TA to Connectivity in the Western Balkans

EuropeAid/137850/IH/SER/MULTI

Sub-Project

Code: CONNECTA-TRA-CRM-REG-01
Area: Connectivity Transport Reform Measures

Preparation of Road Safety Inspection and Audit Plans for core/comprehensive road network in Western Balkans (WB6) and Pilots

REPORT –
Road Map for establishing system for continuous road crash data collection
(Final)

8th June 2018

MOTT MACDONALD
CONNECTA CONSORTIUM

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
1	27/04/2018	Mike Fell (Task. Manager)	Jesper Mertner	Kostas Georgiou	Draft Report
2	08/06/2018	Mike Fell (Task. Manager)	Jesper Mertner	Kostas Georgiou	Final Report

Contents

List of Abbreviations

ALB/AL	Albania
AO	Administrative Order
AIS	Accident Information System
ARA	Albanian Roads Authority
ARCMAP	GIS Mapping program
AVL	Automatic Vehicle Location system
BiH	Bosnia and Herzegovina
CA	Contracting Authority
CADaS	Common Road Accident Data Framework In Europe
CNC	Core Network Corridor
Connecta	Technical Assistance to Connectivity in the Western Balkans
Connecta	The MMD led Consortium implementing Connecta
CRM	Connectivity Reform Measures
CRMMP	Connectivity Reform Measures Management Plan
DfT	Department for Transport UK
DG MOVE	Directorate-General for Mobility and Transport
DG NEAR	Directorate-General for Neighbourhood and Enlargement Negotiations
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EB	Empirical Bayes
EU	European Union
EUR	Euro (currency)
EuroRAP	The European Road Assessment Programme
FBiH	Federation of BiH (entity)
FR	Final Report
GDP	Gross Domestic Product
GIS	Geographical Information Systems
GPS	Global Positioning System
ICD	International Classification for Diseases
ICJ	International Court of Justice
IFI	International Financing Institution
IFICO	International Financing Institution Coordination Office
INSTAT	Albanian Institute of Statistics
IPA	Instrument for Pre-accession Assistance
IPF	Infrastructure Project Facility
ISS	Information Sharing Systems
ITE	Institute of Transportation Engineers
ITS	Intelligent Transport Systems
IR	Inception Report
iRAP	The International Road Assessment Programme
IRTAD	International Road Traffic and Accident Database
KE	Key Expert
KfW	Kreditanstalt fur Wiederaufbau (Bank)

KoM	Kick-off-Meeting
KOS	Kosovo* (hereinafter referred to as Kosovo)
KOIS	Kosovo Police Information System
MAIS	Maximum Abbreviated Injury Scale
MAP	Multi Annual Plan
MED	Mediterranean (corridor)
MIE	Ministry of Infrastructure and Energy
MKD	The Former Yugoslav Republic of Macedonia
MMD	Mott MacDonald
MMUAC	Model Minimum Uniform Crash Criteria
MNE/MON	Montenegro
MOI	Ministry of Infrastructure
MONSTAT	statistical office of Montenegro
MoTC/MoI/MoCTI	Ministry related to Transport and Infrastructure
MoU	Memorandum of Understanding
MTI	Ministry of Transport and Infrastructure
NIPAC	National IPA Coordinator
NKE	Non-Key Expert
OEM	Orient East Mediterranean (corridor)
PD	Preliminary Design
PDF	Project Description Form
PE	Public Enterprise
PERS/PE RoS	Public Enterprise Roads of Serbia
PM	Project Manager
REG	Regional
RFA	Request for Approval
RS	Republic of Srpska (entity of BiH)
RS	Road Safety
RSA	Road Safety Audit
RSI	Road Safety Inspection
RSWG	Road Safety Working Group
SAFEGE	Monitoring of the Road Safety Strategies in SEETO Members and Draft a Regional Short-term Action Plan – September 2015
SEETIS	South East Europe Transport Information System
SEETO	South East Europe Transport Observatory
SNKE	Senior Non-Key Expert
SPF	Safety Performance Functions
SRB/SER	Serbia
SQL	Structured Query Language.
TA	Technical Assistance
TAIEX	Technical Assistance and Information Exchange instrument of the European Commission
TEN-T	Trans-European Network – Transport
TL	Team Leader
ToR	Terms of Reference
TRA	Transport

* This designation is without prejudice to positions on status and is in line with UNSCR 1244/1999 and the ICJ Opinion on the Kosovo declaration of independence.

UNSCR	United Nations Security Council Resolutions
WB	Western Balkan
WB6	Western Balkans 6 countries
WB (G)	World Bank (Group)
WHO	World Health Organisation

1 SYNOPSIS

Project (sub-project) Title:	**Preparation of Road Safety Inspection (RSI) and Audit (RSA) Plans for core/comprehensive network in Western Balkans (WB6) and Pilots** **Final report - Road Map for establishing system for continuous road crash date collection**
Project Code:	CONNECTA-TRA-CRM-REG-01
Area:	Connectivity Transport Reform Measures in WB6
Contracting Authority:	European Commission - DG NEAR
Main Beneficiary/Monitoring:	SEETO
End Beneficiaries:	Albania, Bosnia and Herzegovina, the former Yugoslav Republic of Macedonia, Kosovo, Montenegro and Serbia
Context:	Regional
Consultant:	Mott MacDonald Ltd. (UK) in Consortium with COWI A/S, WYG, CeS COWI, TRENECON, SYSTEMA
Administrative Order:	31 May 2017 (supplementary on 26 June 2017)
Mobilisation of NKEs:	05 June 2017 (Kick-off Meeting with SEETO at 13 June 2017)
Sub-Project Duration:	12 months
Anticipated completion:	04 June 2018
Responsible Transport KE:	Kostas Georgiou

1.1 Project Purpose and Objectives

The South East Europe Region has a high road crash rate compared to EU countries with the 6 SEETO Regional Participants having almost 84 road deaths per million population in 2016 compared to the EU28 at just over 50 road deaths per million of population. In 2016, more than 1,500 were killed and almost 55,000 were injured in the SEETO Regional Participants according to MAP2018[1]. The road safety reform progress around the WB6 varies but is generally low. The EU Directive 2008/96/EC is not (or only partly) transposed in national legislations.

The Preparation of Road Safety Inspection (RSI) and Audit (RSA) Plans for core/comprehensive network in Western Balkans (WB6) and Pilots Project commenced with a Kick-off Meeting on the 13 June 2017 with an expected project duration of 12 months.

The purpose of this TA is to prepare short-term plans (2018-2020) for road safety inspection and audit for the whole Core and Comprehensive Road Network in the Western Balkans. This consultancy will - as RSI/RSA pilots - also deliver a part (10% and 6 projects, respectively) of these overall plans in 2018.

The objective is to provide direct support to the Western Balkans' ministries responsible for transport and infrastructure and to road authorities for programming infrastructure maintenance and to assist the SEETO Secretariat in monitoring the implementation of relevant transport measures in the framework of Connectivity Agenda.

The specific objectives of this TA are to support the implementation of the 2nd, 3rd and 4th road safety measures under the CRMMP for 2016/2017:

- Prepare three-year RSI plan for the core and comprehensive network and pilot RSIs on high accident sections
- Help to ensure that road safety audits are carried out according to the Directive 2008/96/EC on all projects on the core and comprehensive network and undertake sample audits
- Support RPs in establishment of a national system for continuous road crash data collection (by 2018).

This component will support the regional participants in implementing a harmonised crash data collection and analysis system. The activity according to ToR simply states the development of a 'Road Map' for establishing a national system for continuous road crash data collection. To achieve this task, it is proposed to undertake missions in each of the WB6 countries to assess current road crash data collection and analysis capabilities. The three activities contained within this component are:

Activity 1 Assess current road crash data collection-analysis systems.

Activity 2 Set up a concept for a common system in WB6 based on EU practice.

Activity 3 Prepare road map for establishing national system for continuous road crash data collection and analysis.

This purpose of this report is to provide SEETO with the findings of the review and recommendations for Component 3 of the TA, Road Map for establishing system for continuous road crash date collection.

[1] SEETO Multi-Annual Development Plan, Multi-Annual Plan 2018, Common problems – Shared solutions

1.2 The crash database team

The Non-Key Expert responsible to prepare Road Map for establishing a system for continuous road crash date collection is Mike Fell supported by four local traffic engineers to provide in country support for missions and information gathering.

2 Executive Summary

2.1 Introduction

This report is intended to present the components and progression that must be implemented in the development of a comprehensive crash database system. The phrase "Crash Database Systems" covers all the elements which constitute the methods and arrangements to collect, store and analyse any systematic report or information collected on road collisions and those injured in them (WHO 2010). This definition therefore includes the stakeholders, which are any persons involved with the system in any capacity. Generally, when Crash Data Systems are considered the focus tends to be on the IT systems primarily (associated computer hardware and software).

A number of previous reports and pilot studies have been undertaken, the most recent being the SAFEGE study which provided a preliminary assessment of the crash database systems within the WB6 Region. The study used the basic CADaS datasets to assess the current status of the crash data collection; an overview of the findings has been included within this report for clarity.

An updated assessment of the current status of crash data collection within the WB6 Region is provided within the report. It was found that some of the Regional Participants have significantly developed their data collection beyond that found during the SAFEGE study. All Regional Participants reported funding was the main hindrance to progress.

The core focus of the report is to develop a road map for the sequence of activities that must be undertaken by the WB6 Regional Participants to enable them to achieve a common approach to crash data collection, analysis and dissemination of statistical crash to all interested parties.

The core components that must be addressed, in order of priority are:

1. Standardise data collection
    a. Achieve full compliance with the Advanced CADaS datasets
2. Achieve a multi-agency approach to collecting data to include
    a. Medical data
    b. Engineering data, including details GIS mapping
3. Data encoding
    a. Agreement to encode the key facts of the crash before the investigating officer goes off duty or within 24 hours of the incident.
    b. Inclusion within the computer record of photographs and sketch plans of the crash scene
    c. Assign mandatory fields that must be completed within the database record before the initial report can be uploaded.
    d. Develop a review protocol for the encoded data to ensure there are no errors or omissions present.

e. Work towards achieving a basic requirement that 100% of the data fields must be completed before the crash report can be assigned as complete and closed.

4. Data Quality

    a. Develop a quality assessment protocol to rectify errors and omissions

5. Data sharing within a Regional Participant

    a. Develop a 'real time' sharing capability of all the CADaS statistical data sets with all the relevant Ministries and Road Safety Agencies within a Regional Participants.

    b. The signing of a memorandum of understanding (MOU) between all the parties involved outlining the exchange mechanism, security protocols and timelines.

    c. Procurement of a computer linking database or 'HUB' which will facilitate the exchange of data between each of the data sources

    d. Procurement of an advanced analytical and GIS database to permit all the end users the ability to view and analysis the statistical data.

6. Data sharing with WB6

    a. It is proposed all the CADaS statistical datasets is shared with neighbouring WB6 Regional Participants and SEETO. To achieve this sharing will require:

        i. The drafting of a memorandum of understanding (MOU) between all the parties involved outlining the exchange mechanism, security protocols and timelines.

        ii. Each recipient will require a computer linking database or 'HUB' which will facilitate the exchange of data between each of the data sources.

        iii. An advanced analytical database to permit the end user to view and analysis the crash records provided

7. Data Analysis

    a. The need to procure an 'off the shelf' advanced analytical and GIS based system.

2.2 Standardising data

The requirement to align to the CADaS advanced dataset will necessitate a review of the paper report used by each Regional Participants to ensure it includes all the elements. It is recommended that an agreed translation by each country of these elements is achieved and circulated within the WB6 Region through SEETO. It is recommended the reference number for each element used by the CADaS system becomes the accepted protocol for describing the dataset; this will facilitate the sharing of data.

The review identified all WB6 Regional Participants were in the process of upgrading their paper-based report forms; it was originally proposed this report would provide an assessment of these reports to identify omissions however this has not been possible. The report has produced a comprehensive outline of the data requirements together with references which are intended to facilitate the assessment by a Regional Participants of their data collection status.

It is recommended the paper-based approach should ultimately be replaced by electronic means of data collection. The prerequisite to achieving this is the need to have a communication system and computer database to receive the electronic data. Such an approach will greatly simplify the collection process and reduce the work load on the police and other collection agencies.

2.3 Achieve a multi-agency approach to collecting data to include

There is a need to collect more statistical data for the most serious injury and fatal collisions. This is based on the requirement to clearly understand the pre-impact approach paths, and the actions involved. Understanding is essential in developing a data lead approach to reducing such incidents.

The collection of all this additional data is not seen as the sole requirement of the investigating police officer but more of a shared obligation amongst the responsible Ministries; the detailed engineering data could be provided by Ministry of Transport for example.

2.4 Data encoding

Agreement within WB6 Regional Participants will need to be reached defining the protocol for encoding the paper-based reports into the databases. To achieve a real time data sharing capability between Ministries will require the initial report of the collision to be encoded into the database prior to the investigating officer going off duty on the day of the incident.

The inclusion of photographs and sketch plans to complement the statistical data fields will provide significant benefits where analysis of the data is undertaken by other Ministries and agencies that are not able to visit the scene.

2.5 Data Quality

There is a requirement for each Regional Participant to develop a quality assessment protocol. This protocol should dictate the time period when quality assessments should be made and the process of rectifying errors and omissions in the data. It will also need to include the process for designating the record as complete.

The assessment protocol should dictate the data sets that should be encoded within specified time periods. As an example, a damage only or minor injury crash report should be encoded and the record reviewed and completed within 7 days of the initial incident being recorded.

Where a more serious injury of fatality is involved the initial 7-day review should be undertaken to identify any errors or omissions. However, in such cases the computer record may remain active to allow additions / amendments to the data resulting from further investigations. In such occasions a review process should be repeated every 7 days until either the file is completed or a period of one month (30 days) after the incident has elapsed (the international agreed definition for a fatality).

The process should also provide the requirements that must be met before the record can be marked complete and closed. The normal requirement is for the senior database manager to provide the final assessment and closer activity.

2.6 Data sharing

It is proposed that the initial data sharing activity should be undertaken at a local level between the relevant Ministries and Road Safety Stakeholders. Some members of the WB6 region are already achieving a limited data sharing capability while others only provide a periodic exchange of numerical tables.

The proposal of this report is to achieve a real time sharing of all the CADaS statistical data sets with all the relevant Ministries and Road Safety Agencies within a Regional Participant. This will require, in the first instance, the drafting of a memorandum of understanding (MOU) between all the parties involved outlining the exchange mechanism, security protocols and timelines.

The actual exchange of data will require the creation of a compatible computer linking database or 'HUB' which will facilitate the exchange of data between each of the data sources. The central 'HUB' database will combine the data into records associated with each crash and display the information using advanced GIS technology. Many 'HUB' databases also combine advanced analytical capabilities which will allow the users to undertake complex data analysis.

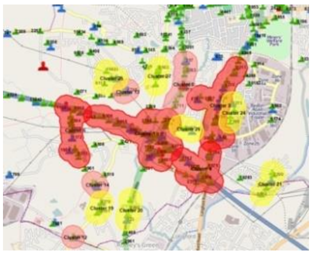
It is ultimately proposed the sharing of all the CADaS datasets with neighbouring WB6 Regional Participants and SEETO or equivalent body. To achieve this sharing will require:

- The drafting of a memorandum of understanding MOU (see Appendix C for an example of such an MOU) between all the parties involved outlining the exchange mechanism, security protocols and timelines.
- Each recipient will require a compatible computer linking database or 'HUB' which will facilitate the exchange of data between each of the data sources.
- An advanced analytical database to permit the end user to view and analysis the crash records provided.

2.7 Data Analysis

To achieve the more complex analysis computer programs have been developed to automate the task. These programs are designed with user friendly interface that permits the creation of simplistic to the most complex queries of the datasets to elucidate the required factors. The results produced are then viewed as either numerical values, specific crash reports or visually using the GIS interface. It is recommended that an 'off the shelf' system is always chosen above attempting to develop one. The implementation phase of an 'off the shelf' system is measured in months whereas developing one is usually measured in years.

The plotting of crash locations on a map is the simplest of these tasks and is provided by all the available 'off the shelf' systems. The ability to provide a sophisticated methodology of interrogating the datasets using a graphic interface provides for a more dynamic approach to the analysis process. Such a process provides the ability to define areas on a map to initiate a search or query of the dataset to identify incidents within the selected Regional Participant fitting the predetermined factors



2.8 Recommendations

The below table presents a summary of the actions and recommendations required to be addressed to achieve a common approach to creating a quality crash data recording system.

<table>
<tr><th>Activity</th><th>Actions</th><th>Components</th></tr>
<tr><td>Standardise statistical crash datasets</td><td>An agreement that all the advanced CADaS version 3.6 2017 datasets will be adopted within WB6 regional as the de-facto crash data recording convention.</td><td>It is proposed the WB6 Reginal Representatives sign a formal agreement to use the Advanced CADaS datasets as a requirement</td></tr>
<tr><td rowspan="4">Standardise statistical crash reporting form</td><td>Enhancement of paper reporting form in line with Advanced CADaS datasets.</td><td>It is proposed a separate statistical crash data reporting form should be created to encompass all the advanced CADaS datasets</td></tr>
<tr><td>Translation of advanced CADaS datasets and manual into local language</td><td>Use CADaS reference codes as de-facto dataset identification and develop an agreed translation for each dataset</td></tr>
<tr><td>Produce protocol for completion statistical report form</td><td>Elements:
• Identification of lead agency responsible for completion of statistical crash report
• Identification of agency /officer / department responsible for completing each sections of report.
• Maximum time periods permitted when form / sections should be completed
• Protocol to quality audit paper form and require lead agency / officer / department to correct omissions and errors identified</td></tr>
<tr><td>Produce training manual in local language that provides an explanation of the CADaS dataset</td><td>Develop a reference guide for the completion of the crash report form in the local language based on the manuals provided by EU.
Provide training to personnel on how to completing the crash report form</td></tr>
<tr><td>Encoding statistical crash data into computer database</td><td>Enhancement of computer database datasets to enable encoding of new statistical datasets</td><td>There will be a need to either:
• Upgrade the existing database datasets to match statistical crash data form or
• Procure / develop a separate crash database capable of encoding the statistical crash data form</td></tr>
</table>

<table>
<tr><th>Activity</th><th>Actions</th><th>Components</th></tr>
<tr><td></td><td>Produce a protocol outlining the methodology for:
Encoding the statistical crash data into the database.
Quality audit of data recorded
Protocol for marking record as complete and closed</td><td>Elements:
Identification of lead agency responsible for encoding the statistical crash data
Maximum time periods permitted when initial record is encoded – within 24 hours
Maximum time periods when record should be completed
damage only 7 days
Serious injury 30 days
Fatal defined on an incident by incident bases at least 30 days.
Protocol to identify omissions and errors
Protocol to rectify errors and omissions
Protocol to close a record as complete.</td></tr>
<tr><td rowspan="4">Multi-Agency approach</td><td>Develop a multiagency approach to providing information for the statistical crash report form:
Medical
Ambulance
Trauma centre
Fire and Rescue
Engineering
GIS mapping
Traffic flow and speed data
iRAP data</td><td>It is proposed each Region within the WB6 produce a formal agreement with the various Ministries to agree on a protocol for the dissemination of data associated with a road crash.
Identify roles and responsibilities of each agency
Develop a protocol for the provision of data.</td></tr>
<tr><td>Ministry of Health to develop a protocol with the Ministry of Interior (police) with respect to the provision of trauma data from ambulance and trauma centre for a causality.</td><td>Medical data associated with a casualty involved in a crash is referenced to the casualty’s name and date of birth.
The Police database also contains the names and date of births of the casualties involved in a collision.
Proposal is to encode the medical casualty data into the police database to enable easy linking of data.</td></tr>
<tr><td>Regional agreement on adopting the Maximum Abbreviated Injury Scale (MAIS) casualty coding system within WB6 Region</td><td>It is proposed each Region within the WB6 formal agree to adopt MAIS injury coding system.</td></tr>
<tr><td>Ministry of Infrastructure to develop a protocol to provide access to GIS mapping</td><td>This will require a computer system capable of displaying crash data as an overlay within a GIS map</td></tr>
<tr><td rowspan="2">Data Sharing</td><td>Achieve a real time sharing of all the CADaS statistical data sets with all the relevant Ministries and Road Safety Agencies within a Regional Participant</td><td></td></tr>
<tr><td>Drafting of a memorandum of understanding (MOU) between all participants</td><td>An example MOU has been provided in Appendix C</td></tr>
</table>

Activity	Actions	Components
Data Linking - local	Develop the technical capabilities to achieve a secure linking capability for the non-sensitive statistical crash data between the relevant Ministries	The actual exchange of data will require the creation of a compatible computer linking database or 'HUB' which will facilitate the exchange of data between each of the data sources. The central 'HUB' database will combine the data into records associated with each crash and display the information using advanced GIS technology
Data Linking - Regional	Develop the technical capabilities to achieve a secure linking capability for the non-sensitive statistical crash data between the WB6 Regions and SEETO	To achieve this sharing will require: • The drafting of a memorandum of understanding (MOU) (Appendix C) between all the parties involved outlining the exchange mechanism, security protocols and timelines. • Each recipient will require a compatible computer linking database or 'HUB' which will facilitate the exchange of data between each of the data sources. • An advanced analytical database to permit the end user to view and analyse the crash records provided.
Data Analysis	Develop an ability to undertake advanced analysis of the statistical crash data within a GIS environment.	It is proposed that to undertake this style of analysis will require the procurement of an 'off the shelf' Analytical GIS capable crash database. Many such programs also combine the ability to function as a 'HUB' to permit the linking of other data sources.

3 Background and Terminology of Crash Data Base Systems

There is a need to collect more statistical data for the most serious injury and fatal collisions. This is based on the requirement to clearly understand the pre-impact approach paths, and actions the involved. Understanding is essential in developing a data lead approach to reducing such incidents.

The collection of all this additional data is **not** seen as the **sole** requirement of the investigating police officer but more of a shared obligation amongst the responsible Ministries; the detailed engineering data could be provided by Ministry of Transport for example.

To achieve this shared approach will require:

- Training for both police and road safety engineers in crash scene analysis
- A more advanced database capable of sharing 'non-sensitive' data amongst the Ministries.
- A more advanced database capable of providing the advanced analytical programmes to undertake the task. A description of such a database is provided later in this report.

The ability to provide this enhanced data will enable detailed analysis to be undertaken to fully understand why the collisions are occurring, this will lead to a more scientific data lead approach to developing actions to reduce their reoccurrence.

3.1 Introduction

The phrase "Crash Database Systems" covers all the elements which constitute the methods and arrangements to collect, store and analyse any systematic report or information collected on road collisions and those injured in them (WHO 2010). This definition therefore includes the stakeholders, which are any persons involved with the system in any capacity. Generally, when Crash Data Systems are considered the focus tends to be on the IT systems primarily (associated computer hardware and software). It is however important to remember that all the elements are important.

The main elements and components of the crash data system are set out here:

- Data collection fundamentals
  - Reporting Form
    - Comprehensiveness
    - Quality
    - Ease of filling
  - Reporting levels of incidents
  - Quality of data collection
    - Training/skill/commitment levels of staff
    - Resources available
    - Collection of location coordinates and/or location description
  - Links to other data sources
    - To improve data quality
    - To enable more advanced analyses
- Data Capture factors
  - Paper based collection

    - Manual data entry
    - Electronic collection direct into database (on mobile devices)
        - Quality checks on data (Validation)
- Data sharing/dissemination
    - Availability of data to all stakeholders
        - Filtering of sensitive information as appropriate
        - Direct access via internet link
        - Indirect access through manual import/export to other local systems
        - Regular summary reports available through various media
- Analysis for management functions
    - Summary reports
    - Crash information management
    - Safe Systems Analysis
        - Strategy development
        - Progress against casualty or other reduction targets
        - Monitoring of Key Performance Indicators (KPIs)
    - Road safety analysis
        - Identification of trends
        - Identification of blackspots/spatial analysis
        - Economic appraisal
        - Management of site treatments or enforcement efforts
        - Analysis of problem locations
        - Evaluation and statistical analysis functions.

3.2 Data Collection

The initial data quality is a very important factor in maintaining the credibility of the Database System. The accuracy and consistency of the information recorded in the system is the fundamental and biggest issue in maintaining a credible analysis capability.

Clearly, inconsistencies in the data can lead to misleading results when performing analyses.

Data quality has three main properties:

- Quality and comprehensiveness of the form
- Quality and consistency of the data reporting on incidents
- Levels of reporting or under-reporting.

3.3 Form Content and Quality

It is important to understand this report is only dealing with the form designed to collect statistical data associated with the collision. It is not intended to address the form used by the police for the legal recording and presentation of evidence in a court of law.

Within the WB6 Region the review identified some countries have separated the statistical form from the official report form while others have a combined form. The review identified where the report is combined the form is always presented as evidence in a court of law thus the statistical data is used as evidence which is not what it was ever intended to be. An example being where the statistical data shows a road surface defect it has resulted in the roads authority being implicated in causation.

The statistical reporting form needs to be comprehensive enough to collect the range of information required by road safety practitioners. Collecting the data is relatively difficult and can be time consuming, so it is important that the process is made as straightforward as is possible.

Having a form that is shorter with predominately multiple-choice questions rather than requesting open, information (e.g. written statements) will improve data quality and also encourage reporting. Logical and intuitive layout of paper-based data collection forms or the interfaces of mobile electronic data collection systems will also promote data quality and help to reduce under-reporting.

Generally, there should be an officially recognised working group to oversee and control the development of the statistical reporting form. The organisation should coordinate aspects such as the layout/design, data collection practices and field changes and version control. This body should include all the main end user stakeholders in addition to the key data collection stakeholder and should ensure that all the users' needs are taken into account. It is important that any changes to the form fields are carefully considered, are minimal and can be harmonized with previously archive data as far as is possible; it is not advisable to make constant small changes to the data that is collected.

Having developed a form, the next most important element is to ensure all the police officers tasked with entering the data fully understand the meaning of every field and the options available. The need for a comprehensive training program is fundamental to guaranteeing the quality of the data within the database; failure to train the police officer correctly will invalidate all the data contained within the system.

3.4 International Recommendations

An EU project initiative has sought to define the basic set of parameters that should be collected on a crash and casualty reporting form (see CADaS version 3.6 2017[2]). The CADaS report states that "the variables and values of CADaS may be considered as recommendations for national police road crash data collection reports". The full CADaS list of data elements is considerably longer and more complex than the minimum set and is aimed at capturing the information that academics might like to be available for high level analysis and research purposes.

The Model Minimum Uniform Crash Criteria (2012)[3] (MMUAC) is a US Government initiative that has identified the basic set of fields which should be included in a crash report form which will provide the information required for safety management purposes. MMUAC's key aim is to promote greater uniformity of the data on crashes which is collected in the different US States. The current recommended list gives a total of 110 elements which it recommends should be captured; 77 of these being collected by police directly with a further 10 derived from the general scene information fields. The final 23 elements should be obtained from data linkages to external official data sources such as asset databases; these could be collected manually if data linkages are not in place.

[2] https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/cadas_glossary_v_3_6.pdff

[3] https://www.transportation.gov/sites/dot.gov/files/docs/MMUCC_4th_Ed.pdf

Whilst the full CADaS list sets out an ideal and extensive set of questions, many countries are decreasing their crash database collection efforts by having shortened and briefer forms. The relative weakness of the data collected is compensated by linking the data to other sources such as hospital systems in Sweden or by conducting surveys to estimate underreporting rates in Netherlands. Researchers and practitioners in these countries would prefer that police collected better primary data.

3.5 Data Capture

Data capture is the general term for the processes to actually gather the information. For crash data systems it generally refers to the methods to get the information collected by the initial reporter into a computer database.

3.6 Data Collection Processes

The process has frequently taken the form of the reporting police officer taking notes at the crash scene or shortly after, then a structured form is completed from the notes when back in the office. The instruction to the reporting police officers is often that the pro forma should be completed directly at the crash location. It is however generally accepted that the often chaotic and dangerous nature of the scene immediately after the incident and the low priority for filling in the crash report form means that this seldom actually happens. The quality of the collected information is likely to improve if the officer uses the specific form rather than doing this later from notes. The completed forms should be checked by a more experienced officer for accuracy and completeness before they are signed-off and filed.

In many instances the form, or a photocopy of it, is passed to support staff for entry into the computer database system. At this point some automated validation of the answers should occur to identify logical errors (where one answer is incompatible with another field's recorded value). Automated checks for blank fields should also be programmed into the system.

The major problems with paper-based approaches are that:

- Data entry is a significant waste of resources when there are more efficient electronic methods available
- Validation is often performed by a person who did not attend the incident:
  - They may incorrectly interpret the information; not communicating with the original collector.
  - They can simply select any option.

There are variations on this model, in some locations (e.g. South Africa), crash report forms are read by optical scanners to populate the database automatically. In the UK some police authorities speak via a phone link to an operator who takes the officer through the questions and enters the answers into the database.

Current best practise makes use of latest advances in communications and mobile technology. These systems can enable the reporting officer to enter the data directly into a mobile electronic device (e.g. a Tablet/mobile computer/larger mobile phone). The device then synchronises with the central database either at the time the information is entered via a mobile data link or later when a Wi-Fi or physical link can be established.

This kind of system has the advantages that:

- It removes the need for data entry staff to perform the additional task of inputting the information from paper forms

    - both time consuming and a potential source of additional errors in the data
- It forces the person who attended the incident to validate the answers
    - saving them time and irritation later
- It speeds up the process so that intelligence can be available in nearly real time
- Bundled GPS equipment can be used to get accurate locations very easily
- Bundled cameras can be used to obtain photographic records of the scene and vehicle damage
    - These are associated with the crash record and are stored in the central database.

Ideally mobile devices can save time and effort by accessing a variety of databases to populate data automatically. For example, inputting the national ID number for a person involved in a crash can potentially link to the national database and populate the age, gender, nationality and so on; inputting the vehicle registration can access vehicle make, age, colour etc. This should save significant effort and ensuring the information is correct.

The Road Accident Data in the Enlarged European Union, Learning from Each Other. Brussels 2006[4] stated:

"Electronic systems have great potential to reduce the burden on the Police and speed up the data collection process. The equipment and software are expensive, however, and data could easily be lost if police officers do not use the new systems correctly. Also, there is a depressing history of large-scale IT systems that have failed to live up to expectations. It is necessary to see the results of major trials before deciding whether to recommend the adoption of these systems. Care should be taken to ensure that existing data quality checks are not discontinued if electronic data collection systems are adopted."

3.7 Under Reporting

Under-reporting is a significant problem in most countries. In High Income countries it is widely considered that reporting rates of fatal crashes are generally close to 100% but this is often far from the case for many Low and Middle-Income countries.

High under-reporting rates undermine the confidence that can be put in the results of analysis and also the value of the dataset as the basis for any safety evaluation and also monitoring casualty reduction. What is important is that the sample is consistently representative of the real situation; the basic data collection process is consistent over time.

It is known that some crash types are more consistently under-reported; these being single motorcycle and bicycle crashes, in some countries pedestrian crashes are also significantly underrepresented in national databases.

It is important to have good estimates of under-reporting rates since this issue can hide the true costs of road injuries and crashes nationally. Some account of under reporting can be incorporated into economic evaluation since crash costs used in appraisal can be inflated to take account of the missing crashes.

A solution to poor reporting levels has been to link police crash and casualty data to hospital records in an attempt to identify road injuries and incidents reported at medical facilities but not to the police to gain estimates of the over-all national problem.

[4] http://ec.europa.eu/transport/roadsafety_library/publications/sau_guide_best_practices_brochure.pdf

In many countries in the world, there is a clear legal requirement to report all car crashes; from damage to fatal incidents to the police. In these countries, damage sustained by a vehicle cannot generally be officially repaired at garages without proof that the crash has been registered with the police. Whilst this seems to lead to high reporting rates of crashes, it is possible that not all casualties in a crash always get reported which is also a possible source of under-reporting.

3.8 Data Linking

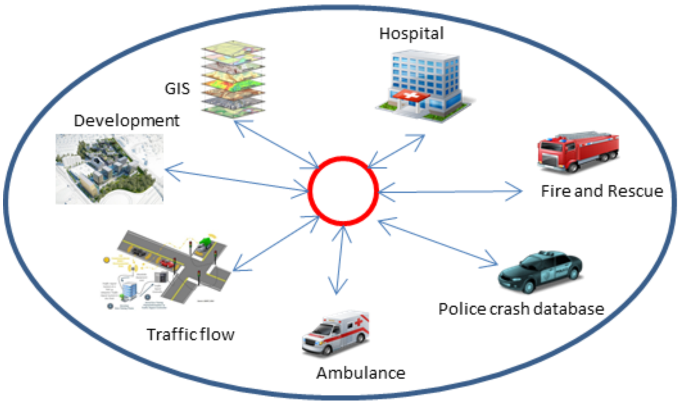
International Traffic Safety Data and Analysis Group (IRTAD) has recently published a document which aims to summarise how data (targeted particularly for those incidents where casualties are seriously injured but not killed) should be linked to other data sources (Reporting on Serious Road Traffic Casualties, IRTAD 2012)[5]. It sets out all the issues very clearly and comprehensively.

The main issues and conclusions in summary are:

- Knowing the true numbers of killed and also those seriously injured is important for:
    - Building investment cases and estimating economic losses
    - Making international comparisons
    - Targeting measures appropriately
- Police do not always collect data on less severe crashes, but generally report most if not almost all incidents involving fatalities.
- Medical data sources can be used to gain an understanding of under reporting levels and the true numbers injured
- Police derived crash report data must be the basic source for analysis to support safety through engineering, enforcement and any other approach that requires spatial investigation and also for statistical purposes
- Medical data has some strengths with greater detail about the individual casualty, but poor location and general details are usually collected, if it at all
- Medical data collection can be highly variable nationally and even within a single hospital
- Severe and slight injury classifications are generally very poorly defined internationally
- Police are not sufficiently skilled (or generally receive training) to accurately assign severity
- Established medical scales should be used to assign severity but this requires significant skill and effort (e.g. ICD, AIS, MAIS, ISS systems)
    - The definition of MAIS[6] 3+ has been broadly accepted as the best definition internationally for serious injury
- Linking records to different data sets is best achieved through shared unique keys/fields rather than through matching a range of broader fields such as incident date/time etc.

[5]http://www.itf-oecd.org/sites/default/files/docs/road-casualties-web.pdf

[6] http://www.surgicalcriticalcare.net/Resources/injury_severity_scoring.pdf



The linking of crash data to other sources of information can have major benefits, in line with "big data" approaches; this can permit new insights into crash causation and factors that affect safety. It is relatively easy to link data sets where there is a well-defined and common unique key which is present in all databases; however, it is seldom the case that datasets which were not originally designed with linking in mind have good common anonymised keys. Linking data by other means such as statistical matching of multiple fields can be difficult with a relatively low success rate.

Crash Data will benefit significantly by linking to medical data to get improved accuracy of the severity assessments of those injured. This linking can also help to estimate under reporting rates from the proportions of casualties in hospital not known to police and vice versa.

3.9 Geographical Information Systems (GIS) Data

Plotting crashes on maps and linking incidents to spatial information held in other GIS layers is also technically "data linking". This relies on linking the crash to spatial elements through the location where the crash occurred as defined by its map coordinate.

How well crashes can be linked to GIS data depends on how accurate the crash locations have been assigned but applications are also limited by how sophisticated the digital maps are and how intelligent the elements they contain are. Some digital GIS maps are simply files which contain definitions for the start and end points of lines which form roads etc. and are in all practicality backdrops only. In contrast in true GIS data sets the road line has the road name/number associated with it and possibly even traffic count data for the stretch.

Current best practise is to use GIS data as widely as possible and making this more possible there is a corresponding recent increase in the number of GIS based datasets that are available. There have also been significantly improving performance of GIS software served over the internet. There are also increasing numbers of useable quality "free" map sets available on the internet such as Open Street and Google Maps.

If the police details recorded for crashes are of poor quality, GIS data sets of road inventory or assets can be used to check that details are correct (number of lanes/speed limit etc.) or to add additional information about the location.

GIS layers can be used to check the location information for a crash in a coarse way, if the form claims the crash occurred in a certain Regional Participant yet the crash plots outside the boundaries of a layer defining that area then the problem could be automatically flagged for manual checking.

Crash patterns and occurrence can also be analysed in relation to GIS spatial objects that might affect safety levels. It may be possible to very quickly derive the crash occurrence rates on different road standards for example if these specific characteristics are available associated with road sections in the data sets. Another example is that crash patterns near schools could be reviewed very quickly if a layer with education establishments identified exists and if a “buffer” to select crashes in the vicinity around such objects.

3.10 Additional Data for Road Safety Analyses

In addition to crash data reported by police, collection of a range of information which influences road safety can be highly beneficial to those working to reduce road casualties. The management of additional data can be very advantageous since if this is stored in a central database it can also be accessed easily by the safety stakeholders and linked much more readily with the crash report information.

The new Safe Systems methods advocated by international road safety stakeholders takes a view that in addition to the “primary” safety indicators such as the numbers killed and seriously injured additional data that is known to be highly correlated (ideally causal) with safety risk and levels should be collected and used to complement the collection and analysis of reported crashes and casualties.

3.11 In Depth Crash Data

The crash reporting system collects fairly general information about a large number of the collisions occurring. This system should be complemented by in depth data collection programmes. These allow more detailed analysis of a sample of the more serious crashes to be undertaken that go beyond the scope of police data. Research programmes of this nature have been established successfully throughout the world. These programmes require considerable resource and expertise, however once established they offer the opportunity to enhance the skills of road safety practitioners to a great extent by developing their understanding of crash causation factors. These studies are generally targeted at the more serious incidents and can be used to check the accuracy of the police reporting system. This approach also provides valuable information on issues such as general vehicle design and safety standards that are not adequately addressed by the police reporting processes.

The current datasets being used within the WB6 Region in the main only provide a simplistic overview, there is therefore a requirement to separate each entity involved and provide a detailed description of its activities pre-impact, at impact and post impact.

For vehicles it should be enhanced to include:

- Pre-event direction of travel
- Number of lanes in direction of travel; of the vehicle
- Number of turn lanes in direction of travel of vehicle
- Pre-crash vehicle position
- Pre-crash movement
- Critical pre-crash event category
- Critical pre-crash event
- Driver manoeuvre to avoid impact
- Attempted avoidance manoeuvre

- Pre-impact vehicle stability
- Pre-impact location
- Driver vision obscured by
- Driver distracted by
- Most harmful event
- Most harmful object struck
- Rollover initiation type
- Rollover initiation location
- Surface type roll initiated
- Surface condition roll initiated
- Pre-rollover event
- Pre-rollover vehicle manoeuvre
- Safety barrier impact event
    - Barrier impact type
    - Barrier impact secondary event
    - Object struck secondary event
    - Impact angle
    - Kerb in front or inline
    - Barrier type
    - Barrier passive safety standards
    - Barrier containment level
- Narrow object impact event
    - Narrow object type
    - Narrow object passive safety standard
    - Narrow object secondary event
    - Narrow object test level
- Detailed crash event sequence
    - Crash event
    - Object struck

    - Post event vehicle manoeuvre
    - Post event vehicle stability

For passenger casualties it should be enhanced to include:

- Student on journey to or from school
- Detailed injury description
- Location prior to the impact
- Action prior to the impact
- Safety features present and used
- Ejection and path
- Airbag deployment
- Entrapment
- Injury diagram

For pedestrian casualties it should be enhanced to include:

- Student traveling to or from school
- Using mobile phone
- Injury location
- Casualty type to include:
    - Cyclist
    - Wheelchair
    - Rideable toys (skateboards etc.)
    - Baby carriage / stroller
    - Unknown type
- Location at time of crash
- Direction of travel
- Action at time of crash
- Contributing circumstances
- Safety equipment
- Condition / impairment at time of crash
- Suspected alcohol / drugs.

4 Findings on crash databases systems from previous studies

The SAFEGE study[7] provided a preliminary assessment of the crash database systems within the Regional Participants. The study used the CADaS basic datasets to assess the current status of the crash data collection. The main findings and conclusions are summarised in the following sections.

4.1 Albania

Crash statistical data in Albania is only collected and recorded by the Police using a paper-based system which is encoded onto a standalone database. The review undertaken in 2016 identified the following areas:

Accident Scene related data
This contains thirteen fields of which two were not recorded; these being the European classifications associated with regional and administrative areas.

Road related data
This contains twenty-five fields of which thirteen were not recorded; these being associated with road classification, junction controls, carriageway types and road markings.

Traffic Unit information
This contains eighteen fields of which thirteen were not recorded; these being associated with vehicle types, makes and models, pre-impact manoeuvre, first point of impact, objects hit and hit and run.

Person related data
This contains twenty-one fields of which seven were not recorded; these being associated with alcohol impairment results, drug impairment testing, driver distraction, medical / physical impairment, journey purpose and MAIS injury scale.

4.2 Bosnia and Herzegovina

Crash statistical data in the Federation of Bosnia and Herzegovina (FBIH) is only collected and recorded by the Police using a paper-based system. Crash data in the Republic Srpska (BIH) RS is only collected by the police using a paper-based form which is subsequently encoded onto a computer program.

The review undertaken in 2016 identified the following areas:

Accident Scene related data
This contains thirteen fields all were either completely or partially recorded

Road related data
This contains twenty-five fields of which seventeen were not recorded; these being associated with GPS locations, road classification, road speed limits, junction controls, carriageway types, road markings and work zones.

Traffic unit information

[7] Monitoring of the Road Safety Strategies in SEETO Members and Draft a Regional Short-term Action Plan – September 2015 - SEETO

This contains eighteen fields of which ten were not recorded; these being associated vehicle make and model, first point of impact and objects hit.

Person related data
This contains twenty-one fields of which eight were not recorded; these being associated with alcohol and drug testing, driver distraction, journey purpose and MAIS injury scale.

4.3 The former Yugoslav Republic of Macedonia

Crash statistical data in the former Yugoslav Republic of Macedonia is only collected and recorded by the Police using a paper-based system which is subsequently encoded onto a computer program.

The review undertaken in 2016 identified the following areas:

Accident Scene related data
This contains thirteen fields of which all were either completely or partially recorded.

Road related data
This contains twenty-five fields of which thirteen were not recorded; these being associated with road classification, junction controls, carriageway types and road markings.

Traffic unit information
This contains eighteen fields of which thirteen were not recorded; these being associated with vehicle types, makes and models, pre-impact manoeuvre, first point of impact, objects hit and hit and run.

Person related data
This contains twenty-one fields of which seven were not recorded; these being associated with alcohol impairment results, drug impairment testing, driver distraction, medical / physical impairment, journey purpose and MAIS injury scale.

4.4 Kosovo

Crash statistical data in Kosovo is only collected and recorded by the Police using a paper-based system which is subsequently encoded onto a computer program.

The review undertaken in 2016 identified the following areas:

Accident Scene related data
This contains thirteen fields of which all were either completely or partially recorded.

Road related data
This contains twenty-five fields of which twelve were not recorded; these being associated with GPS coordinates, road classification, carriageway types and road markings.

Traffic unit information
This contains eighteen fields of which six were not recorded; these being associated with vehicle specifications and vehicle insurance.

Person related data
This contains twenty-one fields of which eight were not recorded; these being associated with drug impairment testing, safety equipment, seating position, driver distraction, physical impairment, journey purpose and MAIS injury scale.

4.5 Montenegro

Crash statistical data in Montenegro is only collected and recorded by the Police using a paper-based system which is subsequently encoded onto a computer program.

The review undertaken in 2016 identified the following areas:

Accident Scene related data
This contains thirteen fields of which all were either completely or partially recorded.

Road related data
This contains twenty-five fields of which seventeen were not recorded; these being associated with GPS coordinates, road classification, speed limits, junction types, junction controls, carriageway types, road markings and work zones.

Traffic unit information
This contains eighteen fields of which ten were not recorded; these being associated with vehicle types, makes and models, pre-impact manoeuvre, first point of impact, objects hit and hit and run.

Person related data
This contains twenty-one fields of which ten were not recorded; these being associated with alcohol impairment results, drug impairment testing, seating position, driver distraction, journey purpose and MAIS injury scale.

4.6 Serbia

Crash statistical data in Serbia is only collected and recorded by the Police using a paper-based system which is subsequently encoded onto a computer program.

The review undertaken in 2016 identified the following areas:

Accident Scene related data
This contains thirteen fields of which all were either completely or partially recorded.

Road related data
This contains twenty-five fields of which only one was not recorded; this being associated with E road kilometre location of the crash.

Traffic unit information
This contains eighteen fields of which only one was not recorded; this being associated with vehicle insurance.

Person related data
This contains twenty-one fields of which only one was not recorded; this being associated with MAIS injury scale.

5 Current road crash data collection-analysis systems

The current road crash data collection system utilised in WB6 Region is predominantly achieved using a paper-based form. The forms used are primarily created to gather the data associated with the police requirements for recording the crash. This report only concentrates on the statistical data associated with describing the elements involved in the incident.

The following section maps the agencies responsible for investigating road crashes from both a Police and Engineering perspective. The data and information provided by each of the Regional Participants are reviewed in line with international best practice and more specifically with compatibility with CADaS principles and methodologies. A major component of the review is identification of what processes are in place to ensure the quality of the data recorded is to the highest level and accurate recoding of the crash location.

The review identifies the data storage and exporting capabilities of each authority and Regional Participant to identify the potential for developing a national data linking capability within the WB6 Regional Participants based on EU practices. This analysis forms the bases of recommendations outlining the actions that is required to enable the exchange of data between systems.

5.1 Albania

The police in Albania have their own 'Accident Information System' (AIS), this is a standalone, Microsoft Access database that was created following a SweRoad project in 2005. The system incorporates some thirty data entry fields which can be used within a simple cross tab analysis to generate numerical table output. The program lacks any integral GIS capability. The statistical report form used by the police was created at the time of the SweRoad project and specifically designed for the AIS database.

The police disseminate, on a monthly basis, crash data to the Ministry of Infrastructure and Energy (MIE). The Ministry, on a yearly basis, undertake a blackspot analysis assessment using the crash data provided by the police. The current assessment dated 2017 identifies 118 blackspot locations on the National Road Network.

The requirement for a fully functioning advanced analytical and GIS capable database will be essential to achieve the proposals outlined in this report as the current database is very limited in its capability to expand. The database also lacks a data linking capability appropriate to the objectives of this report.

The Police also provide the Albanian Institute of Statistics[8] (INSTAT) with crash data which they use in their online interactive database. The current Road crash statistics on the INSTAT web site indicates in 2016 there were 269 fatalities and 2,509 injured people from 2,033 accidents. The site did not provide the number of damage only collisions.

The crash data causation fields produced by INSTAT are:

- Careless driving
- Sudden stoppage
- Noncompliance with traffic sign
- Driving on the wrong side
- Exceeding speed limit
- Unexpected change of direction
- Fail to give priority

[8] http://www.instat.gov.al/en/

- Careless overtaking
- Alcohol/drugs
- Other.

The current crash report form has been developed beyond the basic CADaS datasets and aligns with the existing database. Further development, to align with the advanced CADaS datasets, is not possible within the capabilities of the current database. The institutions within Albania are aware of the problem and are in the process of developing the procurement of a new system to be able to align with the advanced CADaS principles.

5.2 Bosnia and Herzegovina

The Police in Bosnia and Herzegovina are responsible for attending and investigating road crashes. They all use a paper-based form to record their findings. They however have a fragmented approach to statistical data collection:

- The police in FIB RS produce a statistical form which they encode into their database.

- The police in FBIH are disseminated into each Canton which have created their own statistical data collection form. The paper forms are submitted to FBIH MOI who collate the information without the use of a computer database.

Given the variation in the current status of crash data collection within Bosnia and Herzegovina it is not possible to make a simple and meaningful assessment of their current situation beyond what was assessed in the SAFEGE study.

The initial requirement will be to agree on a standardised set of statistical data elements that must be collected. A fully functioning advanced analytical and GIS capable database will then be required to achieve the proposals outlined in this report.

The current crash data fields being recorded by FIBH MOI align with the basic CADaS datasets. They have developed an updated statistical crash report form that enhances their data collection closer to the advanced CADaS datasets (copy of the report is included in Appendix A).

5.3 The former Yugoslav Republic of Macedonia

The Police in MKD are responsible for attending and investigating road crashes. They use a paper-based form to record their findings. There are currently two forms; one for the crash report and the second for the Statistical data. It has been identified that the statistical data form is not being completed so it has been proposed the forms will be combined into a single report. The report is still in development but reportedly it complies with the CADaS dataset. A new crash database is also being developed to replace the current, very old system.

Currently the paper forms are quality checked prior to being submitted to the statistical department at the MOI. This department disseminates the statistical crash data using excel spreadsheets every three months which become the official crash data records for Macedonia.

Due to the fact the revised report form had not received officially authorisation at the time of the review the document was not available for review.

The requirement for a fully functioning advanced analytical and GIS capable database will be essential to achieve the proposals outlined in this report as the current database is very limited in its capability to be expanded. The database also lacks a data linking capability appropriate to the objectives of this report.

The current crash data fields being recorded are in line with the basic CADaS datasets. Institutions are aware of the need to enhance the collection process and reportedly have achieved this in line with the advanced CADaS datasets.

5.4 Kosovo

The Police in Kosovo are responsible for attending and investigating road crashes. They use a paper-based form to record their findings. The data collected is encoded into the Kosovo Police Information System (KPIS). The initial report of the incident is required to be encoded into the database within 24 hours. The final encoding occurring when the investigation and report is completed.

The crash report form has a requirement for the GPS coordinates of the crash scene however, the police state they are not currently collecting this as a matter of course. They indicated they were undertaking trails at the time of this review to identify the best method of achieving this requirement.

The current database is reportedly being upgraded and will have the capability to upload photographs and scanned documents. The proposals for the upgrade of the system will include a GIS and analytical capability.

The police have developed a mobile application to allow the public to report being involved in an accident. The application provides the location of the mobile phone at the time of the call and potentially the location of the incident.

The requirement for a fully functioning analytical and GIS capable database will be essential to achieve the proposals outlined in this report. In the short term the current database has the potential to be enhanced to achieve the primary goal, however, in the long term to achieve the level of data linking and advanced analytical capability will require the procurement of a bespoke system.

The current crash data fields being recorded in the Kosovo Police Information System (KPIS) exceeds the basic CADaS requirements but has not, as yet, reached the full advanced dataset requirement. The limitations of the database would seem to be a factor the degree of enhancement possible.

5.5 Montenegro

The Police in Montenegro are responsible for attending and investigating road crashes. They use a paper-based form to record their findings. The content of the forms is quality checked by a senior officer prior to it being entered into the police database. The crash database is part of the main police system which is developed using an SQL format.

Within each police station is an occurrence register (dairy) in which is recorded all the incidents that are reported to the police station. Where an officer attends a report of a road collision a brief description of the incident together with the date, time, location, involved parties and severity.

The Initial report as provided by the occurrence register is uploaded onto the police database within 24 hours of the incident being reported. The database, at this time, generates a unique Accident ID Number for the record.

In 2017 the police commenced trailing a system for collecting GPS coordinates for the crash scene locations. The Police patrol vehicles have been fitted with Automatic Vehicle Location (AVL) system which is connected through the police radio network to the police control room. The collection of GPS locations by this system went live throughout Montenegro in January 2018. The GIS mapping system used to display the GPS data is using Vector and satellite maps.

The police database is able to export crash data using an excel spreadsheet format. The Ministry of Transport and Communications do not currently have a GIS capability. Proposals to develop a system during 2018 have been agreed. In 2011 a combined police and Ministry blackspot analysis project was undertaken where some 90 locations were identified.

The national and local ambulances of the Department for the Emergency Medical Aid, provided by the Ministry of Health have also been fitted with the same AVL system. Each ambulance is crewed by a registered doctor who completes a paper-based form for each patient they attend. The doctor uses the C10 injury coding system to describe the severity of injury, they also try and locate the patient to a vehicle and to which seat they occupied. When the patient arrives at the hospital a copy of the incident report from the ambulance remains with the patient. The duty doctor at the hospital also examines the patient and completes a report. The report includes an injury assessment (C10) for the patient which is provided to the Police to enable them to classify the injury severity.

The police provide crash data to the statistical office of Montenegro (MONSTST) who published a yearly statistical book in which it reproduces the current crash data records. The year book for 2017 provides details for 2016. Section 19-12 states there were 65 persons killed with 2,358 injured from 5,229 collisions. No other analysis or breakdowns are provided.

The requirement for a fully functioning advanced analytical and GIS capable database will be essential to achieve the proposals outlined in this report as the current database is very limited in its capability to expand. The database also lacks a data linking capability appropriate to the objectives of this report.

The current crash data fields being recorded are in line with the basic CADaS datasets. Institutions are aware of the need to enhance the collection process and are putting into place the components to achieve this especially associated with obtaining the GPS coordinates for the crash scene. The most significant limitation to enhancing the data collection process is the existing database being used.

5.6 Serbia

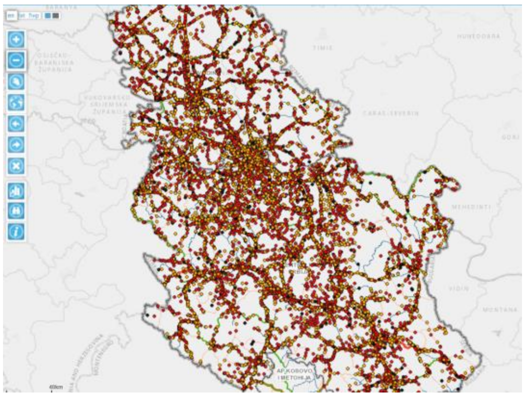
The Police in Serbia are responsible for attending and investigating road crashes. They use a paper-based form to record their findings. The content of the forms is quality checked by a senior officer prior to it being entered into the police database.

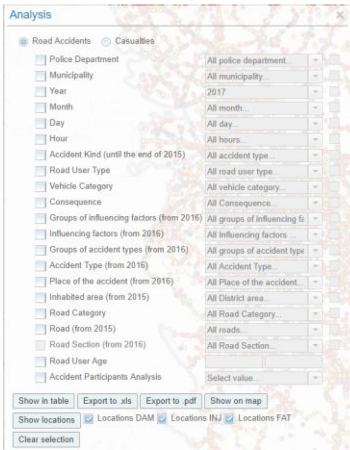
A project named “New Road Safety Database”, funded by the World Bank completed in 2016 provided the capability of connecting all relevant road safety data holders to a unique database. The greatest improvement to the datasets was in the accuracy of injury statistics and data from insurance companies. The crash database has a quality audit capability to check the accuracy of the information recorded. The location of the crashes is achieved by using Garmin GPS units and also from the police radio system.

A pilot study in 2017 trailed the inclusion of photographs and scanned sketch plans into the crash reports on the database. The limited storage capacity of the system was found to be an issue and the proposal has been dropped until additional storage capacity can be identified.

PE Roads of Serbia receive a monthly statistical data download from the police which they encode into their GIS mapping database ARCMAP. They undertake analysis of the data and publish their findings on the internet (www.bazabs.abs.gov.rs).

An example of the data produced by PE Roads that is available on the internet created from the police crash data. The map provides a colour coded location of fatal, serious and slight injury crashes.





An ability to plot selective data onto the map from the crash data fields is provided. The search and analytical capabilities of this system is currently limited and requires enhancement.

The requirement for a fully functioning analytical and GIS capable database will be essential to achieve the proposals outlined in this report. In the short term the current database has the potential to be enhanced to achieve the primary goal however, in the long term to achieve the level of data linking and advanced analytical capability will require the procurement of a bespoke system.

The current crash data fields being recorded comply with mandatory fields in the advanced CADaS dataset database that is being used. The police database has limitations on the fields it records and on the exporting capability of the system.

6 Concept for a common system in WB6 based on EU practice

6.1 Data collection

Creating a common approach to the collection, recording and analysis of crash data within the WB6 Regional Participants will have a significant effect on its ability to undertake a holistic approach to reducing the road casualty statistics.

To achieve such an approach will require the linking of the various databases within each individual member of the WB6 region to permit the free flow of data between the Ministries and road safety agencies. The ultimate goal will then be to share statistical data with all of the other WB6 Regional Participants. The linking of databases has the major benefit associated with a “big data” approach. This style of approach has been found to generate new insights into identifying common factors that Regionally affect road safety.

This common approach must start with realising a uniform set of information that must be collected by the Police, Medical and Road engineers in each Regional Participant. This information will only include the statistical data; which has no personal identification values, as defined by the CADaS methodology.

Within the WB6 Region all the data currently being collected by the various police departments are entered into their own specially developed databases. These databases vary in content and sophistication from the stand-alone Access database in Albania to the computer system in Kosovo. The majority of the police databases contain a significant amount of data associated with the work of the Police. Statistical cash data forms only a very small part of the information held within these systems. The majority of the current Police databases have not been designed, nor are they suitable to be used as a map-based crash data analytical system.

6.2 Data linking and sharing

Internationally, it has been seen that requiring the police alone to collect all the statistical data is unrealistic. An approach where other agencies provide relevant data associated with their area of expertise provides significant benefits. Such an approach will allow the police to concentrate on collecting the core transient scene data while the other responsible agencies provide more detailed information associated with their roles and responsibilities. Such a system will provide a significantly enhancement in the quality of data than currently being achievable.

The medical and engineering data within the WB6 region is, as a norm, predominately recorded using paper-based systems and as yet not being encoded onto any computer database, albeit there are proposals to achieve this in many Regional Participants. The inclusion of this data is essential to achieving a holistic and meaningful analysis, however, achieving this will create a real challenge albeit there are a number of simple solutions to the problem.

Internationally the best solution found has been to use a separate database, which is designed to link to all the Police, Medical and engineering databases as well as providing advanced crash data analysis and GIS capabilities. The linking of data across databases requires a pre-determined methodology that will enable data from one source to be matched with another; a person’s injury profile provided by the ambulance can be matched to the same person in the police accident report. A number of approaches to achieving this will be explored in the following sections.

6.3 Data Analysis

The primary reason for collecting crash data is often lost in the drive to develop methodologies to achieve the collection process. This report and the others before have all concentrated on what data should be collected without much emphasis as to what should be done with it once it has been encoded into a database.

In simple terms the statistical information that is collected should describe the following components of the crash:

- The scene, time, date, location, weather and description of the road etc.
- The vehicles and objects involved
- The casualties, their injury profiles
- The pre-impact movements and actions of the vehicles / people involved
- How the vehicles / people interacted (impacted) with each other
- The post impact to rest movements of the vehicles / people involved.

The crash data, once collected, should be used to identify patterns and trends that can provide insights into why the crashes are happening. Such analysis must go beyond simply stating excess speed, driver behaviour and road defect.

Internationally it has been identified that adopting the Safe System approach; which represents a fundamental shift in road safety policy, has achieved significant benefits. At its core the Safe Systems approach accepts, as road users, we will make errors of judgment that will result in an incident. The goal however is to ensure that any road user that is involved in a collision will not sustain trauma that results in a fatality or life changing injury.

Modern vehicles are built with this Safe System approach concept central to their design, provided they are driven within the limits of the law and environment (speed limit, road, weather, traffic conditions etc.). Passenger cars are also designed to ensure the passenger compartment maintains its integrity during a crash. The safety features within the vehicle will protect the occupants as long as they are seated correctly and wear their seatbelts.

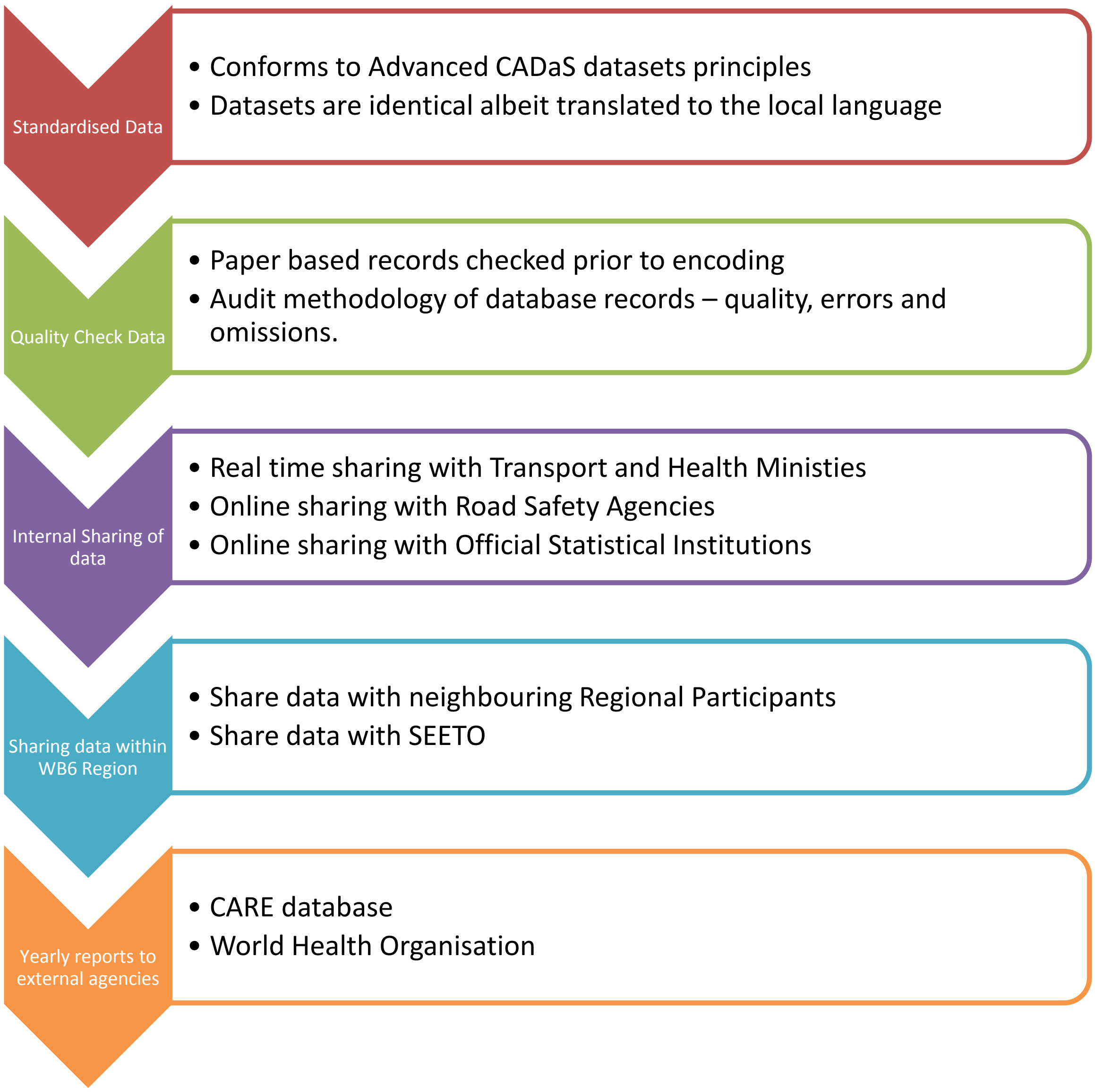
The basic strategy of a Safe System approach is to ensure that in the event of a crash, the impact energies remain below the threshold likely to produce either death or life changing injury. It sees the road user as the weakest link in the transport chain, unpredictable and capable of error, education and information efforts notwithstanding.

Although this is a very long-term objective, it transforms the level of ambition. The safe system approach opens up new potential for improving performance by addressing all elements of the road transport system together and finding synergies for trauma reduction when safer road and vehicle design, speed limits and compliance with road rules, are pursued in concert.

The Safe System approach recognises that humans as road users are fallible and will make mistakes. There are also limits to the kinetic energy exchange which humans can tolerate (e.g. during the rapid deceleration associated with a crash) before serious injury or death occurs. A key part of the Safe System approach requires that the road system be designed to take account of these errors and vulnerabilities so that road users are able to avoid serious injury or death on the road. Where a road user receives fatal or life changing injuries the analysis process should identify why this occurred.

7 Road Map

The below diagram provides the outline of activities that must be adopted to achieve a common approach to creating quality crash data records.



7.1 Standardised Data

To achieve a common approach as stated earlier the first aspect that needs to be considered is the data that is actually available / collected. The current collection practices within the WB6 Regional Participants, with respect to crash data, is predominately achieved using a paper-based collection medium. The information collected by this process is currently undertaken by the police and can be divided into two components:

1. Data specifically relating to the legal requirement of the Police to investigate and record the facts of the incident for a criminal court process. This data invariably contains sensitive information that identifies the persons involved.

2. Data describing the road, vehicles and casualties; this is known collectively as statistical information.

It is only the statistical data that is the subject of this report; that which is designed to provide a description of the crash to enable analysis to determine what factors were present that effected / caused the crash.

In every road crash there are always multiple factors that preceded the actual collision. Any analysis of a collision will require information associated with what occurred prior to the collision, how the objects involved collided and finally how and where they came to rest.

The European Union has developed the CADaS data sets that it considers essential to allow any meaningful analytical analysis to be undertaken. These parameters will therefore be taken as the base factors that should be collected by each WB6 Regional Participant and are reproduced below:

7.2 CADaS Dataset

The SweRoad's report of 2011, presented earlier in this report, set out the status of data collected by each Regional Participant against the basic CADaS datasets. Most Regional Participants today achieve these basic datasets as a norm. The need now is to enhance the datasets in line with the advanced CADaS datasets methodology.

Internationally, the interpretation of the elements from one language to another has been found to be one of the main problems. The manuals produced by the EU on CADaS are primarily produced in English however other languages are available. Within the WB6 region an agreed translation by each Regional Participant for each element should be made and a formal document produced.

The elements of the Advanced CADaS datasets V 3.6 2017 are reproduced below, those elements highlighted in blue are the basic dataset alternatives. It is recommended all Regional Participants develop these as a minimum but should strive to achieve the goals of this report by adopting the more detailed CADaS options. The elements highlighted in green are for European countries and will not form part of this report, as are seen as long-term requirements for WB6.

The proposal is that all the below datasets will be adopted within WB6 regional as the de-facto unified approach to crash data recording convention.

Code	Description	Importance	Sub code	Elements
	Accident			
A-1	Accident ID	High		Country code/Region/year/Number
			A1b	Year code 4 digits
			A1c	Accident number 6-digit number
A-2	Accident date	High		DD/MM/2018
A-3	Accident time	High		00:00
			A-4	Nomenclature of Territorial Units
A-4	NUTS			
A-5	LAU			Local Administrative units
A-6	Weather conditions	High		
			A-6.01	Dry / Clear
			A-6.02	Rain
			A-6.03	Snow
			A-6.04	Fog, Mist, Smoke
			A-6.05	Sleet, Hail
			A-6.06	Severe winds
			A-6.07	Other
			A-6.99	Unknown
A-7	Light conditions	High		
			A-7.01	Daylight
			A-7.02	Twilight
			A-7.03	Darkness Streetlights lit
			A-7.04	Darkness Streetlights unlit
			A-7.05	Darkness no streetlights
			A-7.06	Darkness streetlights unknown
			A-7.07	Darkness no streetlights or streetlights unlit
			A-7.99	unknown
A-8	Accident with Pedestrians	Low		
			A-8.00	Not applicable
			A-8.01	Pedestrian crossing street - no turning of vehicle - outside of junction
			A-8.02	Pedestrian crossing street - no turning of vehicle - at a junction
			A-8.52	Pedestrian crossing street - no turning of vehicle - not specified
			A-8.03	Pedestrian crossing street - no turning vehicle - not specified
			A-8.04	Pedestrian crossing - turning of vehicle turning right (left)
			A-8.53	Pedestrian walking along the road or stationary in the road

Code	Description	Importance	Sub code	Elements
	Accident			
			A-8.05	Pedestrian crossing - turning of vehicle turning left (right)
			A-8.06	Pedestrian crossing - turning of vehicle turning-not specified
			A-8.07	Pedestrian stationary in the road
			A-8.08	Pedestrian walking along the road
			A-8.09	Pedestrian on pavement or bicycle lane
			A-8.10	Pedestrian walking along the road or stationary in the road
			A-8.11	Pedestrian accident - other
			A-8.99	Pedestrian accident - unknown
A-9	Accident with parked car	Low		
			A-9.00	Not Applicable
			A-9.01	Hitting parked vehicles right (left) side of road
			A-9.02	Hitting parked vehicles left (right) side of road
			A-9.51	Hitting parked vehicles - side of the road - not specified
			A-9.03	Hitting parked vehicles - side of road - not specified
			A-9.04	Accident with parked vehicles - opening doors
			A-9.05	Other accident with parked vehicles
			A-9.99	Accident with parked vehicles - unknown
A-10	Single vehicle collision	Low		
			A-10.00	Not applicable
			A-10.01	Single vehicle accident with animals
			A-10.02	Single vehicle accidents obstacles on or above the road
			A-10.03	Single vehicle accidents with road work materials
			A-10.04	Accident between train and vehicle
			A-10.05	Single vehicle accidents with obstacles - other
			AA-10.51	Single vehicle accident with obstacles on the road - not specified
			A-10.06	Single vehicle accidents-leaving straight road - either side of the road

Code	Description	Importance	Sub code	Elements
	Accident			
			A-10.07	Single vehicle accidents in a bend - going either side of the road
			A-10.08	Single vehicle accident on the road
			A-10.09	Single vehicle accident including rollover
			A-10.10	Single vehicle accident in junctions or entrances
			A-10.11	Single vehicle accidents without obstacles - other
			AA-10.52	Single vehicle accidents without obstacles - not specified
			A-10.99	Single vehicle accident - unknown
A-11	At least 2 vehicles not turning	Low		
			A-11.00	Not applicable
			A-11.01	At least two vehicles - same direction - overtaking
			A-11.02	At least two vehicles - same direction - rear end collision
			A-11.03	At least two vehicles - same direction - entering traffic
			A-11.04	At least two vehicles - same direction - side collision
			A-11.05	At least two vehicles - same direction - others
			A-11.51	At least two vehicles - same direction no turning - not specified
			A-11.06	At least two vehicles - head on collision in general
			A-11.07	At least two vehicles - opposite direction no turning - reversing
			A-11.08	At least two vehicles - opposite direction no turning - others
			AA-11.52	At least two vehicles - opposite direction no turning not specified
			A-11.09	At least two vehicles - others no turning
			A-11.99	At least two vehicles - no turning - unknown
A-12	At least 2 vehicles turning or crossing	Low		
			A-12.00	Not applicable

Code	Description	Importance	Sub code	Elements
	Accident			
			A-12.01	At least two vehicles - turning same road - same direction - rear end collision
			A-12.02	At least two vehicles - turning same road - same direction - U-turn in front of the other vehicle
			A-12.03	At least two vehicles - turning same road - same direction - turning right (left)
			A-12.04	At least two vehicles - turning same road - same direction - turning left (right)
			A-12.05	At least two vehicles - turning same road - same direction - others
			AA-12.51	At least two vehicles - turning same road - same direction - not specified
			A-12.06	At least two vehicles - same road - opposite direction - turning left (right) in front of another vehicle
			A-12.07	At least two vehicles - same road - opposite direction - U-turn in front of another vehicle
			A-12.08	At least two vehicles - same road - opposite direction - turning into same road
			A-12.09	At least two vehicles - same road - opposite direction - turning into opposite roads
			A-12.10	At least two vehicles - same road - opposite direction - turning right (left) in front of another vehicle
			A-12.11	At least two vehicles - same road - opposite direction - turning others
			AA-12.52	At least two vehicles - turning or crossing - same road- opposite direction - not specified
			A-12.12	At least two vehicles crossing (no turning g)- different roads
			A-12.13	At least two vehicles - different roads- turning right (left) in front of vehicle from the left (right)

Code	Description	Importance	Sub code	Elements
	Accident			
			A-12.14	At least two vehicles - different roads- turning right (left) - head on collision
			A-12.15	At least two vehicles - different roads- both vehicles turning
			A-12.16	At least two vehicles - different roads- turning left (right) into traffic from the right (left) side
			A-12.17	At least two vehicles - different roads- turning left (right) into traffic from the left (right) side
			A-12.18	At least two vehicles - different roads- turning into traffic - others
			AA-12.53	At least two vehicles - different roads- not specified
			A-12.19	At least two vehicles - crossing or turning - others
			A-12.99	At least two vehicles - crossing or turning - unknown
A-13	Hit & run Accident	High		
			A-13.00	Not applicable
			A-13.01	Not Hit & Run
			A-13.02	Hit & Run
			A-13.99	Unknown
Road				
A-1	Accident ID	High		same as A-1
R-1	Latitude	High		
			R-1	Latitude
			R-1.9999999	Unknown
R-2	Longitude	High		
			R-2	Longitude
			R-2.9999999	Unknown
R-3	E Road	Low		
			R-3.0000	Not applicable
			R-3	E-road code
			R-3.9999	Unknown
R-4	E Road Kilometre	Low		
			R-4.0000	Not applicable
			R-4.0000	E-road Kilometre
			R-4.9999	Unknown
R-5	Function class 1st road	High		
			R-5.01	Principle arterial
			R-5.02	Secondary arterial
			R-5.03	Collector

Code	Description	Importance	Sub code	Elements
	Accident			
			R-5.04	Local
			R-5.05	Other
			R-5.99	Unknown
R-6	Function Class 2nd Road	High		
			R-6.01	Principle arterial
			R-6.02	Secondary arterial
			R-6.03	Collector
			R-6.04	Local
			R-6.05	Other
			R-6.99	Unknown
R-7	AADT 1st Road			
R-8	AADT 2nd Road			
R-9	Speed limit 1st road	High		
			R-9	Speed limit
			R-9.001	No speed Limit
			R-9.999	Unknown
			RA-9.501	<30 km/h
			RA-9.502	30-50 km/h
			RA-9.503	51-80 km/h
			RA-9.504	81-100 km/h
			RA-9.505	101-120 km/h
			RA-9.506	>120 km/h
R-10	Speed limit 2nd road	High		
			R-10	Speed limit
			R-10.001	No speed Limit
			R-10.999	Unknown
			RA-10.501	<30 km/h
			RA-10.502	30-50 km/h
			RA-10.503	51-80 km/h
			RA-10.504	81-100 km/h
			RA-10.505	101-120 km/h
			RA-10.506	>120 km/h
R-11	Motorway	High		
			R-11.01	Yes
			R-11.02	No
			R-11.99	Unknown
R-12	Urban Area	High		
			R-12.01	Inside
			R-12.02	Outside
			R-12.99	Unknown
R-13	Junction	High		
			R-13.00	Not at a junction
			R-13.01	At-grade - crossroads
			R-13.02	At-grade roundabout
			R-13.03	At-grade T or staggered junction
			R-13.04	At-grade multiple junction

Code	Description	Importance	Sub code	Elements
	Accident			
			R-13.05	Not at grade (interchange)
			R-13.06	Other
			R-13.07	At a level crossing
			R-13.99	Unknown
			R-13.51	At a junction - Not specified
R-14	Relation to Junction / Interchange	Low		
			R-14.00	Not applicable
			R-14.01	Approaching (20 m)
			R-14.02	Acceleration / deceleration lanes
			R-14.03	Through Roadway
			R-14.04	Entrance / exit ramps
			R-14.05	Crossing related
			R-14.06	Intersection
			R-14.99	Unknown
R-15	Junction Control	Low		
			R-15.00	Not applicable
			R-15.01	Authorised person
			R-15.02	Give way signs
			R-15.03	Automatic traffic signal
			R-15.04	Uncontrolled
			R-15.99	Unknown
R-16	Surface condition	High		
			R-16.01	Dry
			R-16.02	Snow, frost, ice slush
			R-16.03	Slippery
			R-16.04	Wet, damp
			R-16.05	Flood
			R-16.06	Other
			R-16.99	Unknown
R 17	Obstacles	Low		
			R-17.01	Yes
			R-17.02	No
			R-17.99	Unknown
R-18	Carriageway type	High		
			R-18.01	Single carriageway - one-way street
			R-18.02	Single carriageway - two-way street
			R-18.03	Dual carriageway
			R-18.04	Single carriageway - not specified
			R-18.99	Unknown
R-19	Number of lanes	High		
			R-19	Number of lanes (in one or two directions)
			R-19.99	Unknown

Code	Description	Importance	Sub code	Elements
	Accident			
			RA-19	Total number of lanes
R-20	Emergency Lane	Low		
			R-20.01	Yes
			R-20.02	No
			R-20.99	Unknown
R-21	Markings	Low		
			R-21.01	None or faded
			R-21.02	Only separating travel direction
			R-21.03	Separating travel direction and lanes
			R-21.04	Only separating lanes
			R-21.05	Other
			R-21.99	Unknown
R-22	Tunnel	Low		
			R-22.01	Yes
			R-22.02	No
			R-22.99	Unknown
R-23	Bridge	Low		
			R-23.01	Yes
			R-23.02	No
			R-23.99	Unknown
R-24	work zone related	High		
			R-24.01	Yes
			R-24.02	No
			R-24.99	Unknown
R-25	Road Curve	Low		
			R-25.01	Yes
			R-25.02	No
			R-25.99	Unknown
R-26	Road Segment grade	Low		
			R-26.01	Yes
			R-26.02	No
			R-26.99	Unknown
	Vehicles			
A-1	Accident ID	High		Same as A-1
U-1	Traffic Unit ID	High		
			U-1	Traffic unit ID
U-2	Traffic Unit Type	High		
			U-2.01	Pedal cycle
			U-2.02	Moped
			U-2.03	Motorcycle up to 125cc
			U-2.04	Motorcycle over 125cc
			U-2.05	Passenger car
			U-2.06	Minibus
			U-2.07	Bus
			U-2.08	Coach

Code	Description	Importance	Sub code	Elements
	Accident			
			U-2.09	Trolley
			U-2.10	Goods vehicle under 3.5 t MGW
			U-2.11	Goods vehicle over 3.5 t MGW
			U-2.12	Road tractor
			U-2.13	Agricultural tractor
			U-2.14	Tram / light rail
			U-2.15	Ridden animal
			U-2.16	Other motor vehicle
			U-2.17	Other non-motor vehicle
			U-2.18	Pedestrian
			U-2.19	Quad up to 50cc
			U-2.20	Quad over 50cc
			U-2.99	Unknown
			UA-2.51	Two-wheel motor vehicle
			UA-2.52	Bus or minibus or coach or trolley
			UA-2.53	Goods vehicle
			UA-2.54	Motorcycle not specified
U-3	Vehicle Special function	Low		
			U-3.00	Not applicable
			U-3.01	No special function
			U-3.02	Taxi
			U-3.03	SUV / off-road vehicle
			U-3.04	Vehicle used as school bus
			U-3.05	Vehicle used as scheduled bus
			U-3.06	Military
			U-3.07	Police
			U-3.08	Ambulance
			U-3.09	Fire-truck
			U-3.10	Dangerous goods vehicle
			U-3.99	Unknown
			UA-3.52	Special vehicle
U-4	Trailer	High		
			U-4.00	Not applicable
			U-4.01	Without trailer
			U-4.02	With trailer
			U-4.99	Unknown
U-5	Engine Power	Low		
			U-5.000	Not applicable
			U-5	Engine power
			U-5.999	Unknown
U-6	Active Safety Equipment	Low		
			U-6.00	Not applicable
			U-6	Active safety equipment

Code	Description	Importance	Sub code	Elements
	Accident			
			U-6.98	other
			U-6.99	Unknown
U-7	Vehicle Drive	Low		
			U-7.00	Not applicable
			U-7.01	Left hand drive
			U-7.02	Right hand drive
			U-7.99	Unknown
U-8	Make	Low		
			U-8.000	Not applicable
			U-8	Motor vehicle make
			U-8.999	Other / Unknown
U-9	Model	Low		
			U-9.00	Not applicable
			U-9	Motor vehicle model
			U-9.99	Unknown
U-10	Registration Year	High		
			U-10.0000	Not applicable
			U-10	Registration year
			U-10.9999	Unknown
U-11	Traffic unit Manoeuvre	High		
			U-11.00	Not applicable
			U-11.01	Reversing
			U-11.02	Parked
			U-11.03	Entering a parking position
			U-11.04	Leaving a parking position
			U-11.05	Waiting to go ahead but held up
			U-11.06	Slowing or stopping
			U-11.07	Moving off
			U-11.08	U turn
			U-11.09	Waiting to turn left
			U-11.10	Turning left
			U-11.11	Waiting to turn right
			U-11.12	Turning right
			U-11.13	Changing lanes to left
			U-11.14	Changing lane to right
			U-11.15	Avoidance manoeuvre
			U-11.16	Overtaking vehicle on its left
			U-11.17	Overtaking vehicle on its right
			U-11.18	Going around left-hand bend
			U-11.19	Going around right-hand bend
			U-11.20	Straight forward / normal driving
			UA-11.51	Entering or leaving a parking position

Code	Description	Importance	Sub code	Elements
	Accident			
			UA-11.52	Waiting to turn
			UA-11.53	Turning
			UA-11.54	Changing lane
			UA-11.55	Overtaking
				Pedestrian Manoeuvres
			U-11.21	Crossing (on pedestrian crossing)
			U-11.22	Crossing (on other point)
			U-11.23	Walking on the carriageway, facing traffic
			U-11.24	Walking on the carriageway, back to traffic
			U-11.25	Standing or playing on the carriageway
			U-11.26	Not on the carriageway (on sidewalk, pedestrian road etc.)
			U-11.27	Lying on the carriageway
			U-11.28	Entering or getting out of a vehicle
			UA-11.56	Crossing
			UA-11.57	Walking or standing on the carriageway
			U-11.98	Other
			U-11.99	Unknown
U-12	First point of impact	Low		
			U-12.01	No impact
			U-12.02	Left front
			U-12.03	Centre front
			U-12.04	Right front
			U-12.05	Right side
			U-12.06	Right rear
			U-12.07	Centre rear
			U-12.08	Left rear
			U-12.09	Right rear
			U-12.99	Unknown
			UA-12.51	Front not specified
			UA-12.52	Rear not specified
U-13	First object hit in road	Low		
			U-13.00	Not applicable
			U-13.01	None
			U-13.02	Object from previous accident
			U-13.03	Parked vehicle
			U-13.04	Bridge
			U-13.05	Bollard / refuge
			U-13.06	Central island of roundabout
			U-13.07	Kerb

Code	Description	Importance	Sub code	Elements
	Accident			
			U-13.08	Animal (except ridden animal)
			U-13.09	Other object
			U-13.10	Train
			U-13.99	Unknown
U-14	First object hit off road	Low		
			U-14.00	Not applicable
			U-14.01	None
			U-14.02	Road sign / traffic sign
			U-14.03	Lamp post
			U-14.04	Pole
			U-14.05	Tree
			U-14.06	Bus stop / shelter
			U-14.07	Central crash barrier
			U-14.08	Crash barrier beside carriageway
			U-14.09	Ditch
			U-14.10	Parked vehicle
			U-14.11	Stone / rock / mountainside
			U-14.12	Fence
			U-14.13	Submerged in water
			U-14.14	Other permanent object
			U-14.99	Unknown
U-15	Insurance	Low		
			U-15.00	Not applicable
			U-15.01	Insured for vehicles
			U-15.02	Not insured for vehicles
			U-15.99	Unknown
U-16	Hit & run	High		
			U-16.00	Not applicable
			U-16.01	Not hit and run
			U-16.02	Hit and run
			U-16.99	Unknown
U-17	Registration Country	High		
			U-17.000	Not applicable
			U-17	Country code
			UA-17.501	National
			UA-17.502	Foreign
	Casualties			
A-1	Accident ID	High		
U-1	Traffic Unit ID	High		
			U-1	Traffic ID
			U-1.99	Unknown traffic unit
P-2	Year of Birth	High		
			P-2.9999XXXX	Year of birth
			P-2.99XXXXXX	Year and month of birth (day unknown)

Code	Description	Importance	Sub code	Elements
	Accident			
			P-2.XXXXXXX	Date of birth
			P-2.99999999	Unknown
			PA-2.0000XXXX	Years and months of person
P-3	Gender	High		
			P-3.01	Male
			P-3.02	female
			P-3.99	Unknown
P-4	Nationality	High		
			P-4	Nationality
			PA-4.951	Nationality
			PA-4.952	Foreigner, within the EU
			PA-4.953	Foreigner, outside the EU
			PA-4.954	Foreigner, not specified
			PA-4.999	Unknown
P-5	Injury Type	High		
			P-5.01	Fatal injury
			P-5.02	Seriously injured
			P-5.03	Slightly Injured
			P-5.04	Not injured
			P-5.99	Unknown
			PA-5.51	Injured
P-6	Road User Type	High		
			P-6.01	Driver
			P-6.02	Passenger
			P-6.03	Pedestrian
			P-6.99	Unknown
P-7	Alcohol Test	Low		
			P-7.00	Not applicable
			P-7.01	Tested
			P-7.02	Not tested
			P-7.99	Unknown
P-8	Alcohol sample type	Low		
			P-8.00	Not applicable
			P-8.01	Blood sample
			P-8.02	Breath sample
			P-8.99	Unknown
P-9	Alcohol result	High		
			P-9.00	Not applicable
			P-9.01	Positive
			P-9.02	Negative
			P-9.99	Unknown
P-10	Alcohol Level	High		
			P-10.000	Not applicable
			P-10	Level
			P-10.999	Unknown
P-11	Drug test	Low		

Code	Description	Importance	Sub code	Elements
	Accident			
			P-11.00	Not applicable
			P-11.01	Positive
			P-11.02	Negative
			P-11.03	Not tested
			P-11.99	Unknown
P-12	Driving License Issue date	High		
			P-12.000000	Not applicable
			P-12.999999	Unknown
			P-12.00XXXX	Number of years and months of driving experience
P-13	Driving License Validity	Low		
			P-13.00	Not applicable
			P-13.01	With appropriate driving license
			P-13.02	With inappropriate driving license
			P-13.03	Only driving lesson or driving test
			P-13.04	Invalid or suspended driving license
			P-13.05	No driving license
			P-13.06	No license required
			P-13.99	Unknown
			PA-13.51	Invalid (or no) driving license
P-14	Safety Equipment	High		
			P-14.00	Not applicable
			P-14.01	Seat belt worn no airbag in vehicle
			P-14.02	Seat belt worn and airbag released
			P-14.03	Seat belt worn and airbag not released
			P-14.04	Seat belt not worn and airbag released
			P-14.05	Crash helmet worn
			P-14.06	Child safety seat facing forwards used
			P-14.07	Child safety seat facing backwards used
			P-14.08	No use of safety equipment (seat belt - helmet)
			P-14.09	Other (appropriate equipment for bikers and cyclists e.g. protective pads, reflective clothing, lighting)
			P-14.99	Unknown (it was not recorded)
			PA-14.51	Seat belt worn - not specified

Code	Description	Importance	Sub code	Elements
	Accident			
			PA-14.52	Child safety seat used - not specified
P-15	Seating Position in/on vehicle	High		
			P-15.00	Not applicable
			P-15.01	Driver
			P-15.02	Front seat
			P-15.03	Rear - seated
			P-15.04	Rear - standing
			PA-15.51	Rear - not specified
			P-15.05	Elsewhere
P-16	Distracted by device Driver or pedestrian	Low		
			P-16.00	Not applicable
			P-16.01	Not distracted by device
			P-16.02	Telecommunication device
			P-16.03	Another electronic device
			P-16.99	Unknown
P-17	Psychophysical / Physical Impairment	Low		
			P-17.00	Not applicable
			P-17.01	Good
			P-17.02	Inattention / absence of mind / Worried
			P-17.03	Tired / fell asleep
			P-17.04	Illness / Sudden illness / Lost consciousness
			P-17.05	Defective eyesight or hearing
			P-17.06	Dazzled by sunlight / vehicle headlights
			P-17.07	Others
			P-17.99	Unknown
P-18	Trip Journey Purpose	Low		
			P-18.00	Not applicable
			P-18.01	Route to/from school - education / route to / from work
			P-18.02	Driving as part of the work
			P-18.03	Leisure/Entertainment
			P-18.04	Holiday
			P-18.05	Driving lesson
			P-18.06	Other
			P-18.99	Unknown
P-19	Injury MAIS scale	Low		
			P-19.00	Not Injured
			P-19.01	Minor
			P-19.02	Moderate
			P-19.03	Serious
			P-19.04	Severe
			P-19.05	Critical

Code	Description	Importance	Sub code	Elements
	Accident			
			P-19.06	Maximum
			P-19.51	MAIS Minor
			p-19.53	MAIS 3 Plus
			P-19.99	Unknown

7.3 Regional Variations and Omissions by CADaS

The review process identified that the WB6 region is in the process of upgrading their paper-based report forms. It was originally proposed that this report would provide an assessment of these paper-based reports to identify any omissions, this however would not serve any real benefit as the assessment would only be correct at the time of writing.

The table above setting out the advanced datasets for CADaS should be used as the definitive list which each region should ensure their paper-based form aligns with. It is recommended that an agreed translation by each country of these elements is achieved and circulated within the WB6 region through SEETO. It is also recommended the reference number for each element used by the CADaS system becomes the accepted protocol for describing the dataset; this will greatly facilitate the sharing of data.

7.4 Additional Data

As part of a multi-agency approach the inclusion of medical data is one which will provide the greatest ability to map the elements associated with the most serious incidents. The collection of medical data usually starts with the arrival of an ambulance and its crew at the scene of a crash. The process commences with initial medical assessment of the casualty. The quality of the data available will depend on the status of the medical staff present; first aider through to paramedic and finally to trauma doctor. In most cases a simple coding system is used developed around the Maximum Abbreviated Injury Scale (MAIS)

In 2013, the EC (European Commission) adopted a new definition of seriously injured road victims based on the International Classification for Diseases (ICD10). All road victims with a MAIS score of 3 or more (MAIS3+) are considered as severely injured. This new definition will coexist along with the conventional definition of severely injured, namely persons who stay at least 24 hours in hospital.

Within the WB6 region many medical facilities use the International Classification for Diseases (ICD10) system to define trauma injury. There are a number of technical reviews which provide an exact correlation between the two systems9.

The MAIS scale provides a medical explanation to define the injury of a casualty:

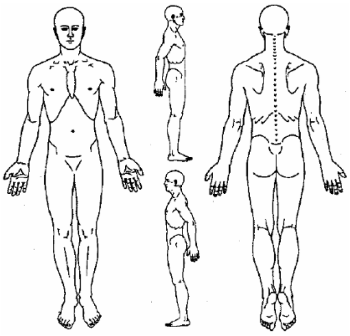
- MAIS 1 Minor Injury
- MAIS 2 Moderate Injury
- MAIS 3 Serious Injury
- MAIS 4 Severe Injury

[9] https://www.ncbi.nlm.nih.gov/pubmed/27736159

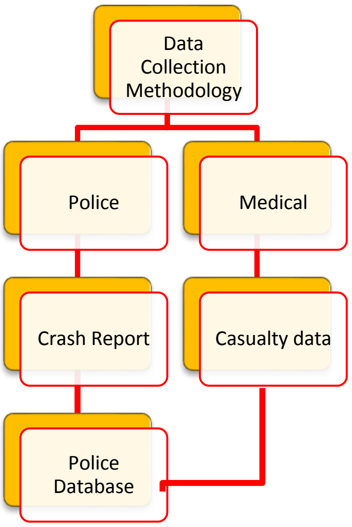
- MAIS 5 Critical Injury
- MAIS 6 Un-Survivable Injury

An example would be as below a knee leg injury where:

- MAIS 1 would be a sprained ankle
- MAIS2 would be a closed fracture of the Tibia bone
- MAIS 3 would be open fracture of the Tibia bone
- MIAS 4 would be amputation.



The type of other data that should be collected would include a diagram that is used to depict injury location.



A number of other factors associated with the response time of the ambulance and subsequent time interval before the patient arrives at a trauma care centre that should be collected. Internationally it has been identified that post-crash response and treatment plans a significant part in the reduction in trauma injury and death resulting from road crashes. Appendix D provides an advanced crash report form that includes additional data sets that could be collected from the medical sector.

The linking of the medical data with the police crash data will necessitate the creation of agreed protocols. Medical data is intrinsically linked to a specific person by Name, date of birth and ID number which are considered sensitive data. While police crash data contains casualty names, date of birth and ID number it is all referenced under a single incident number. All statistical data, once exported from the police database, has names and sensitive details removed.

To enable medical data to be linked to crash data the process needs to be undertaken prior to the exporting of the statistical data as per the adjacent chart.

7.5 Data Encoding

Agreement within the WB6 Region Participants will need to be reached defining the protocol for encoding the paper-based reports into the databases. Currently the following procedures being adopted can be described as:

1. The key facts associated with the crash must be encoded into the database within a limited time period; often prior to the reporting officer going off duty or within 24 hours of the incident. The subsequent encoding of the data should be completed within a given time period.
2. Only after the completion of the investigation into the crash will the crash report be encoded into the database, this is usually undertaken by a person other than the reporting officer.

To achieve a real time data sharing capability between Ministries will require the initial report of the collision to be encoded into the database prior to the investigating officer going off duty on the day of the incident.

The actual encoding of the data can be undertaken either by the investigating officer or by dedicated personnel. Both systems have advantages as well as disadvantages these primarily are associated with an actual knowledge base of the incident as opposed to a simple copying of the paper report.

Where the encoding is undertaken by dedicated personnel the crash report form, or a photocopy of it, is passed to the support staff for entry into the computer database system. There are variations on this model, in some locations (e.g. South Africa), crash report forms are read by optical scanners to populate the database automatically. In the UK some police authorities call up an operator who takes the officer through the questions and enters the answers into the database over the phone.

The descriptive words used for each field always loses something in translation from one language to another, however the most important factor is that their meaning is correctly understood by the Investigating Officers completing the form and subsequently by the users of the database. Where someone other than the investigating officer encodes the data the use of photographs is an essential element in achieving a higher quality of the data especially if the photographs are also uploaded into the database file.

In describing a scene, vehicle or object the creation of a photograph or sketch plan enhances the ability to describe the scene, objects involved and factors immensely. Quality scene photographs provide a wealth of information far beyond any descriptive text.

The photograph above provides a complete scene description; it also provides information about:

- The semi-rural setting of the incident; bounded by trees and hedgerows with no visible junctions.
- The straight and level layout of the road as well as the sight lines available.
- The condition of the road; its width and the surface condition with clear road markings as well as the fact it was wet.
- The presence of street lighting.
- The resting position of the vehicles.
- Limited damage assessment.

If a photograph had been taken from the other side of the scene to show the road layout in the opposite direct; behind the current camera position, this would have provided a comprehensive record of the incident.

7.6 Mandatory Fields

Mandatory fields are the important datasets that must be completed within the database record before the record can be initiated. The mandatory fields have been highlighted in the following table outlining the elements of the advanced CADaS datasets. The column labelled 'importance' has two values 'High and Low'; those denoted as 'High' are the mandatory fields. These fields can simplistically be described as:

- Time, date of the incident
- Location of the incident – GPS coordinates
- Severity of the crash – fatal, serious injury, slight injury and damage only
- Number of vehicles involved
- Number of casualties involved
- Road classification / type
- Junction type
- Initial description of the collision type – head-on etc.

Other levels of field completion can be dictated within the protocol however the most important requirement is the mandatory fields that must be completed before the crash record can be signed off as completed. The primary objective however should be to achieve a 100% completion of all data fields.

7.7 Data Quality

Having defined what should be collected the next task is to develop a methodology to ensure the data recorded is of the highest quality. Failure to achieve this requirement will bring all subsequent analysis of the data into question. The process diagram opposite explains the process to be followed for the continuous monitoring and evaluation of the crash data

The necessity to develop a quality assessment protocol has been found to be essential. This protocol should dictate the time period when quality assessments should be made and the process of rectifying errors and omissions in the data. It will also need to include the process for designating the record as complete.

Modern database programs have been developed with automatic checking and assessment subroutines that are capable of identifying errors and omissions and producing automated reports to the investigating officer and senior management.

The assessment protocol should dictate the data sets that should be encoded within specified time periods. As an example, a damage only or minor injury crash report should be encoded and the record reviewed and completed within 7 days of the initial incident being recorded.

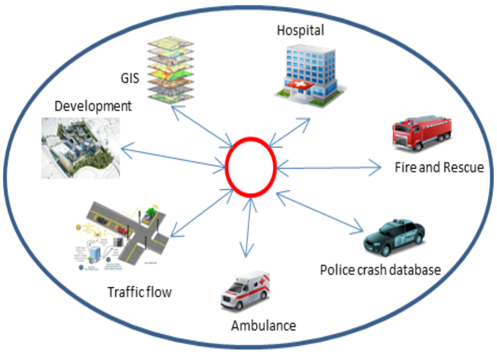
Where a more serious injury of fatality is involved the initial 7-day review should be undertaken to identify any errors or omissions. However, in such cases the computer record may remain active to allow additions / amendments to the data resulting from further investigations. In such occasions a review process should be repeated every 7 days until either the file is completed or a period of one month (30 days) after the incident has elapsed as this is the agreed definition of a fatality.

The process should also provide the requirements that must be met before the record can be marked complete and closed. The normal requirement is for the senior database manager to provide the final assessment and closer activity.

The initial review process should incorporate an assessment of the paper-based crash report against the encoded computer records. Where errors or omissions are identified a report should be created and passed to the investigating officer as well as their senior management. The report should outline the errors or omissions and it is the responsibility of the officer's senior management to ensure the records are corrected.

7.8 Data Sharing

Having achieved a common crash data recording protocol it is proposed that the initial data sharing activity should be undertaken at a local level between the relevant Ministries and Road Safety Stakeholders. Some members of the WB6 region are already achieving a limited data sharing capability while others only provide a periodic exchange of numerical tables.



The proposal of this report is to achieve a real time sharing of all the CADaS statistical data sets with all the relevant Ministries and Road Safety Agencies within a Regional Participant. This will require, in the first instance, the drafting of a memorandum of understanding (MOU) (Appendix C) between all the parties involved outlining the exchange mechanism, security protocols and timelines. The example MOU provided in Appendix C is one that has been developed and accepted internationally by many Police and Ministerial organisations as appropriate. The exact wording should be altered to address local legal requirements and protocols.

The actual exchange of data will require the creation of a compatible computer linking database or 'HUB' which will facilitate the exchange of data between each of the data sources. The central 'HUB' database will combine the data into records associated with each crash and display the information using advanced GIS technology. Many 'HUB' databases also combine advanced analytical capabilities which will allow the users to undertake complex data analysis.

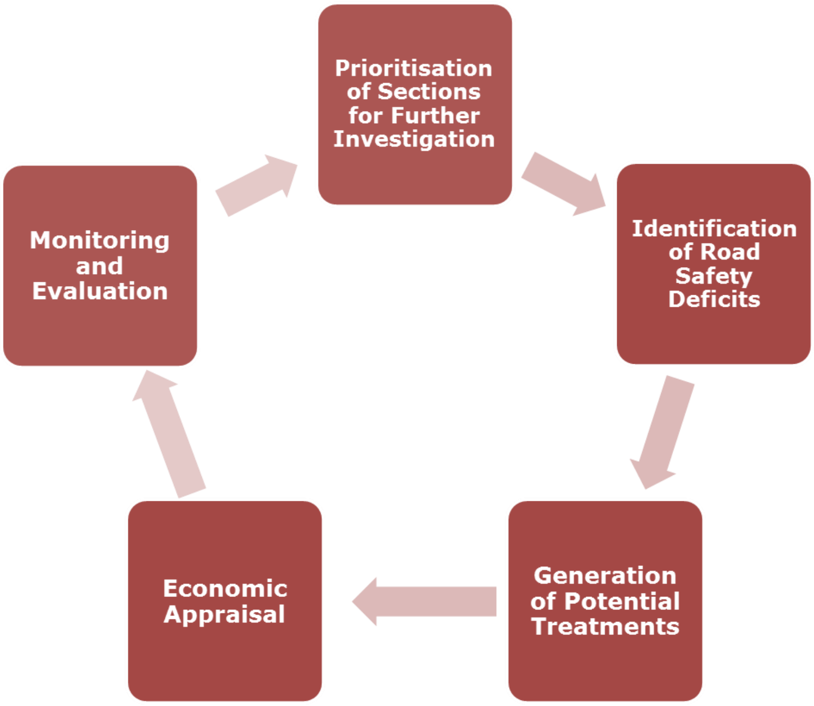
It is ultimately proposed the sharing of all the CADaS datasets with neighbouring WB6 Regional Participants and SEETO or equivalent body. To achieve this sharing will require:

- The drafting of a memorandum of understanding (MOU) (Appendix C) between all the parties involved outlining the exchange mechanism, security protocols and timelines.
- Each recipient will require a compatible computer linking database or 'HUB' which will facilitate the exchange of data between each of the data sources.
- An advanced analytical database to permit the end user to view and analyse the crash records provided.

7.9 Data Analysis

One of the main uses of crash data is to manage hazardous locations on the network. The tasks include identifying locations where excessive crashes are occurring. This activity is designed to identify the characteristics within the crashes that may point to underlying causation, for example it could assist the engineer to identify appropriate treatments. Where such work has been undertaken a reassessment of the crash data can be used to test that they have been successful. It could also assist the police in identifying adverse driver behaviour; speeding. Following an enforcement campaign, the reassessment of the crash data will identify if the campaign has been successful.

Although this method is less advocated by the Safe System, as it is reactive rather than proactive, it remains important to monitor the network for safety problems at discrete locations or junctions. These localised road defects can potentially be treated very effectively at low cost.



The point of identifying hazardous locations is to isolate the best sites which can be treated by engineering and/or enforcement measures. However, the sites which have the most crashes may not always actually be appropriate for enforcement or the top priority for cost effective treatment. The ability to identify, by using GIS mapping systems, the locations where higher crash densities occur is an essential component.

Sites identified which have a lot of crashes might simply have high traffic flows and may not have a very treatable safety issue. This is because crash numbers generally relate to the vehicle flow rate at the location. At junctions the numbers of turning movements occurring are also a factor in the crash numbers. Ideally Blackspot screening identifies locations where excessive crashes are occurring and for this reason some measure of exposure should be taken into account when prioritising these for treatment. The best sites for treatment will have both high crash numbers occurring but also high crash rates per unit of traffic volume.

The simplest way to take exposure into account, at least to some extent, is to assess safety on single routes or parts of the network where the flows do not vary too greatly. Thus, a location with a lot of crashes compared to the surrounding similar lengths is more likely to have a safety problem.

Working with crash rates (per 100 Million Vehicle Km) in addition to the crash numbers can help to identify sections which have higher crash risks. However, it is wrong to rely just on crash rates per unit traffic volume because a section with a small number of crashes but a low flow can have an extremely high-risk rate (crashes per unit of flow) and yet not be worth treating from an economic perspective.

Other potential sources of problems are simply that longer sections will also tend to have more crashes (crash numbers also relate directly to section length, all other things being equal). Thus, taking the crash density (crashes/Km) into account may also be important.

It may be useful to calculate typical crash rates and crash densities on roads on a particular network against which to compare rates of identified possible blackspots.

The most sophisticated method to screen for blackspots is to create crash Safety Performance Functions (SPFs) or APMs for links/junctions. These can be used to estimate the typical expected crash rates for given flows and other features, against which to judge whether the observed crash number are excessive. (See Crash Data Analysis and Engineering Solutions for Local Agencies (2009)).

The way crashes occur inherently includes a great deal of random variation, and crash occurrence is best described by the Poisson or Negative Binomial probability statistical distributions. These distributions mean that some “problem” locations with a lot of crashes that have been identified by trawling the plotted data using GIS cluster (density) analysis, will not actually have any specific safety problem that can be treated. They are generated “randomly”. The problem tends to resolve over time – a process called Regression to the Mean. This means that some sites with a high crash occurrence at a particular point are likely to have reduced incidence in future without any interventions being implemented. This effect has also led to exaggerated estimates being made for the effectiveness of safety measures, since some of any reduction measured is likely to be due to the natural return to the longer-term mean crash rate for a location in the after period.

The effect of Regression to the Mean can be minimised by searching for clusters using 3 or better 5 years of data; over these periods the effect is likely to be smaller, especially if crash numbers involved at sites are high. Other statistical methods can be used to control for the Regression to the Mean issue, the best known being the Empirical Bayes (EB) method, which can be used to both screen for blackspots and also to estimate the true before/after savings when measures have been implemented.

The regression to the mean issue can only be detected or is a highly relevant concern when dealing with high quality data with good location coordinates and where reporting rates are high.

Best international practise is to use Economic Appraisal methods to make an estimation of how cost effective each of a number of possible treatments will be in terms of the financial return likely. This approach can be used to identify the best treatment of a number of alternatives for the same location, or to optimise returns from investment in safety for a programme of treatments when the budget is limited.

Although this is recommended good practise for all road safety investments (big or small) it is not actually widely done (see Elvik and Veisten 2005, SWOV 2010). Problems which prevent the wider spread use of economic appraisal are the relative technical complexity of the methodology, the challenging data requirements, such as the need for estimated crash and/or casualty costs.

For what are in infrastructure development terms, generally small road safety investments, the challenging, full scale transport economic appraisal methodology (which requires environmental and all wider social and transportation costs to be included) can be considerably relaxed. For small safety targeted improvements, it is assumed that there will be little or no effect on trip generation, other social costs and also Carbon costs are seldom calculated. Methodologies most frequently used are the very simple First Year Rate of Returns, cost effectiveness and the more technically demanding Benefit to Cost Ratio calculations (Road safety Foundation 2011).

Economic Appraisal should allow the direct comparison of the economic returns likely from a range of proposed schemes so that where budgets are limited those which will result in the greatest returns can be identified and prioritised.

In order to routinely conduct economic appraisal, organisations need to have the following data available:

- Typical costs of various works or measures
- Crash/casualty costs by severity
- Estimates of measure safety impact
- Values for the national adopted “discount” rate
- Values for national GDP growth and deflators,

In any situation where investments are made in order to improve a road safety problem it is important to objectively assess if the intervention has worked effectively. In the case of road safety, it is generally the aim to reduce crashes and casualties; this can be tested by comparing the occurrence of crashes before and after intervention. Because of the large random variation in crash patterns it is particularly important to apply statistics to identify if any reduction in crashes in the after period is statistically significant: that is greater than that expected through random variation at the 95% confidence level.

It is generally agreed that there are 4 main statistical methodologies available. A recent ITE (ITE 2009) document summarises the pros and cons of the main methods concisely.

The main approaches are:

- Naïve Before-and-After Study
    - Uses before data to estimate expected after crash number
- Before-and-After Study with Yoked Comparison
    - Compares before/after numbers at each treated site with a selected specific comparator
- Before-and-After Study with Comparison Group
    - Compares before/after numbers at a site with a range of comparator areas
- Before-and-After Study with the Empirical Bayes (EB) Approach
    - Requires significant archive data
    - Requires SPF models to be developed.

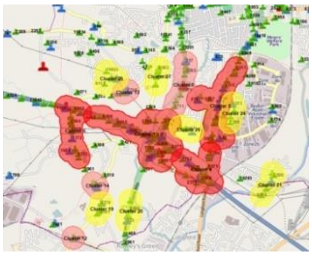
The clear recommendation is that the EB approach be used if possible but that this requires sufficient data to enable crash relationship models (e.g. SPFs) to be developed. The second-best methodology is “Before-and-After Study with Comparison Group” which accounts for extraneous trend affects but not regression to the mean. It is possible to take Regression to The Mean into account by other less accurate but easier methods (see DfT 2004).

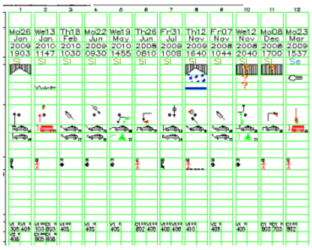
7.10 Computer programs

To achieve the more complex analysis as outlined above computer programs have been developed to automate the task. These programs are designed with user friendly interface that permits the creation of simplistic to the most complex queries of the datasets to elucidate the required factors. The results produced are viewed as either numerical values, specific crash reports or visually using the GIS interface. It is recommended that an ‘off the shelf’ system is always chosen above attempting to develop one. The implementation phase of an ‘off the shelf’ system is measured in months whereas developing one is usually measured in years.

The plotting of crash locations on a map is the simplest of these tasks and is provided by all the available ‘off the shelf’ systems. The ability to provide a sophisticated methodology of interrogating the datasets using a graphic interface provides for a more dynamic approach to the analysis process. Such a process provides the ability to define areas on a map to initiate a search or query of the dataset to identify incidents within the selected Regional Participant fitting the predetermined factors.

Cluster Analysis is a complex algorithm that identifies locations that have incidents with common predetermined factors. The results are displayed as a graphic layer over a map with highlighted areas that are colour coded to indicate importance.





Stick Analysis

Stick Analysis is a graphical way of displaying specific datasets associated with a search criterion. It provides a visual representation of the data to enable quick identification of trends or patterns.

Blackspot Analysis

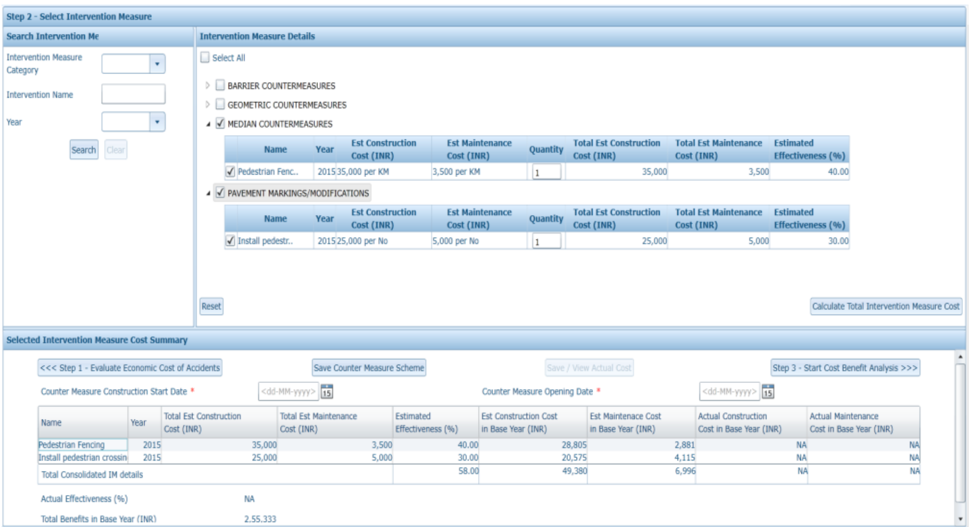
There is no set definition of a blackspot10. It is generally accepted that it is a location that displays higher collision rates than other similar locations due to specific localised risk factor. The analysis to identify these locations is more complex than just identifying numbers of crashes and requires complex algorithms to deduce the plots. Any analysis process to correctly identify blackspots will require a degree of human interface and interpretation however modern analytical procedures are providing significant assistance in identifying such locations. It is essential any proposed system be fully evaluated in this important area to ensure the latest methodologies are being employed.

Counter Measures

Having identified a high-risk location modern analysis programs are able to provide a list of the potential countermeasures, based on the initial review process, which could be undertaken to rectify the localised factors identified. Such programs should contain significant and proven counter measure libraries with an option to add further locally designed measures.

Cost Benefit Analysis

The ability to rank identified blackspot locations with respect to the potential effectiveness and cost of implementing a countermeasure or intervention provides management with the tools to structure an intervention strategy that best utilised the limited budgets available.



---

10 http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.138.2070&rep=rep1&type=pdf

7.11 Recommendations

The below table presents a summary of the actions and recommendations required to be addressed to achieve a common approach to creating a quality crash data recording system.

Activity	Actions	Components
Standardise statistical crash datasets	An agreement that all the advanced CADaS datasets version 3.6 2017 will be adopted within WB6 regional as the de-facto crash data recording convention.	It is proposed the WB6 Reginal Representatives sign a formal agreement to use the Advanced CADaS datasets as a requirement
Standardise statistical crash reporting form	Enhancement of paper reporting form in line with Advanced CADaS datasets.	It is proposed a separate statistical crash data reporting form should be created to encompass all the advanced CADaS datasets
	Translation of advanced CADaS datasets and manual into local language	Use CADaS reference codes as de-facto dataset identification and develop an agreed translation for each dataset
	Produce protocol for completion statistical report form	Elements: • Identification of lead agency responsible for completion of statistical crash report • Identification of agency /officer / department responsible for completing each sections of report. • Maximum time periods permitted when form / sections should be completed • Protocol to quality audit paper form and require lead agency / officer / department to correct omissions and errors identified
	Produce training manual in local language that provides an explanation of the CADaS dataset	Develop a reference guide for the completion of the crash report form in the local language based on the manuals provided by EU. Provide training to personnel on how to completing the crash report form
Encoding statistical crash data into computer database	Enhancement of computer database datasets to enable encoding of new statistical datasets	There will be a need to either: • Upgrade the existing database datasets to match statistical crash data form or • Procure / develop a separate crash database capable of encoding the statistical crash data form

Activity	**Actions**	**Components**

	Produce a protocol outlining the methodology for:
	• Encoding the statistical crash data into the database.
	• Quality audit of data recorded
	• Protocol for marking record as complete and closed
		Elements:
		• Identification of lead agency responsible for encoding the statistical crash data
		• Maximum time periods permitted when initial record is encoded – within 24 hours
		• Maximum time periods when record should be completed
		  ○ damage only 7 days
		  ○ Serious injury 30 days
		  ○ Fatal defined on an incident by incident bases at least 30 days.
		• Protocol to identify omissions and errors
		• Protocol to rectify errors and omissions
		• Protocol to close a record as complete.

Multi-Agency approach	Develop a multiagency approach to providing information for the statistical crash report form:
	• Medical
	  ○ Ambulance
	  ○ Trauma centre
	• Fire and Rescue
	• Engineering
	  ○ GIS mapping
	  ○ Traffic flow and speed data
	  ○ iRAP data
		It is proposed each Region within the WB6 produce a formal agreement with the various Ministries to agree on a protocol for the dissemination of data associated with a road crash.
		• Identify roles and responsibilities of each agency
		• Develop a protocol for the provision of data.

	Ministry of Health to develop a protocol with the Ministry of Interior (police) with respect to the provision of trauma data from ambulance and trauma centre for a causality.	Medical data associated with a casualty involved in a crash is referenced to the casualty's name and date of birth. The Police database also contains the names and date of births of the casualties involved in a collision. Proposal is to encode the medical casualty data into the police database to enable easy linking of data.
	Regional agreement on adopting the Maximum Abbreviated Injury Scale (MAIS) casualty coding system within WB6 Region	It is proposed each Region within the WB6 formal agree to adopt MAIS injury coding system.
	Ministry of Infrastructure to develop a protocol to provide access to GIS mapping	This will require a computer system capable of displaying crash data as an overlay within a GIS map
Data Sharing	Achieve a real time sharing of all the CADaS statistical data sets with all the relevant Ministries and Road Safety Agencies within a Regional Participant	
	Drafting of a memorandum of understanding (MOU) between all participants	An example MOU has been provided in Appendix C

Activity	Actions	Components
Data Linking - local	Develop the technical capabilities to achieve a secure linking capability for the non-sensitive statistical crash data between the relevant Ministries	The actual exchange of data will require the creation of a compatible computer linking database or 'HUB' which will facilitate the exchange of data between each of the data sources. The central 'HUB' database will combine the data into records associated with each crash and display the information using advanced GIS technology
Data Linking - Regional	Develop the technical capabilities to achieve a secure linking capability for the non-sensitive statistical crash data between the WB6 Regions and SEETO	To achieve this sharing will require: • The drafting of a memorandum of understanding (MOU) (Appendix C) between all the parties involved outlining the exchange mechanism, security protocols and timelines. • Each recipient will require a compatible computer linking database or 'HUB' which will facilitate the exchange of data between each of the data sources. • An advanced analytical database to permit the end user to view and analyse the crash records provided.
Data Analysis	Develop an ability to undertake advanced analysis of the statistical crash data within a GIS environment.	It is proposed that to undertake this style of analysis will require the procurement of an 'off the shelf' Analytical GIS capable crash database. Many such programs also combine the ability to function as a 'HUB' to permit the linking of other data sources.

Appendix A - Crash Report forms

Crash Data Report forms

1. Albania
2. BIHF (prosed generic form only provided)
3. Kosovo
4. Macedonia - no form as yet received
5. Montenegro – no form as yet received
6. Serbia – No form as yet received.

Albania

The below table reproduces the datasets from the crash report form created by the SweRoad project

1. Accident number
2. Date
3. Time
4. District
5. Location – free text
6. Road number
7. GPS coordinates
8. Reporting police officer
9. Collision type
    1. frontal
    2. rear
    3. side impact
    4. overtaking
    5. on a curve
    6. overturned vehicle
    7. hit water
    8. collision with other vehicles
    9. collision with pedestrian
    10. collision with cyclist
    11. collision with animal
    12. collision with other
    13. collision between cyclist and pedestrian
    14. other
10. Road Geometry
    1. Straight road
    2. Curve
    3. Roundabout
    4. T junction
    5. Y junction
    6. Cross roads
    7. Staggered junction
    8. Bridge
    9. Railway crossing
    10. Tunnel
11. Surroundings
    1. Rural
    2. Urban
12. Surface
    1. Bitumen
    2. Gravel
    3. soil
13. Road Condition
    1. Good
    2. With holes
    3. Uneven surface
    4. Slippery
    5. Dusty
14. Weather
    1. Dry
    2. Raining / wet

    3. Snow / ice
    4. Fog
15. Other factors
    1. Stolen vehicle
    2. Hit and run
    3. Road works
16. Speed limit
17. Lighting condition
    1. Day
    2. Night
    3. Dawn / dusk
18. Driving license
    1. Learner
    2. Holder
    3. Non-holder
19. Driving experience
    1. Below 3 years
    2. 3-6 years
    3. 6-9 years
    4. Over 9 years
20. Drivers Nationality
    1. Albanian citizen
    2. foreigner
21. vehicle type
    1. car
    2. mini bus 8+1
    3. mini bus >8+1
    4. Auto bus
    5. Wagon < 3.5 T
    6. Sports vehicle
    7. Heavy truck > 3.5T
    8. Heavy truck + trailer
    9. Motorcycle
    10. Animal drawn vehicle
    11. Bicycle
    12. Farm tractor
    13. other
22. Vehicle defects
    1. Unidentified
    2. Steering / front axle
    3. Brakes
    4. Wheels / tyres
    5. Windscreen
    6. Limited visibility
    7. Overloaded
    8. other
23. Registration
    1. Registered
    2. Unregistered
    3. Yearly inspection valid
    4. Yearly inspection expired
    5. Insured
    6. Uninsured

24. Vehicle age
    1. 0-2 years
    2. 2-7 years
    3. 7-12 years
    4. Over 12 years
25. Drivers behaviour
    1. Fail stop at red light
    2. Fail to give way
    3. Ignored traffic sign
    4. Careless overtaking
    5. Careless driving
    6. Careless turn
    7. Unexpected change of direction
    8. U turning with negligence
    9. Sudden braking
    10. Driving too close to vehicle ahead
    11. Dangerous parking
    12. Excess speed
    13. Blinded by sun/ headlights
    14. Changing lane
    15. Fatigued
    16. other
26. Alcohol test
    1. No alcohol
    2. Excess legal limit
    3. No test
27. Pedestrian behaviour
    1. Unknown
    2. Crossing the road without care
    3. Pedestrian crossing
    4. Crossing the road other location
    5. Walking on road
    6. Other
28. Category of involved people (1-10)
    1. Driver
    2. Passenger
    3. Pedestrian
    4. Cyclist
    5. Motor cyclist
    6. Other
29. Number of vehicle in or hit by.
30. Gender
    1. Male
    2. Female
31. Age
32. Injury type
    1. Fatal
    2. Serious
    3. Minor
    4. Injury
33. Seatbelt / helmet in use
    1. Yes
    2. No

BIHF proposed crash report form

TRAFFIC ACCIDENT SUMMARY FORM

Nature of Accident:	FATAL	SERIOUS INJURY	SLIGHT/MINOR INJURY	DAMAGES ONLY

1.Accident no:	2.Date:	3.Hour:	4.District:	Code	5.Police Station:	Code

6.Location:	7.Road no:	8.Kilometer:	9.+ - meters from kilometer:

10.Accident Type
Mv/mv head-on
Mv/mv rear end
Mv/mv side
Mv/mv overtake
Mv/mv turn
Single mv, rollover
Single mv, skid off
Single mv, collision with stationery vehicle
Mv/pedestrian
Mv/bicyclist
Mv/animal
Mv/other
Bicycle/pedestrian

11.Road Geometry
-- Straight road
C-Curve
O-Roundabout
T-junction
Y-junction
+ junction
X-junction
][Bridge
=Road/rail crossing
Tunnel

12.Surroundings
Rural area
Urban area

13.Surface Type
Bitumen
Gravel
Earth

14.Road condition
Good/Fair
Potholes
Corrugated
Slippery

15.Weather
Dry
Rain/Wet
Snowy/Icy
Dusty
Mist

16.Other factors
Stolen Vehicle
Hit and run
Road works

17.Posted Speed Limit
Speed limit posted
Speed limit not posted
◀Posted speed limit km/h

18.Light Condition
Daylight
Night
Dawn
Dusk

19.Pedestrian behaviour	1	2	3	4
Nothing notable				
Crossing road at pedestrian crossing				
Crosing road else where				
Walking in the road				
Other				

20.Driver Citizenship	1	2	3	4
BH citizen				
Foreigner				

21.Vehicles Involved (Vehicle)	1	2	3	4
Car, saloon				
Mini-Bus				
Bus				
Pickup				
SUV				
Train				
Trolly bus				
Light lorry <3.5t				
Heavy lorry >3.5 t				
Motorcycle				
Moped				
Animal carriage				
Bicycle				
Farm tractor				
Other				
22.Vehicle defects	**1**	**2**	**3**	**4**
Not known				
Steering, front axle				
Brakes				
Wheels, tyres				
Windscreen				
Visibility obstacles				
Overloaded				
Other				
23.Driver Licence	**1**	**2**	**3**	**4**
Learner Driver				
Holder				
Non-holder				

24.Vehicle Requirements	1	2	3	4
Registrated				
Not registrated				
Registration SFOR				
Registration EUPM				
25. Vehicle age	**1**	**2**	**3**	**4**
Under 2 years				
2-7 years				
7-12 years				
Over 12 years				

26.Driver behavior	1	2	3	4
Nothing notable				
Did not stop for red light or STOP				
Did not give way				
Ignore traffic sign				
Careless overtaking				
Careless oncoming				
Careless turning, cutting in				
Sudden change of direction				
Reversing negligently				
Sudden deceleration				
Tail-gating, keeping to close				
Incorrect stopping/parking				
Too high speed				
Blinded by sun/oncoming vehicle				
Did not keep to near side				
Fatigued, sleepy, Ill				
Other				

27.Alcohol test	1	2	3	4
No alcohol				
Alcohol over legal limit				
No test				
28. Drug test	**1**	**2**	**3**	**4**
Drug test negativ				
Drug test positiv				
No test				

29.Driving experience	1	2	3	4
Under 3 years				
3-6 years				
6-9 years				
Over 9 years				

Involved in Accident

	30.Road User Category						31.	32.Gender		33.	34.Type of injury				35.Seat Belt/ Helmet Use	
	Driver	Passenger	Pedestrian	Bicyclist	Motor cyclist	Other	Vehicle no	M	F	Age	Killed	Severe	Minor	No Injured	Used	Not Used
Person 1																
Person 2																
Person 3																
Person 4																
Person 5																
Person 6																
Person 7																
Person 8																
Person 9																
Person 10																

Kosovo

The following are the datasets included in the paper-based form used by the police

	Accident No.		
	Date of Accident		
	Time accident		
	Location		
	GPS coordinates		
	Number of Injury		
	Deaths		
1A.	Other damage		
	Name of Injured		
	Police witness		
1	Road Class		
		1	One lane
		2	Two lanes
		3	Three lanes
		4	Four lanes
		5	Five lane
		6	Six lane
		7	Seven lane
		A	Divided
		B	Undivided
		C	Ramp
1A	Traffic Flow		
		1	One-way traffic
		2	Two-way traffic
2	Accident Location		
		1	At intersection
		2	Between Intersections
		3	Intersection of Road & driveway or alley
		4	Bridge
		5	Ferry or dock
		6	Tunnel
		7	Exit deceleration lane
		8	Exit ramps
		9	Exit intersections
		10	Exit acceleration lane
		11	Entrance ramps
		12	Entrance intersection

13 Off highway
14 Parking lot single / multi-level
15 Rail Road Crossing
16 Industrial road
17 Transit express lane

2A Speed zone
A 10 Km/h
B 20 Km/h
C 30 Km/h
D 40 Km/h
E 50 Km/h
F 60 Km/h
G 70 Km/h
H 80 Km/h
I 90 Km/h
J 100 Km/h
K 110 Km/h

3 Land usage in accident area
1 School / playground
2 Urban residential
3 Apartment residential
4 Business / shopping
5 Industrial / manufacturing
6 Agricultural / undeveloped
7 Recreational / park / camping
8 Rural residential

4 Road Type
1 Asphalt
2 Gravel
3 Oiled gravel
4 Earth
5 Concrete
6 Brick / stone
7 Wood

5 Traffic control
1 None
2 Stop sign
3 Yield sign
4 Officer / flagman / school guard
5 Rail road crossing sign

6 Lane use / turn control sign
7 Traffic signal
8 Traffic signal with advanced flasher
9 Flashing signal
10 Lane use signal

6 Road way character

Horizontal

1 Straight
2 Single curve
3 Sharp curve
4 Switchback
5 Winding curves
6 Reverse curves

Vertical

7 Flat
8 Some grade
9 Steep grade
10 Hill crest
11 Sag

7 Road Surface condition

1 Dry
2 Wet
3 Muddy
4 Snow
5 Slush
6 Ice

8 Weather condition

1 Clear
2 Cloudy
3 Raining
4 Snowing / sleet
5 Hail
6 Fog
7 Smog / smoke
8 Strong wind

9 Lighting condition

1 Day light
2 Dawn
3 Dusk
4 Dark full illumination

5 Dark no illuminations

6 Dark some illumination

10 Safety Belt not used vehicle 1

1 Driver

2-100 Passenger

11 Safety Belt not used vehicle 2

12 Location of first contact

A On roadway

B Off roadway

13 Pre-collision vehicle action vehicle 1

14 Pre-collision vehicles action vehicle 2

1 Going straight ahead

2 Making right turn

3 Making left turn

4 Making 'U' turn

5 Starting from parked position

6 Starting in traffic

7 Slowing or stopping

8 Stopped in traffic

9 Entering parked position

10 Parked legally

11 Parked illegally

12 Avoiding object on road

13 Changing lanes

14 Overtaking

15 Merging

16 Backing

17 Skidding

18 Swerving

19 Spinning

20 Jack-knifing

21 Yaw

15 Type of accident collision

1 Other motor vehicle

2 Motorcycle

3 Pedestrian

4 Bicyclist

5 Animal

6 Rail road train

7 Street car /Trolley coach

8 All-terrain vehicle
9 Mope under 55 cc
10 Guard rail / traffic barrier
11 Crash cushion / impact attenuator
12 Sign post
13 Tree
14 Building / wall
15 Curbing
16 Fence
17 Bridge deck or parapet
18 Snow bank / drift
19 Rock face
20 Ditch
21 Culvert
22 Fire Hydrant debris
23 Rocks ore
24 Over turned
25 Fire / explosion
26 Lake / river

16 Vehicle type 1

17 Vehicle type 2

1 Passenger car
2 Car and trailer
3 Single unit truck light
4 Single unit truck heavy
5 Combination unit truck light
6 Combination unit truck heavy
7 Combination unit tractor trailer
8 Tractor
9 Log truck & pole trailer
10 Bus school
11 Bus local
12 Bus intercity
13 Motorcycle
14 Moped 50 cc
15 Bicycle
16 Truck
17 Truck trailer
18 Motorcycle
19 Motor trailer

20 Special

16A Vehicle 1 usage

17A Vehicle 2 usage

1 Parked

2 Personal

3 Business

4 Driver training facility

5 Recreational

6 Emergency

7 Military

8 Taxi

9 Farm use

10 Government

11 Towing / towed

12 stolen

18 Pedestrian Location

1 At intersection

2 Not at intersection

19 Pedestrian actions

1 Crossing with signal

2 Crossing against signal

3 Crossing no signal marked crosswalk

4 Crossing no signal no crosswalk

5 Walking along highway with traffic

6 Walking along highway against traffic

7 Emerging from front / behind parked vehicle

8 Child getting on / off school bus / vehicle

9 Adult getting on / off a vehicle

10 Pushing / working on a car

11 Working in roadway

12 Playing in roadway

13 Standing on sidewalk

Apparent contributing Factors

20/21/22 Vehicle / driver 1

23/24/25 Vehicle driver 2

1 Alcohol involvement

2 Backing unsafely

3 Cutting in

4 Driving without due care

5 Driver inexperience

6	Drugs illegal
7	Extreme fatigue
8	Failing to signal
9	Failing to yield right of way
10	Fell asleep
11	Following too close
12	Improper passing
13	Illness
14	Sudden loss of consciousness
15	Driving on wrong side of the road
16	Pedestrian error / confusion
17	Pre-existing physical disability
18	Prescribed medication
19	Attempt to commit suicide
20	Ignoring traffic control device
21	Improper turning
22	Unsafe speed
23	Ignoring officer / flagman / guard
24	Avoiding vehicle / pedestrian / cycle
25	Accelerator defective
26	Brakes defective
27	headlights defective
28	Brake light out
29	Turn signal defective
30	Oversize vehicle
31	Steering vehicle
32	Tres failure / inadequate
33	Tow hitch failure
34	Driverless vehicle
35	Windshield defective
36	Engine failure
37	Suspension failure
38	Restraint system
39	Insecure load
40	Dangerous goods
41	Vehicle modification
42	Glare artificial
43	Glare sunlight
44	Obstruction / debris on road
45	Pavement surface defective

46 Visibility impaired
47 Weather
48 Road
49 Previous traffic accident
50 Sign obstruction
51 Domestic animal
52 Wind animal
53 insufficient traffic control
54 road / intersection design
55 Roadside hazard
56 Other

Vehicle

2 Insurance Co
Name and address
2A policy No.
Green Card No.
Policy expiry date
3 vehicle type
make
model
year
Plate No.
colour
Vin No.
Country

Driver

6 DOB
Gender
Height
Weight
Hair
Eyes
Alcohol %
Driving License Category
Country Issue

Damage Diagrams

8 Damage Motorcycle
9 Damage to car
10 Damage to bus
11 Damage to truck

Accident description

Other actions

Charges

Report date

Officer

ID No.

Station

Appendix B - Questionnaire

The below questionnaire was submitted to each of the Regional Representatives requesting them to provide feedback prior to the field visit undertaken by the review team.

Information required

The explanation within the introduction provides an overview of the requirement and methodologies currently available for the collection of accident data. The following sections provide guidelines to the subject areas that should be addressed. The underlying requirement is to accurately describe the current status, within each the West Balkan countries, with respect to their accident recording and analysis capabilities. Each of the subjects covered will require documentary evidence to support the explanations and findings presented.

All meetings undertaken will require to be documented; they will also need to include the names and contact details of people spoken to. Where copies of documents are obtained the person providing and the source of the document must be recorded.

Legal statute that defines a road traffic accident

Within the traffic law there is usually a section that defines what constitutes a road traffic accident example:

- It involves a mechanically propelled vehicle
- On a road or other public place
- Involves damage to property or injury.

Information required

- *A copy of the Act and section that provides this definition should be obtained and translated into English.*

The legal requirements on the driver

Within the traffic law there is usually a section that defines the actions required to be taken by a driver of a vehicle involved in a road traffic accident to report it to the appropriate authority.

Information required

- *A copy of the Act and section that provides these requirements should be obtained and translated into English.*

The legal responsibility for the recording of accidents

Within the traffic laws there is usually a section that defines that the police have to investigate and record road traffic accidents.

Information required

- *A copy of the Act and section that provides this requirement should be obtained and translated into English.*

Traffic accident reporting methodology.

The requirement is to identify what information is collected by the police following the initial report that a road traffic accident. This starts with the first communication that is received by the emergency services informing them of an incident through to the last police unit resuming from the scene of the incident.

Information required:

- *This should include the identification of where a single or multiple emergency phone number is directed to and what information is collected by the call handling centre.*
- *How the report is passed to the individual emergency services and the protocols that dictate their response. The primary emergency services will be the ambulance, fire and rescue and the Police.*
- *Information and examples of what incident logs are produced by each agency with specific reference to time and locational information of the initial call, allocation of the units that are to respond, their arrival times and incident report.*
- *It is requested that detailed enquiries should be undertaken with the ambulance services to identify what additional data they collect with respect to the medical condition of the patients conveyed to hospital.*

Accident scene investigation

The severity of the accident will dictate the rank of the police officer leading the investigation. A detailed understanding of the police protocols with respect to who investigates the incident and who is responsible for completing the accident report form.

Information required

- *Information on the police protocols with respect to who investigates the accident*
- *Who is responsible for completing the accident report form*
- *Existence of a dedicated traffic department*
- *Existence of forensic accident investigation capabilities*

Police accident report form

The primary source of information is that obtained at the scene of the accident by the investigating police officer. This is achieved by either a:

- Totally paper based recording system
- Combination of paper and electronically based system
- Completely electronically based system

Information required:

- *The methodology currently in use to record the accident details*
- *A copy of the paper-based form*
- *A description of the computer-based fields required to be completed. This must include those fields that are mandatory before the record can be uploaded into the database.*

Severity classification of the accident

The severity classifications are usually fatal, seriously injured, slightly injured and damage only.

Information required

- *Details of their classification*
- *Details on who decides the classification*
    - *Police or*
    - *Medical personnel*
- *The legal requirement to classify an accident as fatal:*
    - *Death at the scene only or*
    - *Death within 30 days of the accident due to the injuries sustained from the accident*

Police accident database

This is the primary database used by the police to record all road traffic accident reports and the statistical data collected at the scene of the accident by the investigating officer.

Information required

- *The name and technical description of the database*
- *The methodology currently in use to record the accident report form on the computer – input by investigating officer, dedicated police officer entering all accident reports, civilian operator copy typing the data into the database.*
- *The quality audit protocols used to check the quality of the data recorded.*
- *The format of the accident reference number used in the computer system*
- *Information on the protocols for the recording of the accidents details onto the computer; for example, within 24 hours, within 7 days or longer*
- *An assessment and description of the fields that are on the accident report form / designed within the database but consistently have missing data.*
- *Soft copy export in excel format of non-sensitive (no identifying names address vehicle numbers etc.) data held within the data base for 2017*

Analysis undertaken by the police

A comprehensive description of any processes undertaken by the police to analysis the accident data.

Information required

- *Description of the police unit responsible for the work*
- *A description of their role and responsibilities*
- *The computer programs they use to undertake the analysis*
- *Obtain an example of their work, soft copies of any reports they have generated*
- *Copy of yearly statistical reports*
- *What are the main causes of accidents*
- *What are the main causality class for serious and fatal accidents*

Casualty injury profile

The requirement is to identify what additional data is available from the ambulance or medical facilities within a country that treat casualties involved in road accidents. The information required covers information concerning the response time of medically trained personnel to the accident scene, an assessment of the medical condition of the causality at the scene, the arrival time of the casualty at a medical facility and their medical condition on arrival.

Information required

- *The medical qualifications of the ambulance personnel*
- *The equipment available in a front-line ambulance*
- *A description of the data collected by the ambulance personnel – copy of any form used.*
- *Information on*

For any additional information or queries with respect to this questionnaire please contact:

Mike Fell
Road Safety Data Specialist
Email: mail@mikefell.com

Appendix C - Memorandum of Understanding

Example of MoU that has been developed and accepted internationally by many Police and Ministerial organisations as appropriate. The exact wording should be altered to address local legal requirements and protocols.

Memorandum of Understanding

This Memorandum of Understanding (MoU) is made and entered:

By and Between

Ministry of Infrastructure, having its registered office at hereinafter referred to as “MOI*” (which expression shall, unless repugnant to the context or meaning thereof, be deemed to mean and include its successors and assigns)

And

Ministry of Internal Affairs, having its registered office at , hereinafter referred to as “MOIA” (which expression shall, unless repugnant to the context or meaning thereof, be deemed to mean and include its successors and assigns)

And is effective from the ____________ June 2018

Whereas Ministry of Infrastructure is the lead road agency for ***** and Ministry of Internal Affairs is the main law and order agency for the ******.

The attention and focus on improving road safety in ***** has increased greatly in the last few years. Key amongst road safety developments in ***** is the development of the **(National Road Safety Strategy) **. The strategy commits **** to attain significant future reductions in fatal and serious injuries through development of a “Safe System” road transport network. Key to supporting the Safe System is the extensive use of crash and allied data to guide road safety strategies and actions to ensure they are efficient and effective; the ability to monitor and evaluate road safety performance is also a key requirement.

The purpose of this MoU is to finalise the terms for transfer of crash data from Ministry of Internal Affairs to Ministry of ******.

In furtherance of the cooperation, it is hereby agreed between MOIA and MOI to collaborate and work together under the following terms:

1. A secure web service link will be created by MOI for the transfer of crash data from MOIA system to MOI crash analysis system. MOI shall share the credentials and URL for accessing the web service.
2. MOIA will remove personally identifiable fields before exporting the data to MOI via the secure web service link; namely all:
    a. Names and Addresses,
    b. Vehicle Plate Numbers,
    c. Individual ID Numbers,
    d. Driver License Details,
    e. Insurance Policy Details.

3. Crash data will be transferred from MOIA System to MOI Crash Analysis System at 23:30 hours daily:
    a. The first transfer will require all the MOIA crash data records available electronically prior to the first transfer date.
    b. For all subsequent transfers, MOIA will transfer all:
        i. New Crash Records for the day
        ii. Altered or Amended Crash Records for the day.

Reporting Requirements and Governance of the data transfer process.

I. In case where new, amended and or updated crash records are not transferred the Manager of ********** shall review and inform the matter to MOIA General Manager Traffic Department with the detailed pendency report. The pendency report will be manually submitted to the office of MOIA Director of National Traffic Department.

II. In case if the web services are not accessible, the Manager of ****** shall review and inform the matter to MOIA Director of IT with the detailed incident report. The incident report will be manually submitted to the office of ***.

III. MOI will produce and submit a quarterly data quality analysis report to the Chairman of the ***********and MOIA. MOI will submit quarterly action taken report to improve the data quality.

This MoU will remain in effect for 5 years from the date of signature of this document, unless extended by mutual agreement of the parties.

This MoU shall be governed by, construed and interpreted in accordance with the laws of Ukraine and all disputes and proceedings shall be subject to exclusive jurisdiction of the Courts.

This MoU is duly agreed and executed by both parties on this the ___ day of August, 2018.

For	For
Ministry of Infrastructure	**Ministry of Internal Affairs**
______________________	______________________
Witness	Witness
______________________	______________________

Appendix D – Example of medical forms

Example medical forms used by Trauma care teams

RTI Notification Form

DATE (dd/mm/yy) :

FACILITY : HGH ☐ AXH ☐ AWH ☐ CH ☐ ED ☐ Trauma Room ☐

- **Name :** --
- **ID Number :** -------------------- **HC Number :** -------------------- **Unknown :**
- **Sex :** Male ☐ Female ☐
- **Age (By years):**
- **Occupation - Driver :** Yes ☐ No ☐
- **Mobile number if available:** --------------------
- **Nationality:** Qatari ☐ Non Qatari ☐ Unknown ☐ Specify country----------
- **Education (by years):** 0 yr. ☐ 1- 6 yr. ☐ 7-12yr. ☐ ≥13yr. ☐
- **History of chronic diseases:** No ☐ Yes ☐ Specify:

Cardiac ☐ Diabetes ☐ Epilepsy ☐ Allergy ☐ Others ☐ Specify ----------------

- **Mode of arrival to Hospital :** Ambulance ☐ Private ☐ Police ☐ Other--------

AMBULANCE SERVICE SECTION:

- **PCR Number:** --------------------
- **Ambulance service request receiving time**(hh:mm:ss) : ----- :----- :-----
- **Ambulance service on-scene time** (hh:mm:ss): ----- :----- :-----
- **Ambulance service transport start time** (hh:mm:ss): ----- :----- :-----
- **Ambulance service hospital arrival time** (hh:mm:ss): ----- :----- :-----
- **Name of receiving hospital**

TRAFFIC POLICE & AMBULANCE SERVICE:

- **Incident Location: : Inside Qatar** ☐ Specify where--------------------------------
  Outside Qatar ☐ Specify country____________________
- **Mode of transportation:** Motor Vehicle ☐ Pedestrian ☐ Motor Cycle ☐ bicycle ☐
- **Type of car:** Saloon Car ☐ 4X4 W/Drive Car ☐ Bus/Trucks ☐ Other--------------------
- **Vehicle Role:** Traffic collision ☐ Rollover ☐
- **Collision : Other Vehicle** ☐ Fixed Object ☐ Animal ☐ Pedestrian ☐ Other----------
- **Vehicle speed:** High ☐ Moderate ☐ Low ☐ parking or not moving ☐
- **Type of Impact:Head On** ☐ Rear End ☐ Side ☐ Ejection ☐
  Entrapment ☐ Other--------------------
- **Site of vehicle Deformity:** Front ☐ Rear ☐ Side ☐ Roof ☐
- **Vehicle Damage:** Minor ☐ Significant ☐
- **The location of the passenger inside the vehicle:**

Vehicle row	left	center	right	Unknown
Front				
Second				
Third or rear				
Unknown				

- **Restraining Devices used :** Child Car Seat ☐ Air bag ☐ seat belt ☐ Helmet ☐
  Other--------------------

RTI Notification Form

- Patient role : Driver ☐ Passenger ☐ Pedestrian ☐
  Motorcyclist ☐ Bicyclist ☐ other-----------------

AMBULANCE SERVICE, EMERGENCY AND TRAUMA SURGERY:

Location of Injury: (Indicate by ticking box)

- ☐ Eye
- ☐ Ear
- ☐ Face
- ☐ Head (other than eye, ear and face)
- ☐ Neck
- ☐ Back
- ☐ Trunk(other than back and excluding internal organs)
- ☐ Shoulders and arms
- ☐ Hands and fingers
- ☐ Hips and legs
- ☐ Feet and toes
- ☐ Internal organs
- ☐ General and unspecified location
- ☐ Multiple location (more than one of the above)

Nature of Injury: (Indicate by ticking box)

- ☐ Fractures
- ☐ Sprains and strains of joints and adjacent muscles
- ☐ Injuries to nerves and spinal cord without evidence of spinal bone injury
- ☐ Internal injury of chest ,abdomen and pelvis
- ☐ Open wound not involving traumatic amputation
- ☐ Traumatic amputation
- ☐ Superficial injury (abrasion / contusion)
- ☐ Foreign body through orifice
- ☐ Effects of weather exposure ;air pressure and other external causes (including bends; drowning; electrocution)
- ☐ Burns
- ☐ Other and unspecified injuries – specify...

*MANAGEMENT

At site of accident:

Emergency Care; Alive ☐ Emergency Care;Dead ☐ Dead on Arrival to scene ☐

Outcome at Health Institution :

Treated and released ☐ Death ☐ (After how many days)______________

Admitted ☐ Where (Department) ------------------- Referred ☐ (Specify hospital)__________

If not admitted , Sick Leave (number of days) : ________________

ADMITTING SPECIALTY SECTION

Length of stay at hospital (number of days) : _________________

Surgical Intervention: Yes ☐ No ☐

Post- discharged, referred to rehabilitation: Yes ☐ No ☐

Referred for treatment abroad: Yes ☐ No ☐

TRAFFIC POLICE SECTION:

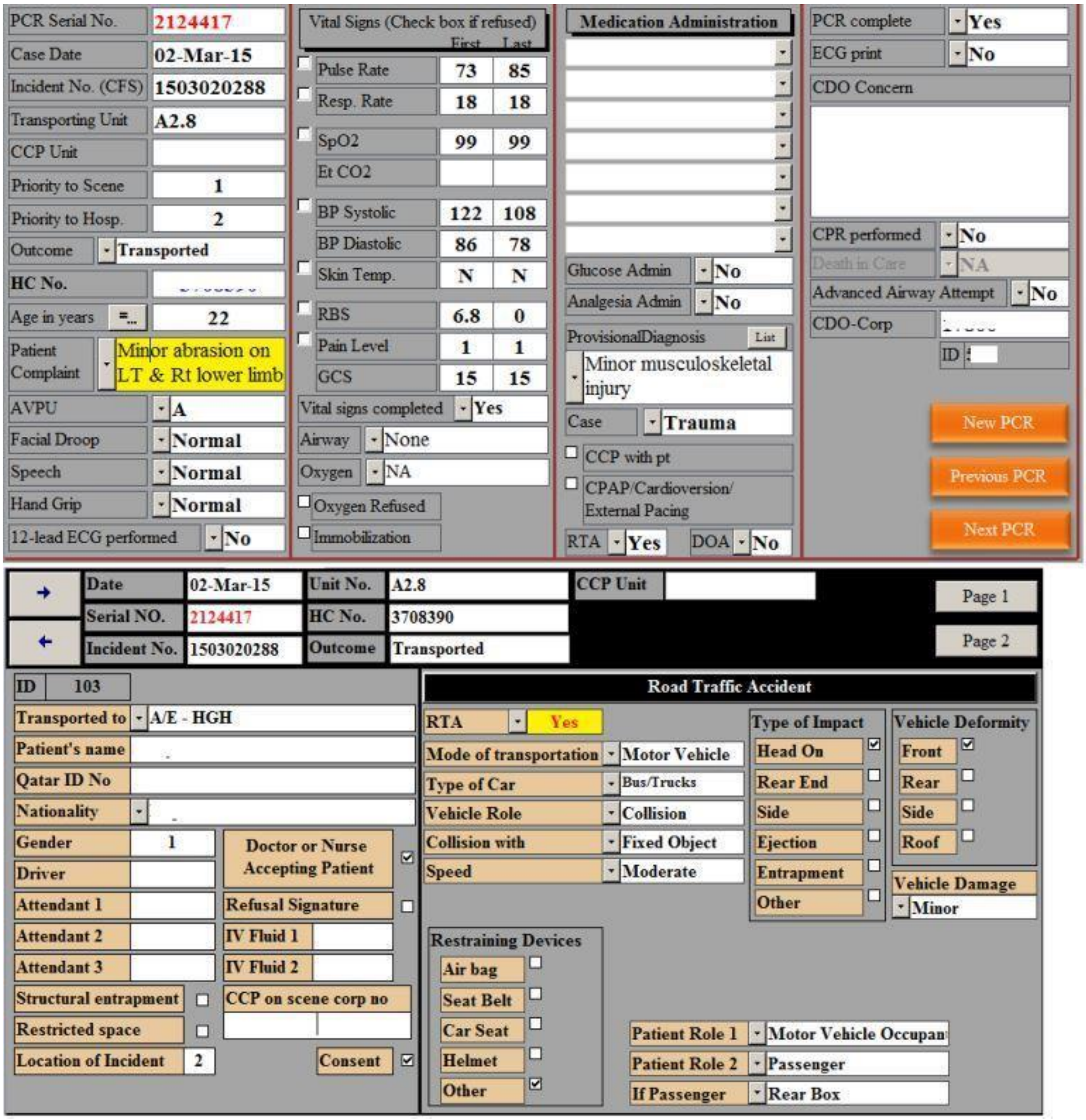
Status at Qatar : Visitor ☐ Resident ☐ For how long _________ Year

Previous history of road accident ([redacted]): Yes ☐ No ☐

If (yes) ;specify how many times : 1 ☐ 2 ☐ ≥3 ☐

year of last 3 accident(s) : _______________ ; _________________ ; _________________

Example of ambulance crash report form



PCR Serial No.	2124417
Case Date	02-Mar-15
Incident No. (CFS)	1503020288
Transporting Unit	A2.8
CCP Unit	
Priority to Scene	1
Priority to Hosp.	2
Outcome	Transported
HC No.	[illegible]
Age in years	22
Patient Complaint	Minor abrasion on LT & Rt lower limb
AVPU	A
Facial Droop	Normal
Speech	Normal
Hand Grip	Normal
12-lead ECG performed	No

Vital Signs (Check box if refused)

	First	Last
Pulse Rate	73	85
Resp. Rate	18	18
SpO2	99	99
Et CO2		
BP Systolic	122	108
BP Diastolic	86	78
Skin Temp.	N	N
RBS	6.8	0
Pain Level	1	1
GCS	15	15

Vital signs completed: Yes
Airway: None
Oxygen: NA
Oxygen Refused
Immobilization

Medication Administration

Glucose Admin	No
Analgesia Admin	No
ProvisionalDiagnosis (List)	Minor musculoskeletal injury
Case	Trauma

CCP with pt
CPAP/Cardioversion/ External Pacing
RTA: Yes DOA: No

PCR complete	Yes
ECG print	No
CDO Concern	
CPR performed	No
Death in Care	NA
Advanced Airway Attempt	No
CDO-Corp	[illegible]
ID	

New PCR
Previous PCR
Next PCR

Date	02-Mar-15	Unit No.	A2.8
Serial NO.	2124417	HC No.	3708390
Incident No.	1503020288	Outcome	Transported

CCP Unit:
Page 1
Page 2

ID	103
Transported to	A/E - HGH
Patient's name	
Qatar ID No	
Nationality	
Gender	1
Driver	
Attendant 1	
Attendant 2	
Attendant 3	
Structural entrapment	☐
Restricted space	☐
Location of Incident	2

Doctor or Nurse Accepting Patient	☑
Refusal Signature	☐
IV Fluid 1	
IV Fluid 2	
CCP on scene corp no	
Consent	☑

Road Traffic Accident

RTA	Yes
Mode of transportation	Motor Vehicle
Type of Car	Bus/Trucks
Vehicle Role	Collision
Collision with	Fixed Object
Speed	Moderate

Type of Impact	
Head On	☑
Rear End	☐
Side	☐
Ejection	☐
Entrapment	☐
Other	☐

Vehicle Deformity	
Front	☑
Rear	☐
Side	☐
Roof	☐

Vehicle Damage: Minor

Restraining Devices	
Air bag	☐
Seat Belt	☐
Car Seat	☐
Helmet	☐
Other	☑

Patient Role 1	Motor Vehicle Occupan
Patient Role 2	Passenger
If Passenger	Rear Box