will improve the quality of crash data but also reduce the manual effort in coding location, thus reducing the ongoing costs.

The variables on the crash report are collision type, vehicle manoeuvre, pedestrian activity and passenger behaviour, combined these with location and this creates groups of like crashes (DCC) at the same location, called clusters. These clusters will identify “Black Spots” that require investigation and remedial action.

The current form will give enough information to locate only a few crashes. The distance from an intersection or landmark is a very approximate estimation in the best of circumstance but becomes further complicated by the Police Officer’s ability to judge distance.

Then in rural areas outside of villages and built up areas this estimation becomes even more prone to error. For the data system to be compatible with any GIS application, latitude and longitude needs to be entered for all crashes. Plus to identify actual locations of clusters a consistent method is needed. There was a map system when the forms were introduced, but this is no longer available. The form does not even ask what road the crash was on, this detail is to be entered on the diagram but there is no instruction on the form to do this

This set of variables is critical to locating the crashes and the following table sets out what information needs to be collected.

Note this table is indicating what information needs to be collected, on the form it may be done with the use of simple diagrams.

Table 8.10: Location Details

Sec.	Detail
30	Name of Suburb / Town / Municipality / Area
31	What road is the crash on?
32	Road Number
33	Is the road
	1. Two way
	2. One way
34	Total number of lanes
35	Was either vehicle right of centre in direction of travel Y/N
	1. Yes
	2. No
36	If crash is at intersection, name of intersecting road (If not go to 40)
	Name
	Number
37	Is the road
	1. Two way
	2. One way
38	Total number of lanes
39	Location in relation to intersection
	1. In the intersection
	2. Within 20m of the intersection
	3. In what direction from the intersection
40	If not at an intersection nearest intersecting Road, Village or Landmark
	1. Road / Village / Landmark
	2. Direction from crash to Road / Village / Landmark
	3 distance in metres (100 = 100 m and 10,000 = 10 klm) to Road / Village / Landmark

41	Is there a posted speed limit & what is it.
42	Latitude
43	Longitude
44	There will still be a box for a diagram on the form with some instructions.
45	There will still be a Police description of the crash.

8.5.10 Vehicle, Driver, Passenger & Pedestrian Details

This group of variables is a collection of details of all people involved as well as their activity or intention. Some of these variables will help determine the DCC, for example what the pedestrian was doing and what the vehicle was doing. Others are the “texture” or “contributing factor” details, such as age, alcohol, and location. Within this group there are some subjective questions, for example driver error, “going too fast”, in this situation we are reliant on the Police Officer’s observation and professional opinion.

Table 8.11: Vehicle, Driver, Passenger & Pedestrian Details

Sec.		Vehicle Details	Existing/ New
46		What Direction was vehicle heading prior to manoeuvre	Existing
47		Was vehicle on left side of centre Y/N	Existing
48		Did Vehicle Leave Road Y/N	Existing
49		Was Vehicle Approaching Intersection	Existing
50		Registration Number	Existing
51		Owner’s Name	Existing
52		Address	Existing
53		Third Party Insurance Y/N	Existing
54		Make	Existing
55		Year of manufacture	New
56		Vehicle Type	Existing
	1	Push Cart	New

	2	Bicycle	Existing
	3	Rickshaw	Existing
	4	Auto Rickshaw	Existing
	5	Electric Scooter	New
	6	Moped	New
	7	Motor Cycle	Existing
	8	Tempo	New
	9	Car	Existing
	10	4WD Wagon	Existing
	11	Pick up	New
	12	Mini Bus	Existing
	13	Bus	Existing
	14	Truck	Existing
	15	Other	Existing
57		Vehicle Manoeuvre	Existing
	1	Going Ahead	Existing
	2	Right Turn	Existing
	3	Left Turn	Existing
	4	U' Turn	Existing
	5	Cross Traffic	Existing
	6	Merging	Existing
	7	Diverging	Delete?
	8	Overtaking	Existing
	9	Reversing on Road	Existing
	10	Sudden Start in Traffic	Existing
	11	Sudden Stop in Traffic	Existing
	12	Vehicle Leaving / Entering Driveway	New

	13	Vehicle driving off Path	New
	14	Parked On Road	Existing
	15	Double Parked On Road	New
	16	Parked Roadside door open On Road	New
	17	Parked Off Road	Existing
	18	Runaway Vehicle	Existing
	19	Other	Existing
58		Loading	Existing
	1	Legally Loaded	Existing
	2	Overloaded	Existing
	3	Insecure Load	Existing
	4	Protruding Load	Existing
	5	Other Improper Load	Existing
	6	Load has fallen off onto Road	New
59		Vehicle Defect (Mark all that apply)	Edit
	1	None	Existing
	2	Brakes	Existing
	3	Steering	Existing
	4	Tyres	Existing
	5	Lights	Existing
	6	Seat Belts not working	New
	7	Helmet non-compliant	New
	8	View obscured by decorations	New
	9	Other (State)	Existing
60		Vehicle Damage (mark only first point of Impact or only point in this collision)	Edit
	1	None	Existing

	2	Front	Existing
	3	Rear	Existing
	4	Right	Existing
	5	Left	Existing
	6	Roof	Existing
	7	Other	Existing
61		Ownership	Existing
	1	Government	Existing
	2	Corporation	Existing
	3	Diplomatic	Existing
	4	Private/Personal	Existing
	5	Public	Existing
	6	Police	Existing
	7	Army	Existing
	8	Stolen	New
	9	Other	New
		Driver/Rider/ Controller Details	Edit
62		License Number	Existing
63		Name	Existing
64		Address	Existing
65		Place of Issue	Existing
66		Licence Type	Existing
	1	Full Licence	Existing
	2	Provisional Licence	Existing
	3	Probationary	Existing
	4	Unlicensed	Existing
67		Driver Sex	Existing

68		Age	Existing
69		Injury	Existing
	1	Fatal	Existing
	2	Serious	Existing
	3	Minor	Existing
	4	Uninjured	Existing
70		Driver Error (or Factors)	Existing
	1	None	Existing
	2	Fatigued/Asleep	Existing
	3	Inattentive	Existing
	4	Too Fast	Existing
	5	Too Close	Existing
	6	No Signal	Existing
	7	Bad Overtaking	Existing
	8	Bad Turning	Existing
	9	Other	Existing
71		Alcohol	Existing
	1	Not Suspected	Existing
	2	Suspected	Existing
72		Seat belt/Helmet in Use Y/N	Existing
		Passenger Casualties	Existing
73		Name	Existing
74		Address	Existing
75		Passenger in Vehicle No.	Existing
76		Sex	Existing
77		Age	Existing
78		Injury	Existing

	1	Fatal	Existing
	2	Serious	Existing
	3	Minor	Existing
79		Position	Existing
	1	Front Seat	Existing
	2	Rear Seat	Existing
	3	M/cycle Passenger	Existing
	4	Bus Passenger	Existing
	5	Standing Inside Vehicle	New
	6	Outside-Sitting on top	Existing
	7	Outside-Standing (Hanging on side)	Edit
	8	Outside-Standing (Hanging on Back)	New
	9	In Back of pick up or truck	New
	10	Other	Existing
80		Action	Existing
	1	None	Existing
	2	Boarding	Existing
	3	Alighting	Existing
	4	Falling	Existing
	5	Other	Existing
81		Belts/Helmets Y/N	Existing
82		Alcohol	New
	1	Not Suspected	Existing
	2	Suspected	Existing
		Pedestrian Casualties	Existing
83		Name	Existing
84		Address	Existing

85		Sex	Existing
86		Age	Existing
84		Injury	Existing
	1	Fatal	Existing
	2	Serious	Existing
	3	Minor	Existing
86		Location	Existing
	1	On Pedestrian Crossing	Existing
	2	Within 50m Pedestrian Crossing	Existing
	3	On Central Refuge	Existing
	4	On Road centre (not 1, 2 or 3)	Existing
	5	On Footpath	Edit
	6	On Edge or shoulder of Road	New
		Action	Existing
87	1	None	Existing
	2	Crossing Road	Existing
	3	Walking on road toward traffic	New
	4	Walking on road with traffic	New
	5	Walking on edge of road toward traffic	New
	6	Walking on edge of road with traffic	New
	7	On footpath	Existing
	8	Playing on Road	New
	9	Working on Road	New
	10	Lying on Road	New
	11	Other	Existing
88		In what direction was pedestrian walking	New

89		Did pedestrian walk from in front or behind of a Parked Vehicle Y/N	New
90		Did pedestrian walk from in front or behind of a Moving Vehicle Y/N	New
88		Alcohol	Existing
	1	Not Suspected	Existing
	2	Suspected	Existing

8.5.11 Objects Hit

The current form has no list of objects.

Table 8.12: Objects Hit

Sec.		Type of objects	Existing / New
89		Objects Hit	New
	1	Animal	New
	2	Water on road	New
	3	Roadwork	New
	4	Power / Light Pole	New
	5	Tree	New
	6	Fence	New
	7	Wall	New
	8	Building	New
	9	River	New
	10	Culvert	New
	11	Embankment	New
	12	Load	New
	13	Machinery	New
	14	Landslide	New
	15	Runaway Vehicle	New

	16	Train	New
	17	Railway crossing	New
	18	Other	New

8.6 Changing the Current Crash Form

The Current Crash Form is of a reasonable quality but compromises made in the past in its design and the lack of any supporting documentation (e.g., Guidance on How to complete the Form) has compromised its data collecting capacity. Making recommendations to change the form “is easy” but doing so will require consultation, funding, support, testing and training. This chapter has made some recommendations to “get the ball rolling” and there are recommendations about future enhancement projects.

It is possible to collect data with the current Crash Form and for it to be of a reasonable quality that need to be coded and validated. Chapter 9 sets out the Descriptive Crash Code System and Templates; this is based on the use of the Current Crash Form. Chapter 10, the Management Manual, will cover how the Data Entry Screen and instructions to the data entry officer will help code and validate the data collected on the current form. Finally, a Form Guide has been prepared for the Current Crash Form to aid Nepal Police in the interim until new systems of data collection and or new forms and training are available.

CHAPTER 9

DESCRIPTIVE CRASH CODE SYSTEM

9.1 Introduction

As covered in the previous chapter, collision type is important in the correct coding of the crashes. A very important distinction here is that collision type is not the Descriptive Crash Code (DCC). There is a strong correlation but there are other factors that may determine the final DCC. The number of vehicles, passengers or pedestrians involved in the crash, also objects, locations and manoeuvres define the DCCs.

The Nepal Descriptive Crash Codes are developed from information that are gathered from the current Crash Report Form used by the Nepal Police Traffic Branch. The coding numbering system is not continuous; this has been done to allow additional codes in the future. New crash types could be identified as the NRCDS starts getting populated. New CRF if developed in future can also provide additional crash types specifically prevalent in Nepal to meet the changing needs of the users of the database in future.

9.2 Method of DCC Coding

A three-digit number has been used to define the DCC.

The first digit represents the DCC groups. This is a high level of clustering of crashes with a broad similarity of characteristics.

The second digit represents the DCC sub-groups. These sub-groups may have the same group characteristic but represent a further clustering of crashes into characteristics that make them different within the group cluster.

The third digit represents the final DCC. This final level further clusters the crashes into those with similar characteristics. This final level gives a cluster of crashes with very well defined set of characteristics. It's this final level of coding that gives the most information to assist the road safety analyst to look at ways to reduce or remove these types of crashes from the road network.

9.3 DCC Group

The DCCs are divided into four broad categories of crashes called DCC Subgroup) as follows:

- 100: Multi Vehicle Crashes

- 200: Single Vehicle Crashes
- 300: Hit Pedestrian Crashes
- 400: Passenger Crashes.

9.3.1 100: Multi Vehicle Crashes

Included in multi-vehicle crash types are:

- Crashes that involve 2 or more vehicles; and
- Crashes that involve 2 or more vehicles and as a result of that collision a pedestrian is injured. An example would be if two vehicles had a head on collision and one of the vehicles then collided with a pedestrian causing injury. The crash of the vehicles is what needs to be treated by the road safety analyst; the pedestrian injury is an unfortunate result of that crash.

Excluded in multi-vehicle crashes are:

- Crashes involving multi vehicles but only one is being driven and the others are parked;
- Crashes that involve the injury of pedestrians as the first event in the crash. An example of this is when a vehicle hits a pedestrian, than a second vehicle hits the first vehicle. This crash has two events and the road safety analyst will need to treat both events; and
- Crashes that involve passengers boarding, alighting or falling from vehicles.

9.3.2 200: Single Vehicle Crashes

Included in single vehicle crashes are:

- Crashes that involve one vehicle; and
- Crashes that involve one vehicle and other parked vehicles

Excluded in single vehicle crashes are:

- Crashes involving the injury of pedestrians; and
- Crashes that involve passengers boarding, alighting or falling from vehicles.

9.3.3 300: Hit Pedestrian Crashes

Included in hit pedestrian crashes are:

- Crashes that involve one vehicle and a pedestrian; and
- Crashes that involve more than one vehicle but the injury of the pedestrian was the first event in the crash. An example of this is where a vehicle applied the brakes to stop from hitting a pedestrian but collides with the pedestrian. Then a second vehicle

collides with the vehicle that hit the pedestrian. This example would be coded as two separate events or crashes. The first is "Hit Pedestrians"; the second is "Multi Vehicle, Rear End". This is because each of these types of crashes requires different engineering treatment to prevent from recurring further.

Excluded in the hit pedestrian crashes are:

- Crashes involving more than one moving vehicle; and
- Crashes that may involve a pedestrian but their injury was the result of a previous event within the crash. An example of this is where a vehicle has stopped for a pedestrian crossing the road, than that vehicle is rear ended by a second vehicle and pushes the first vehicle towards the pedestrian causing injury. This example is a "Rear-End Crash" and coded accordingly because that is the crash that must be treated. The first part of the crash, which was the stopping for a pedestrian, and the vehicle did so successfully and thus there is no need to treat this event within the crash.
- Crashes that involve passengers boarding, alighting or falling from vehicles.

9.3.4 400: Passenger Crashes

Included in "Passenger Crashes" are:

- Crashes that involve passengers boarding, alighting or falling from vehicles.

Excluded in "Passenger Crashes" are:

- Crashes that only involve vehicles and no passenger injury;
- Crashes that involve pedestrian injuries; and
- Crashes that involve passenger injury other than when the passenger was boarding, alighting or falling off. For example, a crash involving a bus will have multiple passenger injuries. The practice of sitting on top or hanging onto the outside of the vehicle results in many injuries in bus crashes. These type crashes are included in either Group 100 or 200 as it is not the passenger action that causes injuries; it is the bus collision that causes injuries.

9.4 DCC Sub-groups

Set under the four DCC Groups are a total of 10 Sub-groups. Five are under 100: Multi Vehicle Crashes and the other five are under 200: Single Vehicle Crashes. The other two groups of 300: Hit Pedestrians and 400: Passenger Crashes do not have sub-groups and are further classified down to the DCC individual level.

9.4.1 100: Multi Vehicle Crashes

9.4.1.1 110 – Head On

Head-on types of crash generally have the following characteristics:

- Two vehicles or more
- Vehicles from opposing or opposite directions
- Collision is predominantly from to front of each vehicle, but it may be side damage only as vehicles take avoidance action or because of the types of vehicle maneuver
- No pedestrians
- No boarding, alighting or falling passenger activity
- Excludes a crash that involves a vehicle overtaking

9.4.1.2 130 – Rear End

Rear-end types of crashes generally have the following characteristics:

- Two vehicles or more
- Vehicles from same direction.
- Vehicle are following each other
- One collides with rear section of vehicle in front
- No pedestrians
- No boarding, alighting or falling passenger activity
- Excludes a crash that involves a vehicle overtaking

9.4.1.3 150 - Right Angle

Right angle types of crashes generally have the following characteristics:

- Two vehicles or more
- Vehicles from adjacent approaches at an intersection
- Collision is predominantly front side quarters or side as vehicles are “T-Boned” in the collision
- No pedestrians
- No boarding, alighting or falling passenger activity

9.4.1.4 170 – Side Swipe

- Two vehicles or more
- Vehicles from same direction
- Vehicle travelling side by side
- Collision is predominantly side of each vehicle
- No pedestrians
- No boarding, alighting or falling passenger activity
- Excludes a crash that involves a vehicle overtaking

9.4.1.5 190 – Overtake

- Two vehicles or more
- At least one vehicle performing an overtaking maneuver
- No pedestrians
- No boarding, alighting or falling passenger activity

9.4.2 200 – Single Vehicle Crash

9.4.2.1 210 – Overturn

- One vehicle
- Vehicle may be going in any direction
- Damage is predominantly side and roof
- No pedestrians
- No boarding, alighting or falling passenger activity

It is important to note that this code is used for a vehicle that has overturned on the road because of some contributing factor to caused loss of control. The vehicle may come to rest on or off the road.

Vehicles that overturn after they leave the road, the contributing factors on the road did not cause the overturning, they caused a loss of control that lead to the vehicle going of the road.

9.4.2.2 230 – Hit Object In Road

- One vehicle

- Vehicle may be going in any direction
- Vehicle hits an object on the road
- Damage may be anywhere
- No pedestrians
- No boarding, alighting or falling passenger activity

9.4.2.3 250 – *Hit Object Off Road*

- One vehicle
- Vehicle may be going in any direction
- Damage may be anywhere
- Vehicle hits an object off the road
- No pedestrians
- No boarding, alighting or falling passenger activity

9.4.2.4 270 – *Hit Parked Vehicle*

- One vehicle in motion
- Other vehicle or vehicles which are parked
- Vehicle may be going in any direction
- Damage may be anywhere
- No pedestrians
- No boarding, alighting or falling passenger activity

9.4.2.5 290 – *Hit Animal*

- One vehicle
- Vehicle may be going in any direction
- Damage may be anywhere
- Vehicle hits an animal
- May occur either on or off the road
- No pedestrians
- No boarding, alighting or falling passenger activity

9.4.3 300: Hit Pedestrian Crash

- One vehicle
- Vehicle may be going in any direction
- Damage may be anywhere
- One or more pedestrians are injured
- No boarding, alighting or falling passenger activity

9.4.4 400: Passenger Crash

- One or more vehicles;
- A passenger must be boarding, alighting or falling from a vehicle;
- Vehicle may be going in any direction; and
- No Pedestrians

9.5 Descriptive Crash Codes

There is a total 71 individual DCCs to define crash types that have the same characteristics. These are as follows:

9.5.1 100: Multi Vehicle Crashes

9.5.1.1 Head On

110 – Head On Through - Through

Vehicles approaching from opposing directions, both are going straight ahead resulting in a head on. (A sideswipe from opposing directions is included in this DCC.)

111 – Head On Right Turn -Through

Vehicles approaching from opposing directions and one is turning right the other is going straight ahead resulting in a head on.

112 –Head On Left Turn -Through

Vehicles approaching from opposing directions and one is turning left the other is going straight ahead resulting in a head on.

113 – Head On Right Turn – Right Turn

Vehicles approaching from opposing directions are both turning right resulting in a head on.

114 – Head On Right Turn – Left Turn

Vehicles approaching from opposing directions, one is turning right the other is turning left resulting in a head on.

115 – Head On Left Turn – Left Turn

Vehicles approaching from opposing directions and are both turning left resulting in a head on.

116 – Head On U Turn - Through

Vehicles approaching from opposing directions, one is doing a U Turn the other is going straight ahead resulting in a collision.

119 – Other Head On

Vehicles approaching from opposing directions and result in a collision.

9.5.1.2 Rear End

130 – Rear End Through - Through

Vehicles approaching from same direction, one travelling behind the other, both are going straight ahead resulting in a rear end crash.

131 – Rear End Through – Right Turn

Vehicles approaching from same direction, one travelling behind the other, one is going straight ahead and rear ends the vehicle in front turning right.

132 – Rear End Through – Left Turn

Vehicles approaching from same direction, one travelling behind the other, one is going straight ahead and rear ends the vehicle in front turning left.

136 – Rear End U Turn-Through

Vehicles approaching from same direction, one travelling behind the other, one is going straight ahead and has a collision with a vehicle in front doing a U Turn.

139 – Other Rear End

Vehicles approaching from same direction, one travelling behind the other, and resulting in a rear end crash

9.5.1.3 At Angle

150 – At Angle Through - Through

Vehicles approaching at an angle to each other and both are going straight ahead resulting in a collision. (These are intersection crashes.)

151 – At Angle Through – Right Turn

Vehicles approaching at an angle to each other, one is going straight ahead the other is turning right, resulting in a collision. (These are intersection crashes.)

152 – At Angle Through – Left Turn

Vehicles approaching at an angle to each other, one is going straight ahead the other is turning left, resulting in a collision. (These are intersection crashes.)

153 – At Angle Right Turn -Through

Vehicles approaching at an angle to each other, one is turning right the other is going straight ahead, resulting in a collision. (These are intersection crashes.)

154 – At Angle Right Turn – Right Turn

Vehicles approaching at an angle to each other, both are turning right resulting in a collision. (These are intersection crashes.)

155 – At Angle Left Turn – Right Turn

Vehicles approaching at an angle to each other, one is turning left and the other turning right, resulting in a collision. (These are intersection crashes.)

156 – At Angle Left Turn - Through

Vehicles approaching at an angle to each other and one is turning left the other is going straight ahead, resulting in a collision. (These are intersection crashes.)

157 – At Angle Right Turn – Left Turn

Vehicles approaching at an angle to each other, one is turning right and the other turning left resulting in a collision. (These are intersection crashes.)

158 – At Angle Left Turn – Left Turn

Vehicles approaching at an angle to each other, both are turning left resulting in a collision. (These are intersection crashes.)

159 – Other At Angle

Vehicles approaching at an angle to each other that result in a collision. (These are intersection crashes.)

9.5.1.4 Side Swipe

170 – Side Swipe Through - Through

Vehicles approaching from same direction, travelling side by side and both going straight ahead, and there is a sideswipe collision.

171 – Side Swipe Lane Change

Vehicles approaching from same direction, travelling side by side and are both going straight ahead when one of the vehicles makes a lane change which results in a side swipe collision

173 – Side Swipe Right Turn – Right Turn

Vehicles approaching from same direction, travelling side by side and are both turning right when they side swipe each other

174 – Side Swipe Left Turn – Left Turn

Vehicles approaching from same direction, travelling side by side and are both turning left when they side swipe each other

179 – Other Side Swipe

Vehicles approaching from same direction, travelling side by side when a side swipe collision occurs

9.5.1.5 Overtake

190 – Overtake Head On

Vehicles approaching from opposing directions, one is overtaking and has a head on with the other vehicle going straight ahead.

191 – Overtake Rear End

Vehicles approaching from same direction, one travelling behind the other, the following vehicle begins to overtake and rear-ends the vehicle in front.

192 – Overtake Rear End Overtake

Vehicles approaching from same direction, one travelling behind the other, both are overtaking, the following vehicle rear-ends the front vehicle.

193 – Overtake Cut In

Vehicles approaching from same direction, one travelling behind the other, the following vehicle overtakes and cuts off the vehicle travelling in front resulting in a collision.

194 – Overtake Right Turn

Vehicles approaching from same direction, one travelling behind the other, the following overtakes the front vehicle, which is turning right, resulting in a collision.

196 – Overtake U Turn

Vehicles approaching from same direction, one travelling behind the other, the following vehicle overtakes the vehicle in front, which is performing a U Turn, resulting in a collision.

199 – Other Overtaking

Vehicles approaching from same direction, one travelling behind the other and at least one vehicle is performing overtaking manoeuvre and there is a collision.

9.5.2 200: Single Vehicle Crashes

9.5.2.1 Overtake

210 – Overtake on Straight

A single vehicle is going straight ahead and loses control and overturns.

211 – Overtake Turning Right

A single vehicle is turning right and loses control and overturns.

212 – Overtake Turning Left

A single vehicle is turning left and loses control and overturns.

213 – Overtake U Turn

A single vehicle is performing a U Turn and loses control and overturns.

214 – Overtake Overtaking

A single vehicle is overtaking and loses control and overturns.

299 – Other Overtake

A single vehicle loses control and overturns.

9.5.2.2 Hit Object On Road

230 – Hit Object On Straight

A single vehicle is on a straight road and hits object on road.

231 – Hit Object In Intersection

A single vehicle is at an intersection and hits object on road.

232 – Hit Object On Incline

A single vehicle is on an incline and hits object on road.

233 – Hit Object On Curve

A single vehicle is on a curve and hits object on road.

234 – Hit Object On Curved Incline

A single vehicle is on a curved incline and hits object on road.

235 – Hit Object when Reversing On Road

A single vehicle is reversing and hits object on road.

9.5.2.3 Hit Object Off Road

250 – Hit Object Off Straight

A single vehicle is on a straight road and hits object off road.

251 – Hit Object Off Intersection

A single vehicle is at intersection and hits object off road.

252 – Hit Object Off Incline

A single vehicle is on incline and hits object off road.

253 – Hit Object Off Curve

A single vehicle is on a curve and hits object off road.

254 – Hit Object Off Curved Incline

A single vehicle is on a curved incline and hits object off road.

265 - Hit Object when Reversing Off Road

A single vehicle is reversing and hits object off road.

9.5.2.4 Hit Parked Vehicle

270 – Hit Parked Vehicle On Road

A single vehicle hits vehicle(s) parked on the road

271 – Hit Parked Vehicle Off Road

A single vehicle hits vehicle(s) parked off the.

9.5.2.5 Hit Animal

290 – Hit Animal

A single vehicle hits animal on or off the Road

9.5.3 300: Hit Pedestrian

310 – Hit Pedestrian Crossing Road

A single vehicle hits pedestrian(s) as they are crossing the road.

311 – Hit Pedestrian Walking Along Road

A single vehicle hits pedestrian(s) as they are walking along the road.

312 – Hit Pedestrian Walking Along Edge of Road

A single vehicle hits pedestrian(s) as they are walking along edge of the road.

313 – Hit Pedestrian Playing On Road

A single vehicle hits pedestrian(s) as they are playing on the road.

314 – Hit Pedestrian On Path

A single vehicle hits pedestrian(s) when they are on the footpath.

315 – Hit Pedestrian On Pedestrian Crossing

A single vehicle hits pedestrian(s) as they are crossing at a pedestrian crossing.

316 – Hit Pedestrian Within 50 metres of Pedestrian Crossing

A single vehicle hits pedestrian(s) as they are crossing within 50 metres of a pedestrian crossing.

317 – Hit Pedestrian in Centre Refuge

A single vehicle hits pedestrian(s) when they are in a centre refuge.

319 – Other Hit Pedestrian

A single vehicle hits a pedestrian(s).

9.5.4 400: Passenger

410 – Passenger Boarding

A vehicle hits a passenger as they are boarding another vehicle.

411 – Passenger Alighting

A vehicle hits a passenger as they are alighting from another vehicle.

412 – Passenger Falling Off Motor Cycle

A passenger falls off a motorcycle.

413 – Passenger Falling Off when Sitting Outside

A passenger falls of a vehicle while sitting outside of that vehicle.

414 – Passenger Falling Off when Standing Outside

A passenger falls of a vehicle while standing outside of that vehicle.

9.6 DCC Diagrams

Each of the above defined types of crashes with assigned Descriptive Crash Codes may be represented by a simple diagram. These are simply templates to represent a particular type of crash that can be graphically shown in the crash diagram. A table of these DCC templates (or diagrams) is included in Appendix 5.

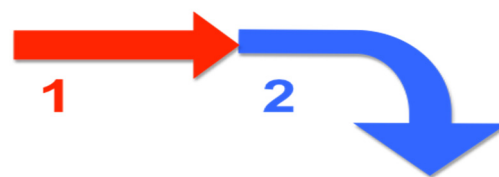
These diagrams help to match crash diagrams on the crash reports prepared by NPS Officers with the crash type definitions represented by the DCC. Also, these DCC diagrams are useful when crash data analysts wish to prepare crash diagrams (similar to that shown in Appendix 6 using the information extracted from the database. Crash diagrams in turn can be a very useful tool for safety engineers to easily identify crash clusters at black spots on the road network and suggest remedial measures.

9.7 Convention of Vehicle 1 & Vehicle 2

The general convention in the DCC diagrams is that a red arrow represents the vehicle at fault. This may not always be the case.

As a convention the vehicle that is “in the wrong” would be coded as Vehicle 1 on the Crash Report. The logic for this is that the coding will follow from this. The easiest example to demonstrate is a rear end crash where the front vehicle is turning left, in most cases the vehicle that collides with the rear of the vehicle is in the wrong (following too close or is not observing what the vehicle in front is doing), so Vehicle 1’s manoeuvre would be, 8 Go Ahead and Vehicle 2 manoeuvre would be, 2 Left Turn. Even though this may be the convention it may not always be followed and careful use of variables in coding is advised.

A typical rear end type crash is represented in the following diagram. Note vehicle 1 is red, in the wrong and following too closely.



Thru-Right 131

Figure 9.1: An Example of DCC Template with Vehicle Convention

Figure 9.1 is the example template for DCC 131 – Rear End Through – Right Turn crash. The full description of the crash is being, vehicles approaching from same direction, one travelling behind the other, one is going straight ahead and rear ends the vehicle in front turning right. There are 71 of these templates.

The emphasis to follow this convention will be at the time of data entry. The data entry officer will make a decision on which vehicle is vehicle 1 and which is vehicle 2 to best fit the DCC diagrams. Police will be informed of this convention on the CRF Guide for the Current Crash Form but it will be up to the data entry officer to check.

9.8 Monitoring of Descriptive Crash Codes (DCC)

NRSC is responsible for the annual review of the Descriptive Crash Codes (DCC).

Trained crash database officers engaged by the NRSC will receive the entered data from the Nepal Police; manage the system in accordance with Nepal Road Crash Database Management Manual (NRCDMM). The management framework shall be based on the principle of sustainability.

One of the tasks within the manual will be to check to see if an acceptable amount of crashes are coded into a DDC and it is only a small percentage that are coded as “other”.

If the NRCDS management team feels that there is an unacceptable percentage of crashes are found to be coded as “other” they will make recommendations to the NRSC for a review of the crash codes and possibility look at additional codes needed to identify changing conditions on the road network.

CHAPTER 10

MANAGEMENT MANUAL

10.1 Introduction

The Nepal Road Crash Database Management Manual (NRCDMM) covers all topics from the collection of data to the dissemination of data. This is not a stand-alone document, as it requires information from other components of the Nepal Road Crash Database System (NRCDS) such as Crash Report Form (CRF), "How to Complete Crash Report Form (HCCRF)", Data Entry Screen (DES), Data Checking Storage System (DCSS), Nepal Crash Data Users' Manual (NCDUM), all of which are part of this Report. The manual, which is presented in the form of an Appendix 11 to this report, needs to be published or printed as a separate booklet or publication for use by NPS and MOPIT (or its agent) responsible to manage NRCDS and NRCDS respectively. In order to make NRCDMM a self-contained document, some of the materials from this report and from NRCUM (See Section 11) are repeated.

One of the primary uses of the data collected about road crashes is to provide information to decision makers who can decide on realistic treatments or countermeasures for particular crash types, road user groups, vehicle types or road characteristics. It is a prerequisite that accurate and consistently compiled data is available and part of that process is the need to apply definitions and guidelines to the collection and processing of the crash data.

To meet this goal this manual steps out recommended procedures to be followed. Supplied with this manual are the NRCDS Report and two EXCEL entry systems: one Data Entry Screen (DES) and the second Data Checking & Storage Screen (DCSS), which support the police officers and data entry teams to enter, validate, code and store crash data.

The NRCDMM is developed under the Nepal Road Crash Database System Project (NRCDSP). It follows best practice examples from other countries but predominantly from Australia.

NRCDMM is presented in 13 Sections and ten Appendices. It contains many subsections. Bullet forms are used mostly to be precise. This is expected to offer clarity to the users of the Manual.

NRCDMM is a critical document for ensuring sustainability of the NRCDS and significant efforts have been placed to develop this. In a country like Nepal where staff turnover is quite high and frequent both in MOPIT and NPS, the retention of the Management Manual in the

custody of agencies responsible to manage database is critical as proper handover of the knowledge and skill does not take place usually when the staff movement occurs and regular training programs are not implemented.

Sections 10.2 to 10.4 cover the steps involved in data entry and forwarding data to other computers with NRSC and other agencies responsible for managing road safety, who wish to have their own database system. Primary source of all these data would be the server with NPS, which is responsible to enter data collected by it in the first instance

Section 10.5 covers checking, reviewing and updating data, then adding data to the database for safe storage. Remaining sections deals with various other database management issues as follows and briefly described below in this Chapter.

- Updating information Lists on DES
- Schedule of functions
- Data dissemination
- Compatibility with GIS
- Basic Definitions
- DCCs
- Related documents and reference materials
- Appendices to NRCDMM

Upon the completion of this study NRCDMM is proposed to be published as a standalone document for ease in use by the NRCDS owners, managers and operators in future who do not necessarily read the report on its development. NRCDS Report, however, sets the context and provides a lot of background materials which help understand the contents of the Management Manual easily.

10.2 Data Collection

Section 2 of NRCDMM describes the CRF with brief introduction and refers further to this report for more information such as gaps in the data in the current CRF (Chapter 7) and detailed analysis of the existing form and what should be done to improve CRF (Chapter 8) when more resources are available.

Having introduced the CRF, this Section provides step by step guidance on how to complete CRF, how the crash data are being collected currently and what needs to be done in the interim and how can it be done better when resources are made available to NPS. Following are the headings of sub-sections in Section 2 of NRCDMM

- Current Crash Report Form (CRF)
- How to Complete Crash Report Form
- Data Collection in Nepal

10.3 Data Entry

Section 3 of the NRCDMM starts with what needs to be done in relation to data entry locations. Then it describes data entry screen (DES) followed by the detailed steps involved in data entry and data entry procedure that needs to be completed by data entry officer and finally the process for local data backup. Following are the headings included in Section 3.

- Data Entry Locations
- Data Entry Screen (DES)
 - Step by Step Data Entry
- Data Entry Procedures
- Local Data Backup

Not all police stations are currently equipped with desk top computers or access to the Internet. The NPS will need to establish “Data Entry Locations” (DEL), which are to be the police stations that have the facilities to enter the data. These locations will be in a direct line of command to the smaller stations and thus be able to work closely with all officers to collect road crash data.

Cooperation between NPS, MoPIT and the NRSC is required to set up good lines of communication so that forms, emails, instructions and support flow smoothly. The cooperation and support between these stakeholders and many others is fundamental in helping to save lives.

Once a set of DEL have been established this needs to be communicated to NRSC and MoPIT so as they know what police stations they will be receiving data emails from. It is also requested that each DEL has a unique identification number. The formatting of this is up to NPS but as a recommendation the first two digits would be best as the District, so 01 to 75. This request for an identification number helps with the movement of information. Also if NRSC or their agents, for example, MoPIT could be supplied with email addresses for each of these DELs. This will allow for follow-up questions or communications or even improvements to the DES pack to be sent out.

A Data Entry Screen (DES) has been developed under this project and will be provided to all DEL for their use. This Report will also be electronically provided so as all data entry staff has access to procedures, steps and supporting information.

As the data entry officer enters data from the CRF into DES, error messages, suggested conflicts and instructions will be seen on the screen. Appendix 8 provides instructions on how to use the screen. In most cases the officer will be able to solve these by looking at the CRF and the Collision Diagram Sketch (CDS) on the CRF. It is not police responsibility to code the crash, but it is highly recommended that the data entry officer familiarize themselves with crash types. Chapter 9 in this report covers this in detail.

As the NPS are entering the data the advantages of this cannot be understated. Firstly, a fundamental role of police is to ask questions and to reason if the answers make sense. It is understood that it will be the Traffic Police of Nepal who will undertake the data entry activity. These officers already have an underlying understanding of what happens on Nepal's roads. It is to be expected that getting used to DES at first and reading about crash types and definitions will pose a steep learning curve, but as with any task it becomes easier each time one performs the same task on regular basis. The NRCDS project team has no misgivings. It is believed that the commitments to solve issues on Nepal's roads of the Traffic Branch seen during the project consultation would ensure perform this task in a responsible, professional and dedicated way. It is the responsibility of other stakeholders to give as much assistance and support as possible to the NPS.

The final step is about the steps that the entry officer needs to do in order to save the data and create back up files for the data entered before closing the current data entry session.

10.4 Data Forwarding

The previous section, Section 3, of the manual created data files. This section provides guidance on how to forward created files to all relevant agencies. At this stage, the recommendation is that a central database system be established and maintained at the IT Department of NPS with complete information for its use and NRSC/MOPIT maintains a separate database that includes all information less sensitive personal information not required by road safety professionals.

If the DOR, DOLIDAR and other government agencies having stakes in road safety would like to maintain their own database system, this feature can be introduced at a later stage in the NRCDS owned and managed by NRSC/MOPIT.

Details of where to send the Email File for IT/NPS and line of command between the police officers involving in entering data and storing in central database system (NPRCDS) should be established before the commencement of entering data using the process described in the manual. TD/NPS may also need to receive and retain a copy of CDS (or whole of CRF) for further check and ongoing improvement of crash data set.

The last section of this chapter describes how to send follow up data.

There will be occasions when extra information will become available and the original entry needs to be updated. Examples of these are:

- A casualty who was serious at the time of the crash and admitted to hospital passed away within 30 days of the crash. This information needs to be updated on the record so as crash severity data is accurate by modifying serious injury type of crash to fatal.
- Hit & Run situations where the police now have the details of the vehicle or driver who had left the scene of the crash. Information is needed to update the crash record. (Note do not send private information such as name address or license number).
- Police may have found out details about a casualty, which were not earlier available (e.g., crashes resolved amicably between the parties involved and therefore not reported to Police at the time of crash have surfaced out, reported by the victims at a later date), and these data need to be added to the original crash record.

10.5 Data Checking and Storage Screen (DCSS)

There are usually six different activities under Section 5 of the NRCDMM. These are:

- Tools required for Data Check and Storage;
- Filing Emails;
- Receipt Reports
- Data Checking and Storage Screen;
 - Files for Checking
 - Check Duplications
 - Data Record Checking in DCSS
 - Step by Step Checking in DCSS
 - Save to Road Crash Database or to be Reviewed
- To be Reviewed
 - Advice from Experienced Operator
 - Requesting extra Information from NPS

- Receiving and entering Updated Data

As seen, there exist features in the NRCDS that allow continual review and update of the records on any crash. Once Crash Identification Number (CIN) is known, any crash can be reviewed and information updated as and when received by MOPIT from any sources such as hospital, NPS (DEL, DPO, RPO or TD) or other agencies (Insurance Companies).

10.6 Updating Information Lists in DES

This is the Section of NRCDMM which provides guidance on how to update lists of information in DES, which change over time and which are received from NPS, DOR and DOLIDAR.

There are primarily two sets of data that need to be updated in the DES. These include:

- List of Police Stations;
- List of Roads (DOR's roads and DOLIDAR's roads classified as "Core Roads")

Over time these lists may change as new police stations are added or closed, the same applies for roads.

The Section has the following heading and sub-headings:

- Police List
 - Instruction on adding new police station list
- Road List
 - Instruction on adding new road list

Entering information manually invites inconsistency in the name of roads which would create problems in identifying the roads if the name of the roads and police stations are spelled out differently. This feature of DES addresses this problem.

Currently, there are 1016 police stations which are available in DES. DES has the capacity of taking up to 1200 police stations. Similarly, there are 2670 roads in the list as per the information provided to the Team during the consultation process. DES currently has the capacity of including up to 6000 roads.

In accordance with the suggested policy guidelines, DOR and DOLIDAR have the responsibility to provide updates on the list of their roads to TD/NPS. This explains why there is a need of robust institutional framework in order to manage crash data in the country.

10.7 Schedule of Functions

Management of NRCDS contains activities that need to be done on regular basis. Data quality would be good and risk of losing data will be low only if is a robust QA QC (Quality Assurance and Quality Control) system is built into the data management process. This Section of NRCDMM provides guidance on the functions that need to be carried out by the team responsible for NRCDS management.

The content of this section of manual specifies the works should be done on daily, weekly, monthly half yearly and yearly basis together with the brief instruction how these works may be carried out. These are presented in the following five sections

- Daily
- Weekly
- Monthly
- Half yearly
- Yearly

Following are some of the examples of the daily, weekly, monthly, half yearly and yearly functions. Details on each function are contained in NRCDMM.

- *Daily:*
 - Record of Emails received and emails entered totals for data in database
 - Backup the days work
- *Weekly:*
 - Back up the weeks work
- *Monthly:*
 - Do management report on number of reports received, number added to database
 - Number waiting review
 - Backup months work
 - Totals report and comparison to NPS
- *Half yearly:*
 - Check with DOR and DOLIDAR and NPS if any supplied lists have changes to be added to DES
 - Back up data
 - Totals report

- And total report comparison to NPS
- *Yearly:*
 - Back up Data
 - Total Entered, Total waiting Review, Total in Database
 - Totals report and comparison to NPS

10.8 Data Dissemination

This Section of the Manual contains brief information how to draw data from the database, what information needs to be supplied with the data to the customer so that they understand the data.

Any data that are entered in the database from the CRF can be supplied to the customers personal information only to involved parties and court proceedings). As the database has been set up on an EXCEL platform, retrieval of data is a simple procedure. The Users' Manual provides information on what is contained in the database. Appendix 6 of the Management Manual also contains this information. End users and road safety professionals may request information based on this list. Operators will simply copy the database and sort down to the required set of data that has been requested and supply an EXCEL sheet with the requested set of data.

It would further be recommended that definitions, possible variables and the CRF also be supplied to new users of the data.

There has been some misconception among some of the stakeholders that the NRCDS, once set up, can generate key performance indicators of interest for monitoring safety performance. It is emphasized here again that the database is created just to store crash data. It has no features for analysing safety performance indicators. Once the end users get data as requested, they would easily be able to analyse data according to their needs. It is not the duty of the database owners or managers to provide data analysis service to the users of the data, neither the database manager knows about end users' need. NRSC can establish a separate Data Analysis Unit or Cell to provide such services to its customers but it is entirely a separate project. A policy needs to be developed if NRSC wants to provide such services. At this formative stage of database and NRSC's establishment itself, this is simply not thinkable and no provision was made in the Scope of NRCDS Project to build such features in the NRCDS itself.

The type of data analysis varies from agency to agency. Road agencies may be interested to undertake analysis on "individual risk" (defined as crash or crash cost per million vehicle kilometre travelled) or "collective risk" (defined as crash or crash cost per km of road). On the

other hand, road safety professionals from health sector may wish to know number of casualty crashes involving head or spinal injuries. Road safety professionals in vehicle standards may wish to know vehicle factors and enforcement professionals may have different analysis requirements. Professionals involved in education and behavioural change programs may wish to know, for instance, education level of road users involved in crashes or age groups of victims of road crashes to develop programs targeted to these specific groups. These are just the examples to demonstrate that NRCDS project is not about the analysis of the data but to collect and store data to serve the varying needs of different road safety professionals responsible to manage road safety.

There are primarily two types of data sets that the NRCDS manager or owner should be responsible for:

- Raw data as stored in the computer based on the request of the professionals (for which these professionals would do further analysis to meet their needs); and
- Processed data (high level road safety performance indicators as determined by NRSC to publish on its web site depending on its policy such as:
 - Number of crashes (fatalities/ serious injuries) by population, kilometer of road, type of road, by district, by regions by road and so on;
 - Crash cost per kilometer of each type of major roads as above;
 - Number of crashes by types or by contributing factors (overtaking, drink driving, speeding, by not wearing helmets, by license types etc.; or
 - Number of crashes due to parking categorized as above;
 - Number of crashes due to pedestrian faults

And the list can go on and on but, first, the policy should be established what to report and what to monitor within the given capacity, priority and availability of resources. These reporting requirements can be given to respective agencies responsible for managing road safety and NRSC can simply set the policy on reporting requirements of these agencies and monitor if these agencies have met their reporting requirements. This is, again, an institutional issue and not the data management and analysis issue.

It is thus clear that it is not to be the scope of the NRCDS managers and, therefore, this analysis requirement is recommended to be identified and institutionalised under a separate follow up project once at least three year crash data would be available. Without having the data in meaningful quantities, data reporting, analysis and monitoring issues make no sense at all.

Furthermore, such varied analysis require data on population (by age group, sex, by education etc.), population of vehicles (by type, by age etc.) road network data (by function, by surface etc.), traffic data (by day, by night, by week etc.), license holders data (by age, by sex, by education level etc.) and many more. The analysis is possible only if all these data are pulled together in a single platform, for which a separate project, in addition to the NRCDS, needs to be established which will create Nepal Road Safety Information Management System (NRSIMS).

10.9 Geographic Information System

The Management Manual emphasizes the need of this information to ensure compatibility with GIS overlay to show clusters of crashes on the road network or a section or a specific site of the road of interest. It provides advice on process to be followed to enter latitude and longitude of crash site so that crash clusters can be shown on the map and black spots identified.

This Section of Management Manual has the following headings and sub-headings:

- Latitude and Longitude; and
- Cluster Maps
 - Crash Cluster
 - Black spots

10.10 Definitions of Terms

Defining the terms used in the Management Manual is very important to ensure consistency in the data entered in the database. These definitions also help in the understanding and execution of the processes involved in managing data. This Section of the Manual contains the definitions of many terms used in the Manual. More definitions can be included later as the database is established. At this initial stage following terms are defined broadly (Details are available in the Manual).

- Road, road related areas, non-standard roads and special types of roads;
- Vehicles such as motorcycle, bicycle, wheeled recreational devices, wheel toys used on roads;
- Road users such as drivers, occupants of vehicles, riders, controllers, passengers and pedestrians;
- Objects on road;

- Road crash, road crash exclusions, crash after stabilised situation, crash involving deliberate intent, crash involving legal intervention and crash not attributable to vehicle movement;
- Vehicle motion (vehicle in transit, vehicle stationary in transit, parked vehicle);
- Crash location (on road, on road related area, off road), crash casualty (fatal, serious injury, minor injury, uninjured);
- Road features (intersections, lane, LATM device, link)

10.11 Descriptive Crash Codes

An explanation of how DCC is achieved in the Data Entry Screen (DES) and how data entry officer may interpret DCC changes in a CRF was provided in earlier sections. The Management Manual includes the following sections to guide the management of data entries:

- single vehicle crash events;
- multiple event crashes;
- independent impacts within a crash; and
- DCC templates and definitions, which are more particularly described in Section 12 separately of the Management Manual

10.12 Descriptive Crash Code Templates

Section 12 of the Manual describes why three-digit crash codes are created with the classification of crashes into various groups and sub-groups resulting finally into DCCs. These templates are created under four major broad groups 10 sub-groups of crashes. These are described in the Manual under the following four groups of crashes These are:

- Multi-vehicle crashes;
- Single vehicle crashes;
- Hit pedestrian crashes; and passenger crashes; and
- Passenger related crashes

The Manual then includes a table of DCC diagram templates for convenient reference by the users of the Manual.

10.13 Further References

The Management Manual also contains information for users on where they can find further readings and references to related documents. These include, but not limited to:

- Final Report on the Development of NRCDS (this report);
- Guidelines on "How to complete CRF";

- Nepal Crash Database Management Manual (NRCDMM);
- Nepal Crash Data Users' Manual; and
- Other reference materials included in this Report

10.14 Appendices to NRCDMM

Following Appendices are included in the NRCDMM. This helps make use of the Management Manual independent of this report. These Appendices include:

- Appendix MM1 CRF;
- Appendix MM2 How to complete CRF;
- Appendix MM3 List of District Number;
- Appendix MM4 How to use DES;
- Appendix MM5 How to use DCSS;
- Appendix MM6 List of all data variables collected;
- Appendix MM7 DCC Template;
- Appendix MM8 Example DCC Crash Diagram;
- Appendix MM9: List of Police Stations available in DES (to be updated at least six monthly); and
- Appendix MM10: List of Roads available in DES (to be updated at least six monthly)

CHAPTER 11

USERS' MANUAL

11.1 Introduction

The Nepal Crash Database Users' Manual (NRCDUM) covers topics that are required by the users requesting the crash data stored in NRCDS. NRCDUM is not a stand-alone document, as it requires information from other components of the Nepal Road Crash Database System (NRCDS) such as fields in Crash Report Form (CRF), Descriptive Crash Code System (DCCS), Data Storage System (DSS), Policy Guidelines on Crash Data usage, all of which are part of this Report. The manual, which is presented in the form of an Appendix 12 to this report, needs to be published as a separate booklet or publication for use by MOPIT (or its agent) responsible to manage NRCDS and by the users of crash data stored in the NRCDS. In order to make NRCDUM a self-contained document, some of the materials from this report and from NRCDMM (See Section 10) are repeated.

The users of crash data are diverse (See Section 12). It is not plausible to develop a manual that provides guidance to users on what types of analysis can be made using the data from NRCDS. As users of crash data, road safety professionals already know what analysis they intend to do. The manual is rather about the guidance on what data are available in the NRCDS and how they can request data from MOPIT.

As mentioned earlier, NRCDS is just a crash data storage system and not the management information system. It is not the Road Safety Information Management System either.

It is important to emphasize that it is not the responsibility of NPS to code the crashes. NPS is only to help MOPIT collect as much data as possible and enter the information from CRFs into a computer.

This raw data is the property of NPS as it contains personal information and information which are relevant only to police procedures. The Traffic Directorate of Nepal Police Services (TD/NPS) then sends a sub-set of crash data, removing personal information and information only relevant to police procedure, to the National Road Safety Council (NRSC). Staff using a second EXCEL system, the Data Checking and Saving Screen (DCSS) to check there is no duplication of crash records, any remaining conflicts of entered variables are removed and coding DCC has been achieved (If automatic coding was not achieved in DES).

The final set of crash records are stored in NRCD EXCEL with a unique Crash Identification Number (CIN) and may be extracted as an EXCEL worksheet. The NRCD does not perform analysis on the data itself; it is the repository of road crash data suitable for distribution, collected by NPS.

The proposed database system does not have access to users. It is the responsibility of the MOPIT or its agent to receive Data Request Form (DRF) from users and prepare data (generally in EXCEL spreadsheet). The Data Analysis Unit (DAU) of NRSC /MOPIT) or its agent is a service provider which offers service related to the provision of crash data to road safety agencies, professionals, crash victims and members of public.

The NRCDUM is developed under the Nepal Road Crash Database System Project (NRCDSP). It follows best practice examples from other countries but predominantly from Australia.

The draft of NRCDUM presented here needs to be updated (or revised) following the adoption of Crash Data Management Policy by the Government. The type of institutional set up, the legal proceedings, resourcing at NRSC (managed in house or outsourced) and funding arrangements will have bearings on how the data would be made available to the users.

NRCDUM is an important document to ensure that users know what data are available from NRCDs and how they should request data. The Manual sets the basis process to be followed in requesting the data and significant efforts have been placed to develop this. In a country like Nepal where users of crash data are yet to be familiar with the crash database system and the correct interpretation of variables (types of data) including their use, the Users' Manual would become very handy. It is recommended that the Users' Manual be printed/ published in enough numbers towards the end of year 1 of data entry commencement and widely distributed to users. It will also be highly beneficial to upload the Manual in NRSC/ MOPIT's web site and other users' (Road Agencies) web site. NRSC should also offer regular training programs to all major users of road crash data.

NRCDUM is presented in 10 sections and five Appendices. It contains over five subsections. Section 1 introduces the Manual. Other sections of the Manual are:

- Geographic Information System;
- Definitions;
- Descriptive Crash Codes;
- List of Variables;
- Guidance on Data Use;

- Data Use Warnings;
- Supporting Data;
- Caution in Variables; and
- Requesting Data.

Bullet forms are used mostly to be precise. This is expected to offer clarity to the users of the Manual.

11.2 Geographic Information System

Section 2 of NRCDUM warns the users of crash data that the currently completed CRFs do not have information on latitude and longitude of crash location. Accordingly, crash data stored in the NRCDS can only be used to identify crash locations tentatively with respect to the nearest identified landmarks or intersection. This is not a good practice and should cease.

Users should be aware of this deficiency and cooperate to the Ministry to implement latitude and longitude in the CRFs. This information is crucial for road safety engineers to determine clusters of crashes on road network. It is also useful to produce maps with road network showing road fatalities and serious injury and undertake analysis of road crashes at network level by route, by districts, by regions, by police regions and by road regions and so on.

The other important information missing in the current CRF that the users of crash data need to be aware of, is the direction of travel. While a crash diagram can provide this information, it may not be precise as there would be no check for this information.

Use of the modified CRF will address these deficiencies, but the use of modified form may require an approval process and support to NPS from NRSC to equip them with the required facilities.

11.3 Definitions

It is important that the users of crash data know basic definitions of terms used in NRCDS. Use of the same definitions by all users offers consistency in understanding the terms across users, which helps in the correct interpretation of data.

Section 3 of the Users' Manual gives information on where definitions of the terms can be found.

NRCDMM may not be available to users of the crash data. While the NRCDUM in Appendix 12 does not repeat the definitions included in NRCDMM for brevity, it is recommended that the stand alone NRCDUM be printed with the definitions of all terms used in NRCDMM.

The following are some of the terms defined in NRCDMM, which are equally important for users to know.

- Road, road related areas, non-standard roads and special types of roads;
- Vehicles such as motorcycle, bicycle, wheeled recreational devices, wheel toys used on roads;
- Road users such as drivers, occupants of vehicles, riders, controllers, passengers and pedestrians;
- Objects on road;
- Road crash, road crash exclusions, crash after stabilised situation, crash involving deliberate intent, crash involving legal intervention and crash not attributable to vehicle movement;
- Vehicle motion (vehicle in transit, vehicle stationary in transit, parked vehicle);
- Crash location (on road, on road related area, off road), crash casualty (fatal, serious injury, minor injury, uninjured); and
- Road features (intersections, lane, LATM device, link).

11.4 Descriptive Crash Codes

The limited exposure of the practicing engineers in Nepal on DCC system introduced in NRCDMM requires that engineers and other road safety professionals be trained adequately on how to interpret DCC, why DCCs are so important, what might contribute to these crashes, what treatments are available for each type of crash codes and so on.

Engineers in Nepal know what a head on crash is, but they may not necessarily be aware of the fact that there are different types (hence different codes) of head on crashes which require different remedial measures. Suffice to say, treatment of crash locations with cluster of head on crashes with the 110 code may require median to separate opposing traffic, whereas head on crashes with code 111 may require entirely different treatments (e.g., introduction of solid arrow in case of a traffic light controlled intersection, or replacement of a give way traffic sign by a stop traffic sign).

Section 4 of the Users' Manual provides pointer to the users where DCCs are described in detail. NRCDMM contains full information on DCC system and NRCDUM also need to contain the same. NRCDUM is for the users of the data and NRCDMM is for the managers of the database system. Detailed description of DCCs is not repeated in NRCDUM for brevity.

In actual practice when NRCDUM is published, NRSC should take this recommendation into consideration to make NRCDUM self-contained and standalone reference document for users. NRCDUM is also provided with a copy of CRF (Appendix UM1) used to collect crash data and HCCRF (Appendix UM2) used to guide local police officers to complete CRF. Appendix UM3 of NRCDUM gives DCC Template Table for easy reference to the users.

11.5 List of Variables

Section 5 of Users' Manual provides guidance to the users on type of variables (data) stored in NRCDS together with brief description of each variables. This information is very much useful for users for effective use of crash data sets and make requests for data.

There are a total of 542 variables in NRCDS at the moment. There are also sub variables in some categories of variables. The number of variables and sub-variable can grow as new codes may need to be devised (hit animal can be hit street cows, hit street dogs, hit wild animals). For instance hit wild animals may require fencing to reduce these crashes while hit street dogs can be treated by non-infrastructure solution such as action from local governments (municipalities).

Users of crash data can request for any variables of their interest from the set of these variables. Table in Appendix UM4 of the NRCDUM gives full list of variables that are collected in NRCDS through DES. There are four columns in this Table:

- Column codes
- Description of variables
- Names (Text)/ Code (Number) of the variables
- Comments on code name/ number

Section 5 of NRCDUM describes what this Table contains. This information would be very handy for users to identify variable of their interest.

11.6 Use of Data

Crash data can be used for a wide variety of purposes. All road safety management systems should base on crash data. Nepal Roads Safety Management System will make extensive use of crash data. Section 6 of the NRCDUM provides tips to the users on where, when, why and how these data can be used.

Road Crash data are used by road agencies to deliver safer roads and roadsides (infrastructure), by transport management agencies to manage speed limits for achieving safer speed, and to

justify the roadworthiness and specify vehicle standards, by traffic police to enforce speed limit and by road safety advocates and Department of Education to implement road safety awareness and education programs, by emergency response services to manage post-crash response systems and by research and academic institutions to undertake further research on road safety, to cite a few.

Other specific examples on the use of crash data include:

- development of relationship between the location of passengers In the vehicle and severity of injury;
- development of relationship between overloading (or any contributing factors) and crashes;
- development of relationship between age of drivers and involvement in crashes; and
- development of risk assessment models

Depending on the agencies' interest use analysis of crash data can be as diverse as the users / stakeholders (See Chapter 12).Following uses of crash data are given for examples.

- establish crash clusters;
- identify black spots;
- plot crash diagrams;
- treat black spots; and
- report safety performance

11.6.1 Crash Clusters

The phenomenon of crash clusters has been recognised for many years and there is considerable evidence showing that the identification and treatment of such sites with low-cost engineering remedial measures can be extremely cost-effective.

Approaches to crash cluster reduction include Single Site, Mass Action Plan, Road Section, Area, and Route Action Plan. Of the five basic strategies, the potential for crash reduction using simple low-cost remedial measures at single hazardous sites is particularly high. In terms of crash reduction and prevention, local authorities in many countries have had considerable success with low-cost engineering safety improvements directed towards treating crash clusters at localized sites

Users of NRCDS can make use of crash data to develop Targeted Road Safety Initiatives (TRSI) to reduce crashes when clusters of crashes are spotted on the map.

11.6.2 Identification of Black Spots

Black spots are road locations that have a record of large numbers of crashes. There are often common problems at these sites, which can be treated with engineering methods. Examples of problem solving for intersection-related crashes:

- Conversion of unsignalised cross intersections to roundabouts;
- New or revised traffic signals;
- Grade separation;
- Staggered cross intersections;
- Extension of median through intersections (turn prohibited); and
- Provision of protected right turn facilities.

Examples of problem solving for non-intersection-related crashes:

- Central median to divide the road;
- Pedestrian facilities;
- Shoulder sealing;
- Removal and/or shielding of roadside hazards;
- Road delineation; and
- Overtaking lanes.

Users of crash data from NRCDS will be able to identify back spots after they get and process data from database manager.

11.6.3 Crash Diagrams

The crash data together with DCC template can be used to produce crash diagrams similar to that shown in Appendix 6 of this report. These diagrams may serve many purposes such as

- to demonstrate decision makers what types of crashes are dominant in a particular location along the road;
- to identify most appropriate remedial measures to reduce those crashes;
- to demonstrate before and after studies pictorially to justify proposed road safety investment

Users are able to produce such diagrams by themselves. NRSC may wish to provide such services at cost recovery basis. Experienced users of crash data are found to be able to

assist database managers to point out inconsistencies in the data sets or problems in coding crashes and suggest corrective measures

11.6.4 Treatment of Crash Locations

With the identification of clusters of crashes and black spots, users of crash data/ engineers can suggest appropriate treatments of crash locations. Crash diagrams helps users to identify suitable treatments measures for the subject crash locations easily.

11.6.5 Risk Assessment Models

Crash data together with other related information sets from HMIS (such as traffic volume, road length, road geometries, road asset) of DOR and DOLIDAR, vehicle registration, driver licensing data from DOTM, population data from CBS etc can form the basis for users to develop Nepal Risk Assessment Model (NRAM) and other types of risk assessment models.

11.6.6 Safety Performance Reporting

Users of crash data can determine how Nepal is doing in relation to its commitment to international community on reducing road deaths by undertaking appropriate analysis ofn crash data received from NRCDS. Road Safety Performance Indicators can vary depending on users and purpose. Road agencies are interested to see the effectiveness of the road safety measures as well as of the roads as a whole. Enforcement agencies may be interested to see how successful their speed enforcement, lane discipline or drink driving control efforts (and so on) are in reducing FSIs. . Health professionals may similarly be interested to know the performance outcomes of their post crash response systems or helmet or seat belts use campaigns. Organizations involved in delivering road safety education and awareness may be interested to know if they are getting more "bang for the buck" they have spent on their programmes.

From the above examples, it is obvious that crash data analysis for road safety performance reporting is best undertaken by specialist users in their respective field. NRSC secretariat may however wish to report "high level" key performance indicators (KPIs)of road safety at national level. Examples of such indicators to be monitored and reported annually include:

- road deaths (and disabilities) per 100,000 population;
- road deaths (and disabilities) per 10,000 vehicles;
- road deaths (and disabilities) per 1,000,000 vehicles kilometers travelled;

- road deaths (and disabilities) per km of roads (lane metres);
- crash cost as a percentage of national GDP; and
- Estimated GDP lost due to road crashes

Users should be aware that these KPIs cannot be generated by the managers of NRCDS. Data stored in NRCDS should be used in conjunction with other data like population, motor vehicle population, AADT, length of roads, crash cost etc to calculate these KPIs.

Following the estimates of these KPIS every year, time series trend can be drawn to compare how the country is doing in respect of improving road safety.

11.6.7 Road Crash Statistics

Users (NRSC, road agencies, enforcement agencies or any other agencies may wish to publish annually road toll in the country or on their network). These statistics can be diverse, as many as variables shown in the list. Examples for guidance are:

National Road Crash Statistics

- Fatalities;
 - driver fatalities;
 - Passenger fatalities;
 - Motorcycle rider and pillion fatalities;
 - Bicycle rider and pillion fatalities; and
 - Pedestrian fatalities
- Total fatal crashes;
- Total units involved;
- Licenses (from DOTM);
- Moto vehicle registration (from DOTM); and
- Population (from CBS).

Provincial Road Crash Statistics

- Fatalities
 - All;
 - All - where age known;
 - All - where gender known; and
 - Vehicle occupants - where restraints use known
- Fatalities by road user type
 - Drivers;

- Passengers;
- Motorcycle riders and pillions;
- Bicycle riders and pillions; and
- Pedestrians
- Fatalities by gender
 - Female;
 - Male; and
 - Unknown/unclassified
- Fatalities by age groups
 - 0-4;
 - 5-11;
 - 12-16;
 - 17-24;
 - 25-29;
 - 30-39;
 - 40-49;
 - 50-59;
 - 60-74; and
 - 75 and over.
- Fatalities as a result of the behaviour/ characteristics
 - Speeding drivers/drivers;
 - Drink drivers/ riders;
 - Fatigued drivers/riders;
 - Unrestrained drivers/ riders;
 - Unlicensed drivers/ riders;
 - Young adut drivers/riders;
 - Senior adult drivers/ riders;
 - Heavy freight vehicles; and
 - Motorcycles.

Other road statistics such as belw can also be reported for public consumption

- Fatalities by crash type
 - Single vehicle
 - multiple vehicle Hit pedestrian

- Other
 - Fatalities by crash nature
 - Hit object;
 - Hit pedestrians;
 - Head-on;
 - Angle;
 - Overturned
 - Rear-end;
 - Fall from vehicle;
 - Sideswipe;
 - Hit parked vehicle;
 - Hit animal; and
 - Other
 - Fatalities by police region;
 - Fatalities by day of week;
 - Fatalities by month of year; and
 - Fatalities by unit type.
- (These can be expanded)

Annual reports on road toll should be published by NRSC / MOPIT or by road agencies with focus on their road network only. All these statistics are possible from the NRCDS when CRFs are completed correctly and data are entered into the database and stored properly.

11.7 Data Use Warnings

Section 7 of the NRCDUM warns the users regarding the limitation of data sets and reminds minimum best practice time series crash data needed for meaningful analysis.

The database needs to contain a sufficient amount of data before analysis is advisable. Generally speaking in relation to road crash safety analysis a minimum of three years is best practice. This does not rule out the use of data in early stages as supporting data for other types of analysis.

Looking at a simple one on one comparison within the database such as the comparison of injuries between the controller on a motorcycle wearing a helmet and the pillion passenger on the same motorcycle not wearing a helmet may not need a long series of time to support an argument of helmet use.

The same simple comparisons apply to items like seatbelt use, defects in vehicles and location off passengers on a vehicle.

For other types of analysis such as establishing black spots, a time series data of at least 3 years is required (preferable is 5 year data) as mentioned above.

11.8 Supporting Data

Section 8 of the Users' Manual provides advice in relation to the requirements of other data sets to support crash data analysis.

While many types of analysis can be done without supporting data (identifying clusters, contributing factors, deaths by age, sex etc.) there are many other analyses that require additional data. These data are called supporting data.

Examples are given in the Manual about the need of population data, kilometers travelled, number of trucks in motor vehicle fleet in order to be able to undertake specific analysis of users' interest. Users are required to gather data from other sources.

11.9 Cautions in Variables

Section 9 of NRCDUM contains explanation on why users are required to exercise caution when requesting data. It provides a few examples of variables that may change over short time. The NRCDSP makes recommendation for changes over time to the CRF, so users of the data need to check what question was used to collect the data. Reference to the most current CRF used in collecting crash data could be useful for users to determine if there are any changes in the data sets collected.

An example of this is condition of road surface; on the CRF at the commencement of the data collection for the NRCD the possible answers are “Good” or “Damaged”. Both the question and answers are subjective, that is an opinion, not scientifically measurable. These options are proposed to be expanded in the new CRF with more definitive option boxes to tick on. DES already includes extra questions in relation to condition of surface, the presence of potholes, rutting, and corrugations or uneven, answers to these questions may give a measurable variable of surface condition.

Direction of travel and geo-codes are other variable that may not be available for the datasets collected before introducing new CRF but these data would be added in the crash data collected using new CRF.

Users are needed to keep their eyes on the changes in the data sets over time.

11.10 Requesting Data

Section 10 of the NRCDUM provides guidance to the users on how to request crash data. A Crash Data Request Form has been developed for this purpose and included in the Manual.

Practitioners may request data using the Request Form, which has been drafted in Appendix 5 of the Users' Manual. The Request Form covers the following:

- Contact information for the supply of data;
- Details of the data user;
- Data user's contact details;
- For what purpose do they want the data? This may be the question they are asking about certain events on the road network or types of crashes or locations. It may be that data collected in the NRCD is supportive of their studies;
- Date range of data request; and
- The variables they are requesting (these are the column codes).

NRSC staff or their agents acting on their behalf to supply the data may consult with the user to help with the selection of variables and supporting documentation, such as definitions and collection methods.

A complete set of NRCDUM should be uploaded in the NRSC's web site so that users can have access when they need to refer to it.

11.11 Appendices

Following Appendices are included in the NRCDUM. This helps make use of the Users' Manual independent of this report. These Appendices include:

- Appendix UM1 Crash Report Form;
- Appendix UM2 How to complete Crash Report Form?
- Appendix UM3 DCC Templates;
- Appendix UM4 List of Variables;
- Appendix UM5 Data Request Form

CHAPTER 12

CONSULTATION

12.1 Introduction

Needs of varied types of crash data are assessed and ascertained through the consultation process. It is therefore important to consult all stakeholders before the development of the system. Previous chapters described all the background works required for the development and management of NRCDS. This Chapter describes briefly the consultation process used during the NRCDS development period and its key outcomes.

NRCDS is not a "one off" but an ongoing process and the activities related to its development do not stop following the installation of the created programme application in the computer, completion of on-the-job training to a few computer operators and presentation of this report. The consultation process undertaken during the creation of the NRCDS is to be considered as the starting point of establishing communication channels between the various government agencies responsible for the development and management of NRCDS as well as between the manager of the system and major end users of the data stored in the system.

There are quite a number of government agencies that needed to be involved in the development process. Also, there are a large number of users of the crash data. The first step in the consultation process is therefore to identify all potential stakeholders and select the stakeholders which are important to be included in the consultation during the limited time available within the NRCDS Project period. The identification of all potential stakeholders assist NRSC to continue consultation during the ongoing process of collecting crash data and populating NRCDS with the data collected.

A project of this complexity, which needs to capture the entire country, the entire timeframes in future, the complex organizational dynamics of multiple agencies and the varied needs of diverse users does require an extensive consultation scheme. Consultations undertaken during this short study process are limited to investigating basic requirements of client and its key customers and to seeking input from key stakeholders to the development process. The consultation should continue in future. In fact, there is a need to establish a clear process of ongoing consultation and line of communication between the key agencies such as TD/NPS, NRSC/MOPIT and NCDU/DOHS involved in collecting data and populating NRCDS.

12.2 Identification of Stakeholders

Managing road safety and, therefore, the creation of road crash database system is the responsibility shared among various government organizations. There are multiple government agencies which need to work with, and support to, each other. Better understanding on the functioning of these agencies, governance, quality of business relationship are some of the practical aspects that needed to be taken into account in suggesting policy framework for ensuring sustainability.

Stakeholders are categorized into two major groups. The first group of stakeholders has the shared responsibility of managing the database system. They are also the users of the data from the system they manage. These are:

- MOPIT:
 - CTD; and
 - NRSC.
- NPS:
 - TD/NPS;
 - MTPD/NPS;
 - ITD/NPS;
 - All 75 DPOs; and
 - All 1016 LPSs.
- DOHS:
 - NCDUs;
 - All major hospitals;
 - National Trauma Centre (now under Bir Hospital); and
 - Emergency Response Services.

End users of road crash data are more diverse than the managers cum users of the database. They vary from government agencies down to individual consultants and members of public. The information needed for consumption by these diverse groups of stakeholders will naturally vary widely. And it is not possible to capture all types of demand by the system analyst of NRSC or its agencies. Some of the example stakeholders in these groups include:

- Road Agencies:
 - DOR;
 - DOLIDAR;

- Major Municipalities (e.g., KMC); and
 - DDCs/ VDCs.
- Other Government and Semi-Government Agencies:
 - MOE;
 - MOPH;
 - NEA (e.g. Street Light Section);
 - NA (e.g., Post-crash Emergency Services);
 - CBS;
 - NPC; and
 - GIDC.
- NGOs:
 - NNGOs (e.g., RSSN, NTDRRC);
 - INGOs; and
 - Road Safety Advocacy Groups (e.g., Laxmi Foundation).
- Consulting Agencies, Educational Institutions and Research Centres:
 - Consulting Firms - Transport and Traffic;
 - Consulting Firms: Social Economics Environmental etc.;
 - Consulting Firms: General Education/ Health Education;
 - Schools;
 - Colleges and Universities;
 - Health Education and Social Research Centres; and
 - Media (Education and Awareness, publicity)
- Development Aid Agencies and Funding Partners:
 - Bi-lateral;
 - Multi-lateral;
 - Development Aid Partners;
 - Insurance Agencies; and
 - Local and International Banks having interest in funding.
- Individual Transport, Traffic, Social, Environmental, Economics, Education, Public Health, Media, Consultants;
- All individual road users who may need to support his/her cases in case of involvement in road crash;

Each and every member of society can be impacted by road crashes and therefore each and every member of society has stakes on road crash database system. Proper collection and storage of road crash data help support crash victims and their families. The significance of creating and operating a sustainable road crash database system for use by agencies responsible for managing road safety does not need any emphasis.

In the development phase, the NRCDS Project has managed to consult with primary stakeholders only. Some of the individual professionals prominent in the field of road safety are also consulted in addition to the above primary stakeholders. Background of these consultations and key outcomes are provided in the following Sections. Important consultation notes are recorded in Appendix 9.

12.3 Consultation with MOPIT

MOPIT is the peak agency responsible for managing road safety in the country and is also in charge of managing NRCDS Project. NRSC Secretariat is expected to be the manager/ owner of the NRCDS created by this Project, provided the Government adopts the policy guidelines recommended by this study.

CTD /MOPIT managed NRCDS Project from the Government. Hence, CTD is the first point of contact and consultation for the Project.

Several review meetings and project management meetings were held among the members of NRCDS Team and CTD officials. An example of minutes of one of the important project management meetings is included in Appendix 9A.

Further inputs and guidance on the format, contents of the report and other NRCDS development matters were received during the workshop and other project management meetings.

Comments on the structure, format and contents of early version of the draft report together with the response from NRCDS Project Team are included in Appendix 9B.

12.4 Consultation with NPS

Consultations with NPS officers were more extensive than any other agencies. Because of the benefits of nicely completed CRFs for quality crash data and ability to code crashes automatically, extreme care was taken to find the exactly what formal or informal processes and chain of command were adopted. Police officers at both grass root level (Local Police Stations LPS and Hospitals) who are directly involved in attending crash scenes and completing CRFs as well as senior level officers at MTPD office at Singha Durbar, and

TD/NPS office at Naxal, who are in command and control were also consulted. Some officers were met twice to resolve inconsistent responses.

Appendix 9C shows details of consultation with individual or group of selected traffic police officers at various locations in the Valley. Consultation covered a wide range of issues such as completion of CRFs, channel of communication, data transfer, under reporting, hospital update on police reported crash, reporting, mandates, guide and so on.

A special meeting was requested by the Project Team with Mr Pankaj Shrestha, DIGP of TD/NPS in order to engage TD in the Project (Note the change of guard at TD/NPS during the Project period) and to get the view regarding several aspects of the Project including the ownership of the database system created by the Project. Minutes of Meeting of the day are contained in Appendix 9D. The consultation meeting decided to organize a separate workshop with Traffic Police to discuss and resolve on the most practical way of moving the NRCDS Project forward(See Section 12.9.3).

Following the consultation with the traffic police officers, the NRCDS Project Team was convinced that the ownership of the crash database system should go to the NPS Traffic Directorate. A revised model of ownership was suggested to accommodate the outcomes of the consultation. This revised model supports the dual ownership of the suggested database system, which is very similar to Queensland System.

According to this model, IT Division of NPHQ/ Naxal receives crash data (EXCEL File) from the NPS nominated DELs at various locations in the country and will maintain the database system, named as Nepal Police Road Crash Database System (NPRCDS). This NPRCDS will be under the control of TD/NPS, the owner and manager of NPRCDS. NPRCDS is considered to be the system that stores "raw" crash data, although it can also store "clean" if TD/NPS wishes so.

NRSC/MOPIT receives raw data stored in NPRCDS (EXCEL File) from TD/NPS or its nominated unit such as IT Branch and creates its own database system, named as NRCDS. This ""clean" database system contains all crash data as in NPRCDS but checked further for consistency, accuracy and greater level of validity checks.

12.5 Consultation with DOTM

NIRTTP Technical Adviser was the main focal point in terms of consultation with DOTM for obvious reason. The Project had already undertaken a study which conceptualised the development and implementation of a pilot project involving the trial of the web based

collection system using tablets. The project envisaged the use of current CRF, development of software to implement web-based data collections within the Valley and along the Birgunj-Kathmandu freight corridor and recommendation to expand the Project to appropriate agency for country wide implementation. It was learnt that the progress on the pilot project was significantly delayed due to an unexpected administrative and management hurdle in the implementation NIRTTP resulting from the prolonged absence of technical support.

One of the major outcomes of the initial consultation sessions was the understanding between the NRCDS Team and NIRTTP Team that the first would improve the CRFs and the second would use it to test, validate and train NPS officers to use new form and tablets.

NIRTTP Pilot Project has the programme to purchase many computer servers to store data received from the web with the backup of the crated database at GIDC. The Project has already sufficient allocations for this Project and it was agreed to share and complement the outcome of one Project with the other. Notes of the meeting with DOTM representative are included in Appendix 9E.

It is to be noted that, in many countries with best practice road safety management system, crash database system is usually owned and managed by the department equivalent to DOTM in Nepal. Collection of crash data is managed by police officers in most countries.

There is a clear advantage in this model worth consideration in Nepal as well. For instance, it would be an easy and smooth transition of vehicle registration data, driver licensing data, infringement data, bus routes data and other transport and traffic as well as vehicle standards data are stored in the DOTM's system to NRCDS/ NRSIMS. This advantage cannot be used though at this time due to limited institutional capability on one hand and multi-ministerial responsibility / coordination needed for managing NCRDS.

Over time, however, with the strengthened DOTM, it is plausible for NRSC/ MOPIT to delegate its role of managing NRCDS to DOTM.

12.6 Consultation with DOLIDAR

DOLIDAR is the user of the crash data. Except for fatal crashes and high profile serious injury crashes, for which road agencies are required to undertake separate investigation as per the recommended policy guidelines, DOLIDAR has no role in the creation of database. However, DILIDAR was needed to be consulted to find out if it has any issues or suggestions for the Team.

A consultation meeting was held with the officers of DOLIDAR including Director General in the early stage of NRCDS Project (January 2016) inception phase. During the consultation process, it was revealed that DOLIDAR was also considering the establishment of its own crash database system for their roads. A road safety unit was also established in the Department to manage road safety.

In the consultation process it was agreed that a separate database system for each type of road network based on asset ownership is not required provided NRCDS would capture local road network too. It was further agreed that only those roads defined by DOLIDAR as core local road network would be included in NRCDS. Major crashes on non-core local roads can also be included if police officers complete CRFs but these roads may not be identified by name.

It was further agreed that DOLIDAR will send database of their roads to NRCDS Team to include these in NRCDS.

12.7 Consultation with DOR

DOR, as the owner of strategic road asset, is the main user of the NRCDS. In absence crash data on its roads DOR has neither been able to identify black spots in any objective manner nor has been treating crash location with the most suitable remedial measures. DOR has also been not able to incorporate savings from crash reductions in the economic analysis undertaken during the feasibility stage. It has not been able to develop road safety program and prioritization of road safety works in any objective or rational manner. Strong support from DOR senior management is essential for ensuring sustainability of database. DOR should be one of the major sponsors of NRCDS. It was for this reason that the proposed consultation meeting was considered to be important.

Owing to the busy schedule of the Director General, Department of Roads, the NRCDS Team, however, was advised to meet Deputy Director General. In the meeting related to a different project, mention was made briefly about the works being undertaken on the development of Road Crash Database with no detailed discussion on ways how DOR can contribute to the project on an ongoing basis from its road development and maintenance budget or major road project fund.

This is an issue that can be discussed even at a later stage when the NRCDS is up and running but before any fall out resulting from the shortage of fund.

12.8 Consultation with Other Users Groups

There are many other governmental and international agencies that are expected to use road crash data for their projects or program development. These include, but are not limited to:

- Department of Education
- Road Safety Society Nepal
- World Health Organizations
- Nepal Red Cross Society
- Bilateral Agencies DfID
- Community/ Public Health Department

As in the case of major users such as DOR and DOLIDAR, these users can be consulted once the NRCDS starts getting populated. The main purpose of such consultations is to understand their needs of data. The second purpose is to disseminate knowledge as well as to assist these groups on how to request crash data from NRCDS manager, what data are available, what else needed to be added in the database system and so on.

12.9 Stakeholders' Workshops

Two workshops were organized by MOPIT. The first was organized to seek feedback from selected key stakeholders at the end of inception stage of the study to get initial comments on the various aspects of road crash database development. The second workshop was organized specifically with Traffic Police at the end of draft reporting stage when all features of NRCDS were ready to demonstrate. The purpose of the second workshop was twofold. First, there was a need to seek the commitments of NPS to NRCDS Project and establish working relationship to start populating NRCDS with the new sets of completed CRFs. There was also need to resolve resourcing and training issues as well as the ownership of the database system.

12.9.1 Inception Workshop

Monday 21st March 2016 a workshop was conducted with some 50 stakeholders. The size of this group was too large for effective discussion by all participants.

Some of the key points raised included:

- Use of technology to collect data;
- Identifying overloading issues;
- Situation of under reporting of victims;
- Quality of data collected and existing CRF;

- Ownership of data;
- Extra work for NPS as "slave" to other agencies

The last point implies that NPS would prefer to own the system over to contribute create the system.

Other issues discussed in the workshop were on following:

- How to address under reporting of crash data;
- What reporting connections should be established between NPS and Hospitals and NPS and MOPIT;
- Who should own the data;
- Who should provide fund for ongoing collection of data;
- How to introduce web usage in the crash data collection?
- How to introduce Tablets or Smart Phones in the collection and transmission of crash data;
- Cloud based storage of data; and
- Web based data distribution

Many of these issues raised by stakeholders were outside of the scope of the NRCDS Project. It was clarified that the NRCDS Project's scope included identification of gaps in the existing system of collection, retention and use of data and make recommendations on the basis of this. A separate project needs to be implemented for each of these additional issues which can be planned for future following the completion of the background works envisaged in this Project.

It is to be emphasized that all these issues are important but cannot be completed in a simple and short NRCDS Project. It was suggested that the NRCDS would make series of recommendations starting from additional data items that need to be collected in the CRF and changes to be made in the existing Form to improve the data collected but the development, testing and validation of the new CRF were not included in the scope of the Project.

It was apparent that many participants had not been exposed to the topic of survey design, crash types, validation of crash data and crash coding system. Some of the participants were even confused with factors contributing to crash (e.g., overloading, speeding) with the types of crashes. The afternoon sessions needed to concentrate on this topic and

therefore not much discussions were held on the presented policy guidelines and DCC codes, and only a few inputs were able to be collected.

The fundamental questions regarding the sustainability of the system remained unresolved (got no direction). Workshop ended with the recommendations on future directions the created database system should take. In particular, it was suggested that the NRCDS being developed under the Project should be

- web based;
- capable of incorporating hospital data (to address under reporting);
- able to have multi-user accessibility; and
- cloud based.

Following the discussion on these matters and clarification from NRCDS Project Team on the scope of the Project, it was decided that a separate project would be created by MOPIT to build these capabilities into the NRCDS. The Project Team advised that building these features is fully possible in the proposed database system and that the works could be efficiently completed if the timing of the new assignment would coincide with the timing of the ongoing Project.

Workshop concluded with the understanding that

- NRCDS Project would continue with the current scope;
- the recommended policy guidelines for managing crash database system would be considered by the Government over time;
- the NRCDS would be commenced with the DCC system presented in the workshop but would have the capacity to include more in future.
- post workshop consultation with NPS would continue to understand the dynamics of crash data collection and storage better.

Workshop details are included in Appendix 9F.

12.9.2 Post-inception Workshop with Nepal Police Service

Post the inception workshop the members of the NRCDS team met several officers from MTPD in many occasions to continue consult on the subjects raised at the inception workshop and to seek assistance to collect more completed CRFs. Meeting with the DIGP/MTPD in the morning of May 10, 2016 mainly focussed on the changes that needed to be made in the existing CRF and the ownership of crash data collected by NPS officers.

From the discussion, it was inferred that the officers from MTPD understood the need to change the form but they saw issues with the introduction of tablets. However, police officers were keen to see the possible roll out of this type of technology but expressed concern about the training to ground officers on completing the new form and by using tablets. The issue, as they highlighted, would be more prominent with remote areas, which do not have net access or even a PC in their office. While the proposal on the roll out of the new technology was well received, the concern was also expressed about their ongoing replacement that may be required in such locations due to breakage or malfunctioning in adverse field conditions.

NPS is keen to enter data from CRF and to manage its own database system. The concern with ownership of raw data resting with MOPIT or its hired agents was the sensitivity of the personal data that is collected. Senior officers indicated that there was capacity for NPS to store data collected and to collect more data as required. They would take the responsibility to keep this data. They talked about a system idea, which was almost that, which is used in the Queensland.

The Queensland model is that the police officers use a designed (by NRSC/MOPIT) crash report form that collects complete data required by all end users. The police officer enters the data into QPRIME and a sub set of this data goes to QOESR where it is coded to make these data suitable for safety analysis. From the QOESR data are disseminated to different end users one of which is the Department of Transport and Main Roads (DTMR).

It was found that the NPS are a group of stakeholders who are keen to get this system working, as it is they and the hospitals that deal daily with the death on the roads.

The meeting on May 10 was concluded with the request to consider introducing dual ownership of crash data. Ownership of raw crash data rests with NPS. NRSC/MOPIT shall maintain a second database system which will be used for consumption by safety professionals for analysis purpose. The team assured that they will explore the option and adjust their data entry and data transfer process accordingly.

12.9.3 Workshop with Nepal Police Service

As the works on the development of NRCDS advanced, more meetings were held with the Traffic Police at MTPD (May 10, 2016) and TD/NPS/Naxal (May 25, 2016). TD/NPS/Naxal suggested that the NRCDS Team demonstrated what has been proposed in the Project. Only after detailed deliberation on the Project, TD/NPS would be able to

comment on NPS's involvement /commitment in the sustained management of NRCDS. The NRCDS Project Team also felt that the issues such as dual ownership of database system (as suggested above), resourcing and funding for ongoing data collection, storage and management as well as analysis and dissemination of data needed to be discussed further to provide clarity regarding the roles and responsibilities of two primary agencies, namely MOPIT and NPS.

Following a separate meeting at TD/NPS/Naxal (See Section 12.4), MOPIT and NPS agreed to organize a second workshop. The workshop, specifically designed for traffic police officers, was held on June 10, 2016 at the Conference Hall of MTPD, Singha Durbar. Following the introduction of the Project and demonstration on how the data is entered to create the database system, how database system works and how a correctly completed CRF can classify the types of crashes and generate codes for these crashes, discussion was held on various aspects of the database system (mainly on how to manage completing CRFs, maintain and/or manage database and so on.

Key items of concerns, discussions and outcomes are noted and included in Appendix 9G. MOPIT would discuss issues raised by NPS internally and let NPS know about ways to move the NRCDS Project forward.

12.9.4 Focused Group Discussion

Several meetings were held with focused groups during the inception phase consultation process. The consultation process was continuing even at the time of writing this report. Focused groups were chosen mainly from local police stations in the Valley, some of which also related to hospital sites. Others included representatives of focused groups which included consultants from the World Bank, group of informal sectors / road users, individual members from the team of consultants working on revising VTMA and VTMR, revising PRA and drafting PRR, revising NTP and drafting RSA/RSR during the same period as the works on NRCDS progressed.

Resolving ownership, resourcing, funding and training have been coming up high on most, if not all of these meetings.

12.9.5 Meetings with Individual Consultants and Academicians

There are not many consultants and academicians in Nepal having exposure on road crash data. In fact, the practice of using road crash data at route level and specific locational (at mid-block sections or at intersections) level is not existing. NPS reports aggregated data.

DOR and DOLIDAR do not know how many people are killed on their roads and were, because they do not collect and or store data. Road asset owners and /or managers are not obliged to monitor and report safety performance of their roads and road network. Individual road consultants and academicians also do not speak up and advocate for the need of crash data to undertake safety and economic analysis of road projects.

Many individual consultants and academicians were contacted to get opinions and share their experience regarding the need and use of data. Many of them were also invited in the inception workshop. Apart from sharing the experience on how MAAP failed, what lessons were learnt from the past and what could be done not to repeat the mistake of the past, it was suggested by almost all individual professionals, that introduction of any new / revised CRFs or technology require the implementation of extensive training programme.

Individual consultants and academicians working in road, transport, health, awareness education, media, law were consulted who once again emphasize the need of leadership in the organization to improve road crash database system. Concerns were expressed that this may yet be another failed Project if the follow up actions are not implemented. Those who had previous exposure on crash coding system appreciated the introduction of elaborate DCC system in NRCDS. Many expressed the view that if NRSC / NRCDS is enacted, road planning, feasibility study and detailed design required reporting crash data by road length and location, road safety audits are undertaken on regular basis, safety performance reported and monitored, then the importance of data would be realized by all individual consultants. People who were consulted advised that they would do their best

NRCDS Team also suggested that road crash database system be included in the Curriculum for University students. Some of the individual professionals who were contacted during the consultation period included:

- Dr. Ashok Ratna Bajracharya, Consultant Orthopedics, National Trauma Centre Bir Hospital;
- Dr Bhakta Bahadur Ale, Visiting Professor, Central Campus, Institute of Engineering, Tribhuvan University;
- Dr. Padma Bahadur Shahi, Professor in Transport and Traffic, Pokhara Campus, Pokhara University;
- Mr. Subhash Dhungel, Senior Consultant, Transport and Traffic;
- Mr. Sunil Poudyal, Senior Consultant, Road Safety and Project Management;

- Mr. Anil Marsini, Assistant Professor in Transport and Traffic and Coordinator for RSSP funded Road Safety Engineering Curriculum Development Project, Central Campus; and
- Dr. Thusitha Shai, Professor in Transport and Traffic, Nepal Engineering College.

12.9.6 Presentation of NRCDS Work at RSA TOT Sessions

During the implementation of NRCDS Project, RSA TOT programme was also running. Trainers from ARRB who were delivering training requested NRCDS Team to present the work to the trainees.

RSA TOT was delivered in two lots. Each lot included 20 participants. Participants were from DOR, DOLIDAR, DOTM, academia and engineering consulting industry, who are all end users of the database. Presentation provided a very good opportunity to disseminate the NRCDS Project to forty additional future road safety auditors. Interest from the participants on the Project was overwhelming and support to the Project was great. Feedbacks from the participants were useful to improve NRCDS.

12.10 List of Persons contacted

List of persons contacted (and/or invited in the workshops) during the consultation process is given in Appendix 10. The list will be useful for future reference.

CHAPTER 13

DEVELOPMENT TESTING AND VALIDATION

13.1 Development

The NRCDS is developed taking big picture into account. The NRCDS is viewed as one of the basic and first key components of NRSIMS. The conceptual framework of both NRSIMS and NRCDS was presented in the meeting of the NRSC Ad-hoc Committee on July 12, 2015 by the NRCDS Team Leader long before the NRCDS development contract was awarded to the current Team. In fact, these concept papers were the basis for commencing this initiative.

13.1.1 NRCDS: A Component of NRSIMS

Figure 13.1 provides framework for NRSIMS development in future. Full development of NRSIMS can occur only after NRCDS has been up and running, crash data collected for at least three years and other information on population, vehicles, traffic volume etc are brought into single platform. Bringing all these data sets allows to integrate data for developing various risk assessment models, safety works programmes development and prioritization. NRCDS is the first step towards the development of comprehensive NRSIMS with all relevant processed data (information) collated in a single platform.

As can be seen from Figure 13.1, crash data including any updates from hospitals and other sources is the data input for NRSIMS, which can be used to analyse and report most key road safety performance indicators (such as crash per 100 million VKT, crash per vehicle population, crash per kilometre or any indicators that would be of local, regional or global interest).

13.1.2 Structure of NRCDS

NRCDS is the lower level database management system that deals with the collection and storage of one specific data set among several data sets required in the development of NRSIMS. Structure of NRCDS is shown in Figure 13.2.

The data grouping shown in Figure 13.2 are for examples only. This does not show all the data collected in CRF that are extensive and the full list can be found in the Management Manual as well as in Users' Manual. In actual practice, all data collected in the Crash Report Form by NPS and updated subsequently will be included in NRCDS.

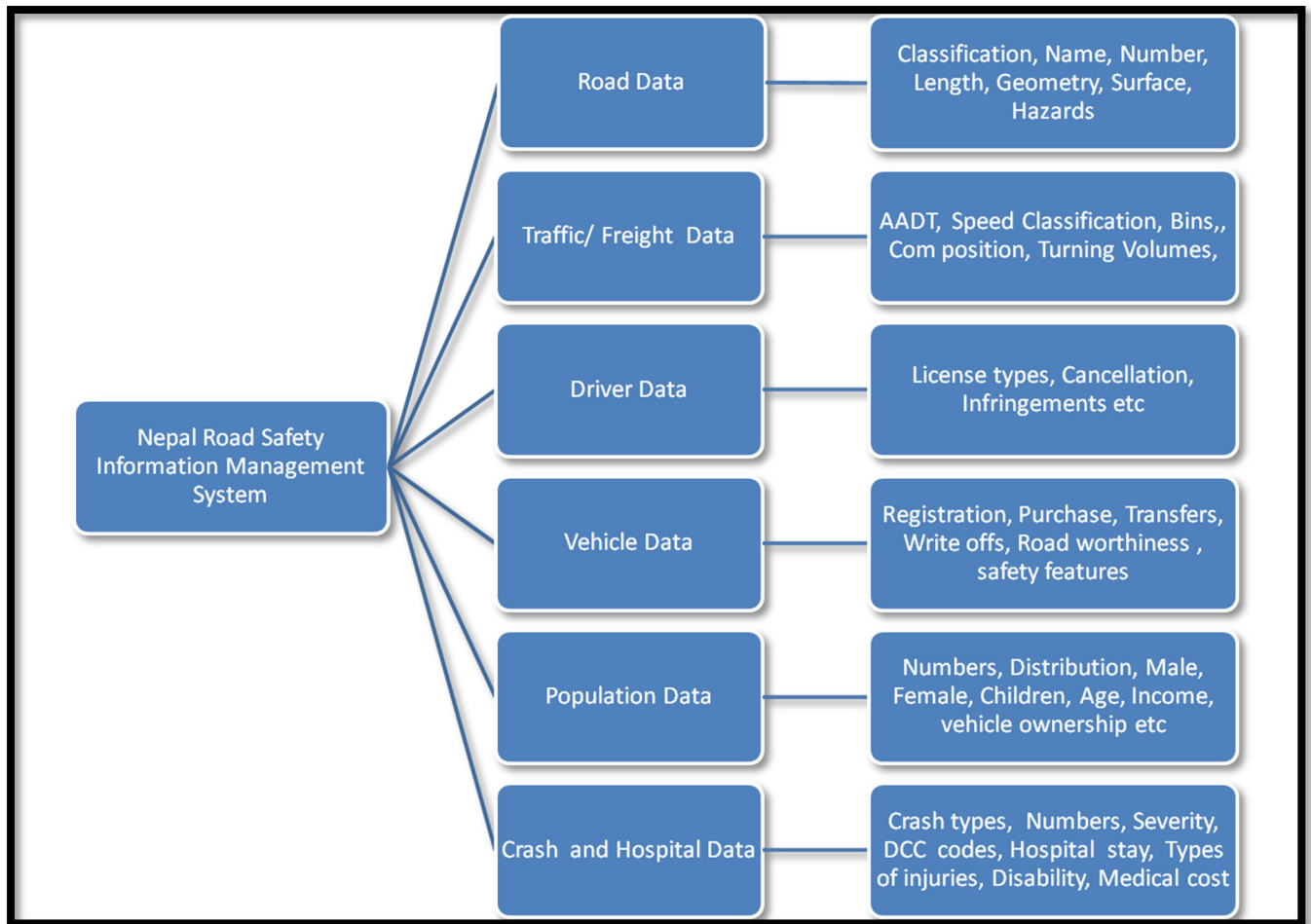


Figure 13.1: Structure of NRSIMS

13.1.3 System Architecture

The development of NRCDS as mentioned in Section 13.1 should be considered as a sub-task of the development of NRSIMS. The high level system architecture included in this report represents the holistic view which has guided the development of NRCDS. The conceptual level architectural overview of NRCDS is shown in Figure 13.3.

The larger version of System Architecture diagram (Figure 13.3) together with live registry data flow and analytical registry data flow is included in Appendix 8.

13.1.4 NRCDS Development Principles

In the development process of NRCDS there were three underlying principles that were kept in focus:

- Keep it simple;
- Make it sustainable; and
- Focus on cost effective solution

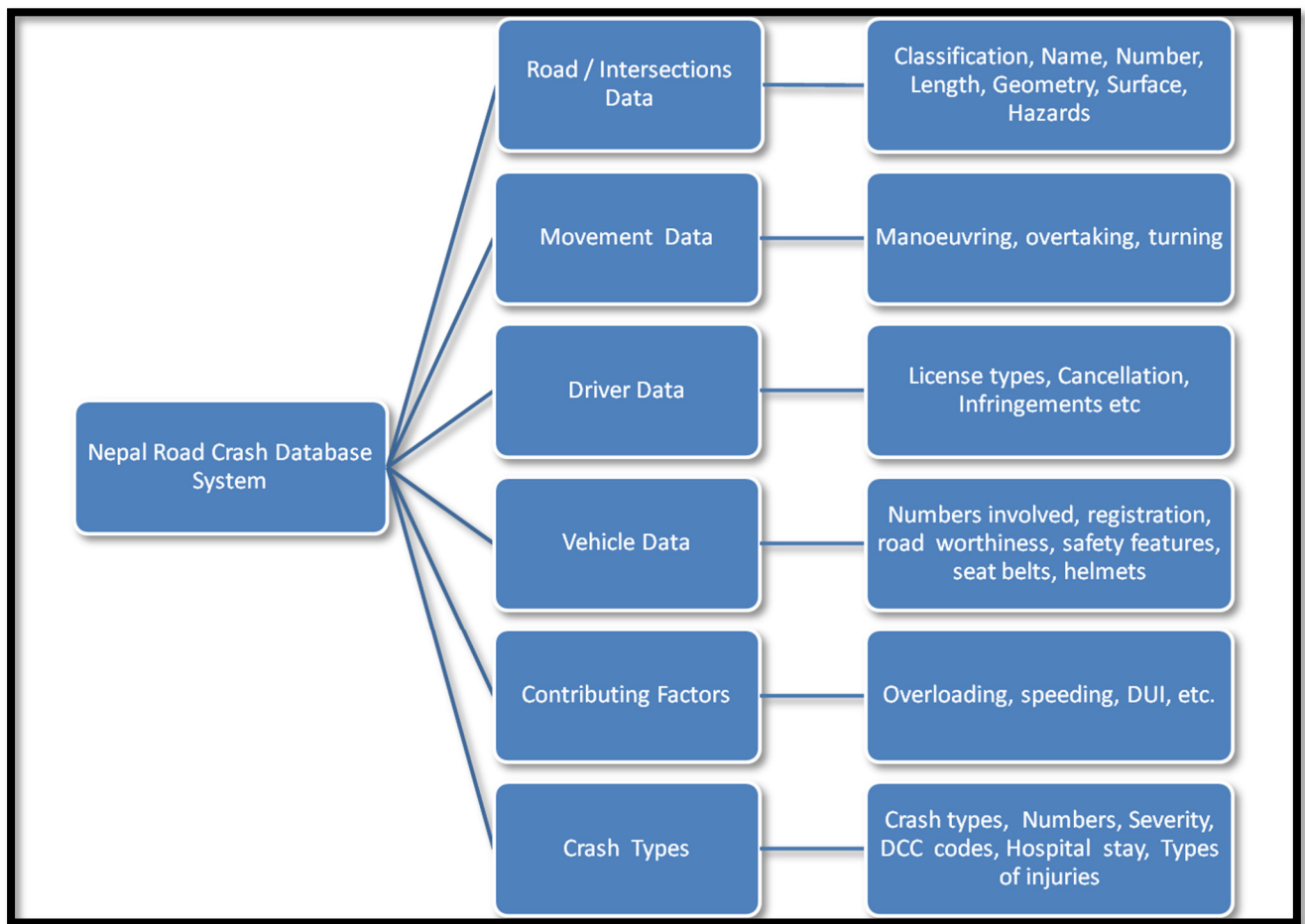


Figure 13.2: Structure of NRCDS

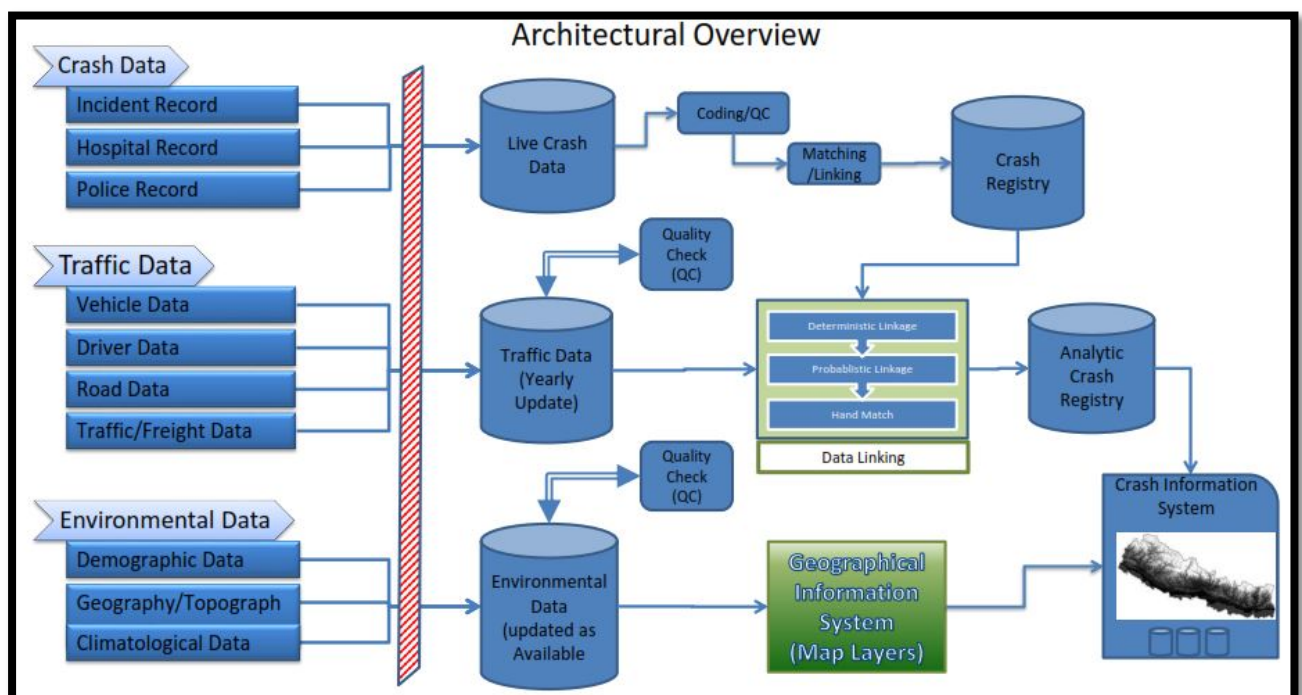


Figure 13.3: System Architecture

The KISS (Keep It Simple & Sustainable) principle has been mentioned several times because this policy is important in the Nepal context. The NRCDS project team have been delivering this Project at a fraction of the cost for similar projects implemented elsewhere in the region.

With these principles in mind the team established what was in use and what practices were in place in the country. The strength of the Project team included a local team member who had worked on the 1996 MAAP project and who had excellent contacts with the NPS. Previous working relationship with the DIGP along with other senior officers was of great assistance in getting copies of the very few CRFs that survive the current virtually non-existent storage processes. With this valuable team member, the team was able to consult at both MTPD and TD/NPS level quite well.

The experience of the incumbent DIGP at MTPD in the 1996 MAAP Project has been valuable in understanding the principle of the Crash Report Form development process which led to the improvement of the CRF in this Project. A stage wise improvement is adopted keeping in mind the limitation in resources to enable the introduction of new CRF. In the first stage, current form will be continued with minor training using the "How to complete CRF" flyer. In this stage coding becomes laborious involving the interpretation of crash diagram included in CRF but possible. In the second stage, new CRF with new additional information field will be introduced. Data from these additional fields generate crash codes automatically in most cases. In the third stage, new CRF with more added fields (yet to be developed based on the detailed analysis presented in Chapter 8) will be introduced together with Apps developed and loaded in Tablets. Both DES and DCSS can be used for all three types of CRFs introduced in three different stages. Sharing of the knowledge and invaluable experience of the incumbent DIGP has been instrumental in the improvement of many tools such as CRF, DES, DSS and DCSS proposed in this Project and recommended for gradual implementation.

13.2 NRCDS Development Process

There are basically four major steps in the development of various components of NRCDS. These include:

- Police Stations complete CRFs;
- Data Entry Locations (DEL) enter data from CRF using DES and create email file to be sent to TD/NPS;
- TD/ NPS receive email file and create NPRCD (DSS);

- TD/NPS create EXCEL files with subset of data excluding private information to NRSC (or their agents); and
- NRSC (or its agent) receives EXCEL file from TD/ NPS and load into DCSS to create NRCDS. AT this stage, NRSC (or its agent) carry out validation, update data and undertake check DCCs further and generates final, updated NRCDS ready for public consumption and for use by road safety agencies.

At the time of writing this report CRF remains in the Paper Form. Works on the development of Crash Reporting Applications (Apps) Software are expected to start soon. This "Apps" will be uploaded in the Tablets that will be used by the police officers attending crash scenes. Whether the Paper Form or Tablets will be used in collecting crash data, the process of development of NRCDS remains the same.

The NRCDS development process chart is shown in Figure 13.4.

13.2.1 Collection of Data

Internationally, crash data collection, storage and performance reporting practices were investigated from UK, USA, Australia, New Zealand systems. As the goal of the team was to leave recommendations in place within a few months, an early decision was made to use the current CRF. Gaps and issues with this crash form are covered in Chapters 7 and 8, and there are recommendations to improve the way data is collected in future projects.

The objective of the NRCDS project was not to collect the data, it is to make recommendations on how to collect data and establish a system in place to enter and store that collected data.

13.2.2 Choice of Software for NRCDS

Past practise had relied on expensive software and high cost IT support. Again, early in the project a decision was made to use an EXCEL platform, this being off-the-shelf software and relatively easy for local teams to use and maintain in the future. Systems being introduced in areas of India, still relying of a paper crash form and a data entry procedure, and these were costing upwards of a million US Dollars. The Team was unable to ascertain what the type of crash data was available for analyses with these projects and attempts to carry out further investigation was ruled out in absence of response from the owner of these systems.

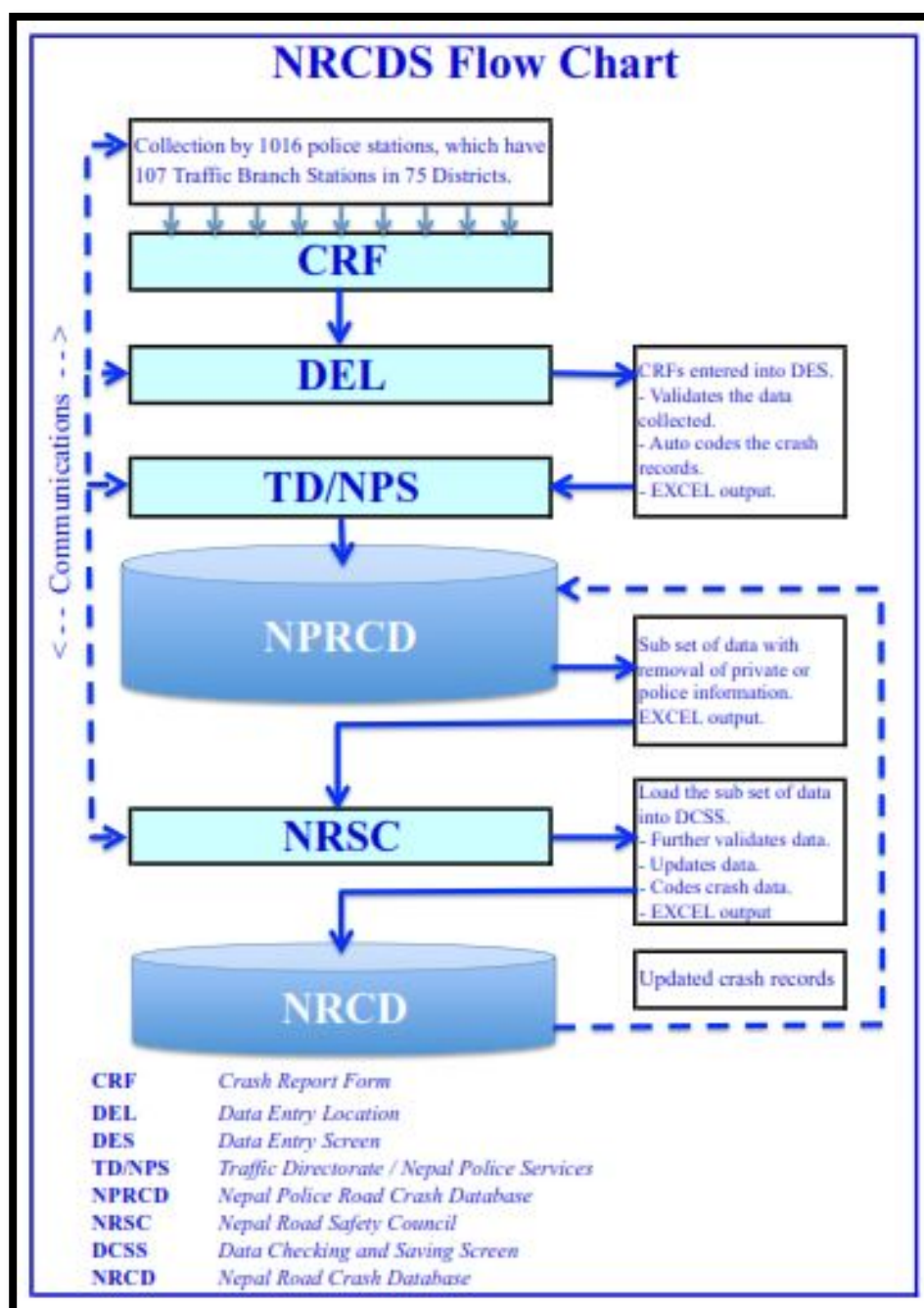


Figure 13.4: Process Chart

13.2.3 Coding Crash Data

The NRCDS Project also required the development of a crash coding system. Best practise in many countries was reviewed. Team members were very familiar with crash coding systems having worked on them for many years. Based on these studies and experience of the key team members, recommendations have been made on the types of crashes, contributing factors and performance reporting system suitably modified to Nepal context for establishing NRCDS. Note the decision to start the data collection with the current CRF dictated that the coding system would need to be able to be flexible for future

improvements. A set of DCC (Descriptive Crash Codes) was developed and a template of diagram for each DCC was also designed.

The introduction of Crash Coding is new to this region. The concept with stakeholders seems to be still an issue. Delivery of a very detailed final report and a step-by-step management manual is expected to be a valuable resource for the sustainability of the ongoing process of collecting, coding and storing of road crash data.

13.3 Testing

Testing is about checking the ability of the EXCEL software to code most of the CRFs when entered. The team was only able to collect around 100 actual CRFs, but this was sufficient to get an idea of what was and wasn't completed on the CRF. That is to say, the current standard to which the CRFs are completed has significant improvement opportunities.

A "How to complete CRFs" flyer has been developed to assist police officers at local stations which do not have training on completing CRFs. Each police station has to retain a copy of laminated flyer in the file. This is expected to improve the quality of completed forms which in turn facilitate producing quality crash data.

Information from the collected CRFs were repeatedly entered and re-entered into the Data Entry Screen (DES) as the coding matrix and the data checking equations were fine-tuned. This process was being carried out at the same time as we were identifying gaps in the CRF. As with much of this project the processes are very much overlapped and decision on "what to keep" and "what to let go" had to be made on a regular basis.

A final testing phase is to be the training process of a few key staff with NPS and MoPIT. This would allow a simulation of the two EXCEL systems in a "live" work situation.

Unfortunately trainees have not been supplied as yet. The original scope of the Project had pointed out that "on the job" training was required. The aim is to develop small team, who would be left behind and who would be able to train others. The local team member who is well versed and who has extensive experience in training will be on the ground even after the submission of the report. Ongoing support can be provided to the local team member remotely but any in field training if needed will be negotiated.

13.4 Validation

Validation for the purpose of this project is defined as the process of verifying the proper functioning of the system components of NRCDS developed during the Project Unfortunately there has been some misunderstanding in the term "Validation" used in the project's scope.

Some of the stakeholders were insisting on validating crash data in statistical sense. This is not possible while crash data in the NRCDS do not exist.

There are four stages of validation and only first three stages validation processes are implemented in this Project. The last one can be undertaken when enough crash data are available from NRCDS. These are briefly described below.

13.4.1 Validation of Information on the CRF

The CRF is a survey form and survey forms are designed to “validate” the answers to questions on the form. Question also should be objective, meaning the responses are scientifically measurable. This is covered in detail in the relevant chapters.

The NRCDS Project team's task was to develop a data entry process, which compensated for some of the weaknesses on the CRF. The final DES asks extra questions which will require the data entry officer to examine the CRF and, more particularly, the collision diagram sketch. Many of these steps relate around vehicle, pedestrian and passenger involvement, movements and direction of travel.

The final result is a “Smart” DES (Data Entry Screen). It points out conflicts of information entered and guides the data entry officer to correcting the information.

13.4.2 Validation of Crash Type or Code

The next stage of validation used in the process is to determine if the correct DCC has been applied by the "Matrix" to this crash. The data entry officer at the final stage (not the NPS) will need to check that the coding has been successful.

As seen in Figure 13.4, there are many questions and responses (answers) to these questions. If response to one or more questions conflict with the response to another question, DES and DCSS will not let the data entry officer move to the next step. At times, it alerts the data entry officers at DEL that the data entered is incorrect or has conflict with response to another related question. Many equations and logics behind DES ensure that the coding of crashes in most cases is validated automatically. But this is not the replacement of the "human brain" and further validation of the code obtained in this automatic process needs to be implemented manually by comparing the crash collision diagram with the crash code obtained using the DES or DCSS.

13.4.3 Validation of Crash Events entered into Database

This validation is to ensure that the same crash event is not entered into the NRCDS multiple times.

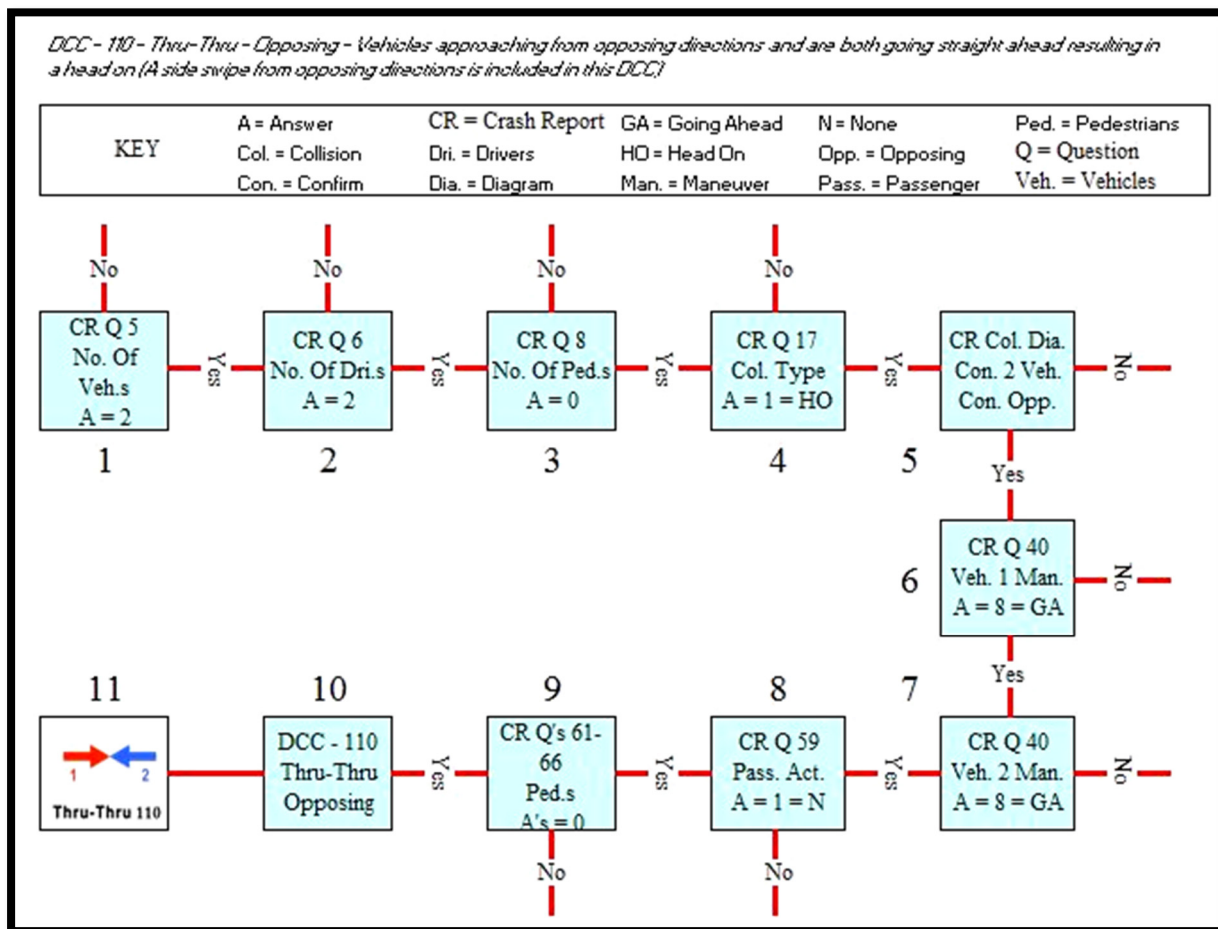


Figure 13.5: An Example of Validation of Crash Codes

The system involving manual collection of crash data in paper, then a process of entering onto computers, then forwarding to a central storage is going to have issues of information possibly being repeated. Within the NRCDSMM, a series of steps in administration practice have been recommended to help avoid this, but there is one final “key” to be added to the database.

DES automatically assigns a CIN. This is a Crash Identification Number, and before any line of crash data is added to the database, this CIN is tested for duplications within the database. It is very unlikely that the 17 digits CIN generated from information entered on DES will be duplicated, but if it would, there are steps to change the number when to ensure it would indeed be recorded as a separate crash event.

13.4.4 Validation of Road Crash Data

Validation of RCD is a statistical analysis that is carried out when data is released to a road safety practitioner or when the data release is being prepared. This process is not within

the scope of this Project and needs to be addressed by a data analyst when the database begins to mature with its content and useful amounts of data become available.

13.5 Use of Crash Database

Data stored in NRCDS can be used for a variety of analysis. This includes the layover of crash data on the road or intersection or the network of roads of interest if geo-codes are available for each crash data.

During consultations the team was informed that a lot of work has been done on mapping all roads in Nepal. By including latitude and longitude in the RCD, the creation of cluster maps and identifications of black spots is possible.

This is just an example of how data from NRCDS can be used. Other examples include the development of crash diagrams to assist engineers in the identification of contributing factors, in the treatment of crash locations, in road safety performance reporting and in developing strategies for safety awareness and education campaigns, in deciding post-crash response system types and so on. These are described in Chapter 11: Users' Manual.

CHAPTER 14

TRAINING AND CAPACITY BUILDING

14.1 Introduction

NRCDS is a new database management system developed under this Project. It can be implemented properly only if officers responsible to manage, operate and maintain have the sense of ownership and capability handle the system. Obviously, any new system being introduced in the institution requires training to its staff and introduction of NRCDS is not an exception.

Two different packages of training have been suggested in order to build the capacity in collecting crash data and managing crash database system:

- Basic level; and
- Advanced level

Basic training is to be targeted towards the development of NPS staff, who will be responsible to complete CRFs at all police stations (currently at 1016) and use of DES at all DELs (currently, considered to be 75 District Police Offices plus other locations with access to computer and internet that TD/NPS would nominate). NRSC/MOPIT staff or its agents who will be responsible to receive crash data from TD/NPS are also to be trained on the use of DES and in the interpretation of CRFs. Additionally, staff from MOPIT or its agents are required to be also trained on how to use DCSS.

14.2 Training Needs Assessment

The issue on the needs of training was raised by stakeholders in most of the meetings and workshops. The issue was high on the agenda.

Trainings are needed urgently (Phase 1) on the following areas:

- Completing CRFs correctly and completely;
- Using DES to enter data; and
- Using DCSS to check and update.

In the second phase, when tablets are introduced trainings are needed on to use tablets in the completion of CRFs.

In the third phase, possibly at the beginning of the three year of crash data entries, trainings are needed on how to extract data from the NRCDS, how to interpret the data and how to analyse data.

14.3 Target Groups

The problem associated with the training for completing CRFs and entering data is the frequent turnover of NPS personnel from traffic service to general service. Similarly staff at MOPIT also changes frequently. Therefore, the training must be conducted on regular basis. This should be a part of regular job induction programmes.

Four target groups are identified. These target groups, based on the needs assessment are:

(1) The first target group is obviously the NPS personnel at the grass root level who usually attend crash scenes at which times, CRFs are completed. Some of the fields in the CRFs must be completed at the crash scene; others can be completed at the stations after attending crash scenes. Training to these personnel is vital because the better the CRFs are completed, easier, more accurate and better quality crash data are ensured. Subsequent task become less labour intensive and it saves time for the police personnel at DELs. Trainings are required to be programmed at the Police Stations or at the crash scenes.

(2) The second category of target group is the NPS personnel at DELs, who are responsible to enter crash data using DES developed by the Project. DES is a smart Data Entry Screen (DES) and it is important that police personnel responsible to enter data are trained on how to use DES. This provision of entering data at DELs ensures that any CRFs not completed correctly can be corrected with the chain of command within NPS.

(3) In terms of creating and managing crash database, the third level of target group is the police personnel at TD/NPS. TD/NPS which maintains road crash database (NPRCDS) at Naxal HQ receives email file from DELs by way of EXCEL files. Police personnel are responsible to maintain NPRCDS so that raw crash data (files) are stored somewhere in the system which can be supplied to NRSC (NRCDS).

(4) Once NPRCDS is created, crash data required for NRSC/ MOPIT can be easily obtained and made available for public consumption. NRCDS is the database maintained by NRSC/ MOPIT which consists of all data entered by DELs minus the data related to private information. This target group is to be trained for using DCSS developed in the Project.

Three categories of target groups are identified based on their roles and responsibilities. These target groups include:

- Target Group 1: NPS
 - NPS personnel at 1016 police stations;
 - NPS personnel at DELs (at least 75 district headquarters);
 - NPS personnel at TD/ NPS, Naxal;
 - NPS personnel at IT Department of NPS/ Naxal, who will be responsible for managing NPRCDS;
 - Traffic Police personnel of MTPD responsible for attending crash scenes and completing CRFs and DCSS;
- Target Group 2: NRSC/MOPIT
 - MOPIT personnel at NRSC Secretariat who would be responsible for managing completing
- Target Group 3: End Users of Crash data
 - Road agencies' (DOR, DOLIDAR and City Councils) personnel responsible for requesting, analysing, interpreting crash data and for treatment of crash locations (end users of data); and
 - Other governmental and non-governmental agencies have interests/ stakes in road safety.

MOPIT should consider immediate deployment of a dedicated system analyst for managing NRCDS. This person should preferably have excellent road safety engineering experience in addition to formal qualification in IT. NRSC should also seek to deploy road safety engineers for analysing and reporting safety performance. Depending on the structure and work load of IT Department of Naxal Police Headquarter, it may be necessary to have one senior personnel who could be made responsible for coordinating works on managing NPRCDS and maintaining good chain of command with all DEL. This arrangement would ensure the timely flow of emails with EXCEL files from DEL to TD/NPS. The need of additional resources (personnel, computers, for police stations, DELs, TD/NPS etc must be assessed in consultation with NPS.

14.4 Types of Training

Trainings, the need of which has been assessed as above can be offered in a variety of ways:

- Informal (on the job) training;
- Formal (conference hall) training;
- Training of Trainers (TOT); and
- On-site /off site training.

Depending on the actual operational requirements of, and availability of trainees from, NPS and NRSC, the two key owners of crash database systems (NPRCDS and NRCDS), selection of the types of trainings should be made in consultation with these agencies. The ways trainings are to be delivered depends also on the target groups. Both training type and target group need to be considered in choosing the types of training.

14.5 Training Modules

A number of new sub-systems within the database system have been developed and suggested for implementation in order to create a sustainable NRCDS. Introducing the new system requires training to make it work.

Following training modules are suggested.

- Training on how to complete Crash Report Form;
- Training on how to enter data from CRF using DES;
- Training on how to check/ update data using DCSS - to MOPIT;
- Training on how to use Tablets complete CRF;
- Training on how to extract crash data from NRCDS; and
- Training to end users and customers on how to complete data request form - what data are available and what they can do with the data?

Details of training modules are to be worked out as a separate project and training delivered once the system is approved, policy guidelines are adopted, recommended institutional arrangements are established and suggested process agreed among all stakeholders. There is a need to have a strong leadership within the NRSC/ MOPIT to lead the training program and ultimately to take the ownership of the system.

Without the legal, institutional and funding frameworks suggested in this Project and committed by agencies responsible for managing road safety in Nepal for sustained development, maintenance and operation of NRCDS and a memorandum of understanding among all stakeholders signed to this effect, any further exercise in the development of training modules, will be futile. The suggested training modules are for guidance only and further works are required to develop power point presentation, notes and method of delivery based on the guidelines on completing CRFs, on using DES and DCSS, Management Manual and Users' Manual delivered under this Project.

Delivery of training is resource intensive. It is important to have required background works completed before any talk about developing any training modules in order not to waste further resources on the system.

14.6 Training Tools

Apart from the training tools used in delivering regular trainings such as lap top, overhead projector, flip charts, microphones, training rooms/ hall etc., specific tools developed in this project such as,

- How to complete CRFs;
- Database Management Manual;
- Users' Management Manual; and
- This report

are to be printed in easy to understand format in enough numbers for distribution in the training programmers.

14.7 Training under the Project

Training under the Project is limited to the demonstration on how the DES and DCSS works, where data are stored, what variables are contained in the database system, how these data are stored and managed and so on. The on-the job training involves working sessions on entering data from CRFs into NRCDS using DES and DCSS. There are no other formal training programmes envisaged in the NRCDS Project other than on-the-job training to the nominated personnel from NPS and MOPIT.

The local counterpart, national database specialist, has been adequately trained during the development of NRCDS. He is responsible for delivering training using the training tools mentioned in Section 14.6 under the guidance of the international crash database specialist as and when necessary.

CHAPTER 15

FINDINGS AND RECOMMENDATIONS

15.1 Findings

Review of selected previous works and studies undertaken, locally, regionally and internationally along with the consultation with the stakeholders (one to one and as a group) in relation to the collection of crash data, development of Crash Database System and usage of crash data has revealed wide differences in the method and process of collecting, compiling, storing, analysing and reporting system as well as in the nature and extent of their uses/applications. The review helped to understand the issues in the existing system in Nepal, identify gaps in the available system and compare the system with the regionally and internationally practices and processes. While the creation of crash database started in mid 1990s with an excellent system, Nepal could not sustain it due to a number of reasons including institutional, legal and funding issues. Currently crash data collection is just limited to filling up the crash report form. In terms of the storage, Traffic Police maintains a record of aggregated crash data in the computer. While aggregated data gives overall picture of country's performance reporting on national level (increasing/ decreasing trend), these aggregated data are of limited use for safety analysis. These data do not give engineers and road safety specialists clues on how to reduce those crashes and where and what type of countermeasures were needed or would work. The crash report forms are destroyed over the time and time series historical detailed crash data are lost. Safety professionals are to rely on limited data, if at all available, from Local Police Stations, and process / interpret data by themselves one by one on project basis. Any meaningful interpretation, safety analysis, identification of black spots along a specific road corridor or network of roads and recommendation on countermeasures is not possible with the aggregated data stored by the Police. Also identified during the review process were the gaps in institutional, legal and funding framework for sustained operation and maintenance of the database system.

Regionally, in particular Bangladesh and some of the States of India have recently started implementing web based data collection system. What form of storing database system and to what extent and levels of crash data are used in safety analysis such as types of crashes (descriptive crash codes) and reports are not known at this stage. Efforts were made to get this

additional information but in absence of responses from the relevant agencies, it has not been possible to ascertain these features of their database systems.

Internationally, crash data collection, storage and performance reporting practices were investigated from UK, USA and Australia/ New Zealand systems especially in relation to DCC codes. Based on these studies and experience of the key team members, recommendations have been made on the types of crashes, contributing factors and performance reporting system suitably modified to Nepal context for establishing NRCDS.

Sustainability has been found to be a key issue for the ongoing entries of data and updates, operation and maintenance of the crash database system in Nepal. A simple system, which is easy to understand, easy to update, easy to maintain and operate has been suggested within the existing (or proposed as relevant) legal, institutional and funding framework. A set of policy guidelines has been suggested for consideration by the Government. Once endorsed, the policy will provide robust framework for sustained management of NRCDS.

An extensive review of the "Accident" Report Form currently in use in Nepal by Police was made. The form, which was developed in mid-nineties, was found to be reasonably suitable to extract most of the information needed to create a good crash database system. MAAP5 introduced during that period, for which the form was developed and which could have the automated validation capability is no longer available. Significant efforts and hence resources are required therefore to interpret data, validate these data and assign codes to crashes, establish primary, secondary and tertiary contributing factors reported in the form. Greater reliance on the paper based "open" form and on the interpretation of the data in the form by data entry persons is associated with greater risks from human errors in ensuring data integrity and accuracy. All required checks are to be done manually by the computer operators responsible to enter the data and thus mistakes might creep in undetected. Once the operator completes the entry form at the operators' interface, relevant information will get dumped into the database. The entry form in the desktop is almost similar, or same as, to the "Accident" Report Form used at the crash scene by the Police.

Two sets of key issues have been resolved by the proposed improvements in the data collection and validation system. Correspondingly, two different options have been suggested for consideration by the Council. In the first proposal, improvements in paper form are incorporated to reduce the degree of subjectivity by changing the questions, introducing new questions, adding questions to help validate data, and providing instructions on how to prepare the layout and vehicle damage sketches etc. The current data transfer process from local police

stations to district, regional and central headquarters of the NPS will remain paper based but a copy of the completed form will also be sent to NRSC to enter the data in the computer storage. The improved form will facilitate the validation and data entered by computer operators using the form provided in the NRSC computers. These computers will have the features built into it to assign appropriate coding to the crash automatically.

In the second, web based option, the same "improved" crash report form will be uploaded in the tablets (or smart phones) and local police officers that attend crash scenes will use these devices to enter the data. The tablet apps will have validation features, similar to the one in NRSC computer. The Apps so designed will have the features to restrict movement to the next step and/or have warning features if the system (Apps) detects that the data is entered incorrectly (e.g. conflicting data entered against two similar questions but posed in a different manner). In this option, data validation occurs at the crash scene (or at local police stations) in lieu of at NRSC office computers. This is certainly a better option provided local police officers are trained properly and they do not view the process as an additional work load. The advantage of the second option is also that the chances of tampering the data or hiding the crash report as a result of amicable solutions reached between the parties involved in crashes are greatly reduced as it would be tamper proof once the transmit button is pushed by the local police officer. The data, already automatically coded correctly in most instances, will reach district, regional and central headquarters as well as to NRSC computer straight away automatically. Ongoing tasks for data entry at NRSC would be minimal. The second option involves additional resources during the crash data system development process while the first option requires more ongoing O & M costs.

Coding of crashes is of vital importance for any crash data to be meaningful. The study has proposed descriptive crash coding system to determine the type of crashes based on best international practices but customised to Nepal situation. More crash types, if required can be added at a later stage.

The proposed Crash Database System needs ongoing management. The system should be managed only by trained personnel who would be given access to it. Training has been proposed for computer operators nominated by NRSC. Access to the data will be provided to all interested agencies and members of public but not to the Database System. Types of information request on crash data vary depending on the purpose. Crash data request form is developed for this purpose. Time series road safety performance data in the country by types, region, division, roads, severity, year, contributing factors etc for public consumption can be

queried from the database system and uploaded in the NRSC/ MOPIT web site which DoR, DoLIDAR, Traffic Police and other agencies or members of public can access through the link to the NRSC web site or emailed separately. A crash database management manual and data users' manual is developed in order to provide clarity in the management of the system and data use.

It became obvious from the consultation with various agencies and professionals that many stakeholders do not understand the dynamics of collecting and using crash data. It is not simply a process of punching in a few answers on a tablet or computer and then having data that could be used to solve road safety issues. There are steps of designing the survey, what questions are asked and the ability to make measurable valuations on the answers. Then how that collected information is grouped or coded to create meaningful clusters of information is equally important. Finally, what additional information is needed to make scientifically based decisions for improvements to the roads, vehicles and drivers' behaviour can be provided by NRCDS.

The proposed database system has to use data collected in the past using the old crash report form for validation. Original scope included the use of data from NIRTTP's pilot projects but this has been ruled out by key stakeholders because of the problem in coordinating the activities of these two projects. Insufficient information on crashes is available to create a real database system and dummy data have been used to validate the system. Many stakeholders are not aware of the fact that a minimum of three years data needs to be entered in the created database system to validate it and to undertake a reasonable analysis and inferences on crashes. One of the most important issues is to start to collect data now in the best way possible in the current environment. Once the process of collection of data has started issues of introducing better ways to do so may be introduced and implemented over the time in various stages. There has been some misunderstanding in the scope and output of this Project in that the Project would deliver the complete Crash Database System. However, it is important to note that this project is just the starting point to establish the framework for establishing database system and not to create the database itself, as there is no meaningful collection of road crash data in Nepal, which can be used for road crash database creation.

The proposed Nepal Road Crash Database System Project is a very small cog in a large wheel of projects to be completed. But without this first cog, improvement in crash database and the use of these data for road safety analysis and for identifying countermeasures in the reduction in the number of crashes and the severity of crashes will be severely limited.

Many stakeholders are interested to introduce web based data collection system and dissemination of road crash data by means of implementing multiple users' access with cloud based data backup system. While this sophistication is highly desirable to introduce now, this type of system is possible when the new form, coding and database system is introduced, tested and validated. Additional features as desired by stakeholders can be implemented within the proposed database system when more resources become available at some point in the future. These are costly and there are issues with sustainability in the Nepal context in light of previous attempts to collect data.

The scope of this project is limited, firstly to highlight the gaps in the data collection and storage system and to make recommendations on the improvement in the data collection and create a database system that is currently non-existent. Secondly, coding system for crash data, which is also currently non-existent, is to be implemented. The crash coding system appears to be a new concept in the region and in Nepal. Thirdly, a new database system that incorporates crash codes is created under this Project.

Before any future projects involving the tablets, smart phone applications for web based collection or dissemination of data are proposed, many of the issues identified by this study have to be addressed. The ownership, responsibility, accountability, ongoing funding, legislation are all-important for ensuring sustainability. Most importantly no other projects may go forward without first deciding on what data to collect and how to code it, because the introduction of any electronic devices will require this information before any programming of applications can be done.

This early draft report is released with the objective of creating more discussions and getting more active consultations to result in a better quality final report. The purpose of the early release of draft report is to provide clarity to various stakeholders with varied level of understanding on what has been proposed, why the tasks proposed are necessary and how to create robust framework to sustain the system. The report is expected to make meaningful contributions on the content, ideas and recommendations. Ideas must be achievable and stakeholders must be well informed about the limitations in the scope of the current project and way forward for ongoing improvement in the created system.

Crash data is not the only item, but is a key item in the creation of the Nepal Road Safety Information Management System (NRSIMS). For road safety performance analysis, reporting, programming and prioritization of safety improvement works, there is a need of population data, vehicle data, road users data, traffic data, road data, speed data, data on the use of seat

belts, helmet to name a few. For instance, exposure of road users to crash risks can only be estimated when these information are available. A road with 150 vehicles per day will have lower priority in road safety treatment works than the road with 15,000 vehicles per day for the same number of road crashes. Road safety professionals program and prioritize road safety treatment works not just on the basis of crash data but also on the basis of host of information to be collected and analysed from Road Safety Information Management System. The proposed study is the way forward in the creation of "holistic" Nepal Road Safety Information Management System (Nepal and Parajuli, 2015).

15.2 Recommendations

There are a number of tasks that need to be completed following the creation of Nepal Road Crash Database System (NRCDS) under this Project. These include, but not limited to the followings:

- Ensure that the draft National Transport Policy which is under review (work in progress under RSSP), includes a policy statement that the Government of Nepal would establish an appropriate Crash Database Management System to facilitate the road safety performance monitoring and evaluation of all public roads in Nepal;
- Ensure that the Road Safety Act (work in progress under RSSP) sets and/ or emphasizes the requirement that NPS would be responsible for collecting, storing raw crash data in NRCDS and supplying these (minus sensitive personal data) to NRSC/MOPIT and that NRSC/MOPIT would be responsible for storing, maintaining, managing and operating NRCDS and supplying these data to all stakeholders responsible to manage road safety and to inform the general public of safety performance in the country;
- Ensure that Motor Vehicle and Transport Management Act (MVTMA) and Motor Vehicle and Transport Management Regulation (MVTMR), which are currently under review (work in progress under RSSP) sets similar requirement that the agencies responsible for managing transport and traffic and managing the delivery, maintenance and operation of roads and transport system require to report to the government and general public safety performance of their road transport system under their control (road network, road based public transport network, transport operations and traffic management)
- Ensure that Public Roads Act which is currently under review and the development of Public Roads Regulations (both works are in progress under RSSP) requires that the

road agencies carry out safety analysis (road safety audit, identification of black spot, treatment of black spots) and report the safety performance outcomes (before and after the project) using the data obtained from NRCDS;

- Establish a Project to confirm the causes of underreporting of crashes, develop and implement the process for addressing underreporting;
- Commence the development of web based crash data collection system. This is expected to address one of the causes of under reporting and malpractices in crash reporting;
- Train the police officers on completing current CRF (and slightly modified CRF) correctly and completely to ensure consistency in the crash data entered in NPRCDS;
- Translate Crash Database Policy Guidelines into Nepali and get verification on its appropriateness by legal specialist;
- Translate Crash Report Form (CRF) in Nepali for police officers' use;
- Translate Instructions to complete existing and slightly modified new CRF (How to complete Crash Report Form?) into Nepali for use by NPS personnel;
- Translate Crash Database Management Manual into Nepali;
- Translate Road Crash Database Users' Manual into Nepali;
- Develop the process of updating crash data based on the hospital information. Crashes reported, as serious injury by NPS may need to be recorded as fatal if the victims die within 30 days of the crash. Also, if the contributing factors are related to pre-existing medical conditions (e.g., heart attacks while driving or suicide attempts), these crashes are not to be included in the Crash Database System;
- Consider implementing Project to improve the Reliability, Integrity and Accessibility of Database System: Two options: (a) Cloud based storage system and (b) Storage of data Government Integrated Data Centre (GIDC) could be considered for data back up and not losing any data if the computer in NRSC/ MoPIT or NPS crashes;
- Interface with other database systems such as mentioned above (population, vehicle, licenses, traffic volume, road network etc.) to provide single platform for road safety analysis (Nepal Road Safety Information Management System). A follow up Project should be considered to create NRSIMS; and

- Integration of the Crash Database System with Highway Management Information System (HMIS) of the Department of Roads (DOR) and Department of Local Infrastructure and Agricultural Roads (DOLIDAR) to provide a single platform for road safety analysis.

All these tasks or projects make sense when the NRCDS is in place. And this report is expected to provide enough background information to initiate debate on the creation of NRCDS and ultimately NRSIMS and possibly NRSMS (e.g, development of Nepal Road Risk Assessment Model and similar other road safety decision tools/ models);

The above and other activities can be undertaken successfully if the Government adopts and implements Nepal Crash Database Policy, which requires strengthening institutional capacity of the agencies responsible for crash data collection, database operation and management and data use. Four follow up projects are recommended for consideration by the Government. These include:

- Capacity Enhancement Project (NPS)
 - Instruction Sheet to complete New Crash Report Form (CRF);
 - Training to complete CRF (Paper based/ Tablet based);
 - Resourcing (supplying Tablets, Computers, Solar Power System, Access to Internet) to all Police Stations and District Police Offices;
 - Piloting the use of Tablets for web based data collection system;
 - Servers at NPS/TD Headquarter;
 - Ongoing technical support for system maintenance, operation and management; and
 - Technical Assistance for ongoing improvement, operation, management and further development of database system (and other tools) required to analyze and report crash data
- Capacity Enhancement Project (NRSC/Road Agencies)
 - Resourcing as above minus for data collection;
 - Training to analyze and report crash data to road safety engineers from MOPIT, DOTM, DOR and DOLIDAR;
 - Training to create crash diagrams/ collision diagrams for use by road safety engineers;

- Technical Assistance for system maintenance, operation and management for at least another 5 years
- Ongoing improvement and development of NRCDS for the next 5 years
- Project for the development of Nepal Road Safety Information Management System (NRSIMS) (Refer to Concept Paper 1 (Parajuli, 2015a); and
- Project for the development of Web based / Cloud based/ Multi-access Database System

The last two projects are considered to be long term and are optional for the Government to consider only if it wants to go adopt hi tech system in crash data management information system. Institutional arrangements are to be set up, strengthening and capacity building issues are to be resolved followed by the development of Operational Plan of NRSC's Secretariat before moving forward in this direction. A number of activities to be completed as soon as possible to ensure the NRCDS could be operationalized are:

- Complete drafting RSA and RSR which are expected to provide legal basis for setting NRSC. It is understood that the Minister /MoPIT were to chair the NRSC (as per NRSAP);
- As an interim/ transitional arrangement (as it might take some more time), resolve to revamp the existing Ad-hoc Committee chaired by the MOPIT Secretary and agree among stakeholders that NRSC Ad-hoc Committee to sit regularly to guide NRSC Secretariat through the entire road safety management process including the development and management of NRCDS;
- Complete the strengthening of NRSC Secretariat, which, at minimum, should include:
 - provision of decent work space;
 - nomination of a dedicated officer to assist joint secretary of CTD/MOPIT on day to day basis on matters related to the proper functioning of NRSC secretariat (At this stage, no one in the CTD seems to know who were nominated to the members of NRSC Adhoc Committee when it was formed and where are the records of all decisions or minutes of meetings are placed etc.);
 - furnish fully the office space and equip the NRSC Adhoc Committee Secretariat with essential resources such as computers (including complete peripherals), high speed dedicated internet connection, printers, photocopiers and other essential office facilities;

- engage a team of system analyst (with road safety engineering background), a graduate engineer (with strong Advanced EXCEL knowledge / data analysis skill), Computer Operator (with good command working in English and EXCEL) and probably an office assistant (Position Description with Qualification and Experience Requirements position description with roles and responsibilities; and
- Alternatively, nominate and engage an external agent (consulting firm having the team members as above) on performance based contract for the duration of at least 5 years with NRCDS Project Management responsibility given to the Joint Secretary/ CDD/MOPIT
- Resolve to adopt (possibly by the decision of Ad-hoc Committee meeting) policy guidelines developed under this Project (with appropriate changes as required) as the an interim instrument to guide the NRCDS's operation and management procedure (s) until such times as the promulgation of RSA (NRSC) Act and Regulations are not formulated and enacted;
- Develop and agree among the three primary stakeholders (NRSC/MOPIT, TD/NPS including MTPD/NPS and NCDU/DOHS) the process to address under reporting of crash data;
- Develop, approve (Ad-hoc Committee Meeting) and execute Memorandum of Understanding (with roles and responsibilities of each signatory party) among these three primary stakeholders (some of the major users from government agencies such as DOR and DOLIDAR as decided by Ad-hoc Committee can witness the signing of MOU and may commit funding contributions from their large scale road projects because these are the projects that would immensely benefit from NRCDS) to support further ongoing improvement in NRCDS (see above capacity enhancement projects and other strategic level recommendations); and
- Develop work programme together with funding and resourcing schedules and commit to implement it such that nationwide data collection and storage process could begin from January 1, 2017.

Obviously NRSC as the peak body responsible for managing road safety in the country should lead all these activities. It should play active mentoring role in the development and management of NRCDS while the work on RSA is still being progressed. When the RSA is promulgated/ enacted, it is believed that the same would then mandate all relevant

government agencies to collect crash data compulsorily, operate, maintain and manage NRCDS and make use of crash data stored this way for road safety analysis and performance monitoring and evaluation of roads on regular basis by road agencies and other governmental agencies having responsibility to manage road safety in the country.

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APPENDICES

(Refer Volume 2)

Appendix 1: Crash Report Forms

Appendix 2: List of Descriptive Crash Codes

Appendix 3: List of Police Stations and Codes

Appendix 4: List of District Police Offices and Codes

Appendix 5: Templates of Descriptive Crash Codes

Appendix 6: Sample Crash Diagram

Appendix 7: How to Complete Crash Report Forms

Appendix 8: NRSIMS - System Architecture and Data Flow Chart

Appendix 9: Notes of Workshops and Meetings

Appendix 10: List of Persons Contacted

Appendix 11: Nepal Road Crash Database System Management Manual

Appendix 12: Nepal Road Crash Database System Users' Manual