Road Safety Guidelines

for the Asian and Pacific Region

4.2

ROAD ACCIDENT DATA SYSTEMS

Asian Development Bank

EXECUTIVE SUMMARY

4.2 ROAD ACCIDENT DATA SYSTEMS

An accident database is needed for accurate assessment of the road safety situation. In order to be useful, the data need to cover more than deaths and should include data on casualties and the circumstances of the accident. This will help organizations that are able to contribute to safety improvement to devise and implement appropriate measures designed to combat specific problems.

The main processes involved in producing an accident database include an accident **reporting and recording** system, a **storage and retrieval** system, an **analysis** system, and an effective **dissemination** system.

Traffic police are the most ideally placed to record and manage accident data. Police do, however, need to be motivated and convinced of the usefulness of devoting the considerable effort required to collect this data and they also need to have adequate resources in terms of staffing, training, and computer systems. The data collected for all recorded accidents need to answer the following questions:

- **where** accidents occur;
- **when** accidents occur;
- **who** was involved;
- **what** was the result of the collision;
- **what** were the environmental conditions; and
- **how** did the collision occur.

Having introduced an effective database system, it is important to ensure that the data is utilized as effectively and widely as possible. Police annual accident statistics reports should be circulated widely and national decision makers should use the data. They should also be made readily accessible to relevant organizations for designing appropriate countermeasures, producing plans, monitoring effectiveness, and carrying out research.

PRIORITY ACTIONS NEEDED

1. Review police accident report forms to ensure that they are easy to complete, used nationwide, and include sufficient information to meet the needs of all potential accident data users.

2. Introduce an easy-to-use computerized data storage and analysis system that provides an understanding of the scale and characteristics of the problem, and permits appropriate countermeasures to be devised for high-risk target groups.

3. Ensure accident data statistics and analyses are distributed to those able to affect road safety and that they are used in designing and monitoring countermeasures.

An effective computer-based accident data system using a standard police data collection form nationwide is one of the most important prerequisites for a country that hopes to improve its road safety problem. It permits the characteristics and nature of the problem to be defined and appropriate countermeasures to be devised.

1 INTRODUCTION

These sector guidelines on "Road Accident Data Systems" are from a set of *Road Safety Guidelines for the Asian and Pacific Region* policymakers, developed as part of a regional technical assistance project (RETA 5620: Regional Initiatives in Road Safety) funded by the Asian Development Bank (ADB).

In order that governments are fully aware of the level of safety, it is necessary to collect information on road accidents and to keep data in a form that allows analyses to be undertaken if and when needed (i.e., a database). Only through analysis of accident data can an understanding be achieved of when, where, and how accidents occur. Many countries appreciate that a significant proportion of their populations suffer death, injury, and economic loss as a direct result of road accidents, and that it is possible to use accident data effectively in planning interventions to improve the situation.

This document includes guidance on what a police accident database should contain, computer software requirements, and indications of how such a database is best utilized. It also describes the Transport Research Laboratory (TRL) Microcomputer Accident Analysis Package (MAAP) system, which is the only microcomputer-based accident data system specifically designed for use in developing countries.

2 WHY IS AN ACCIDENT DATA SYSTEM NEEDED?

To answer this question a widely used definition of a road accident must be first considered; as follows:

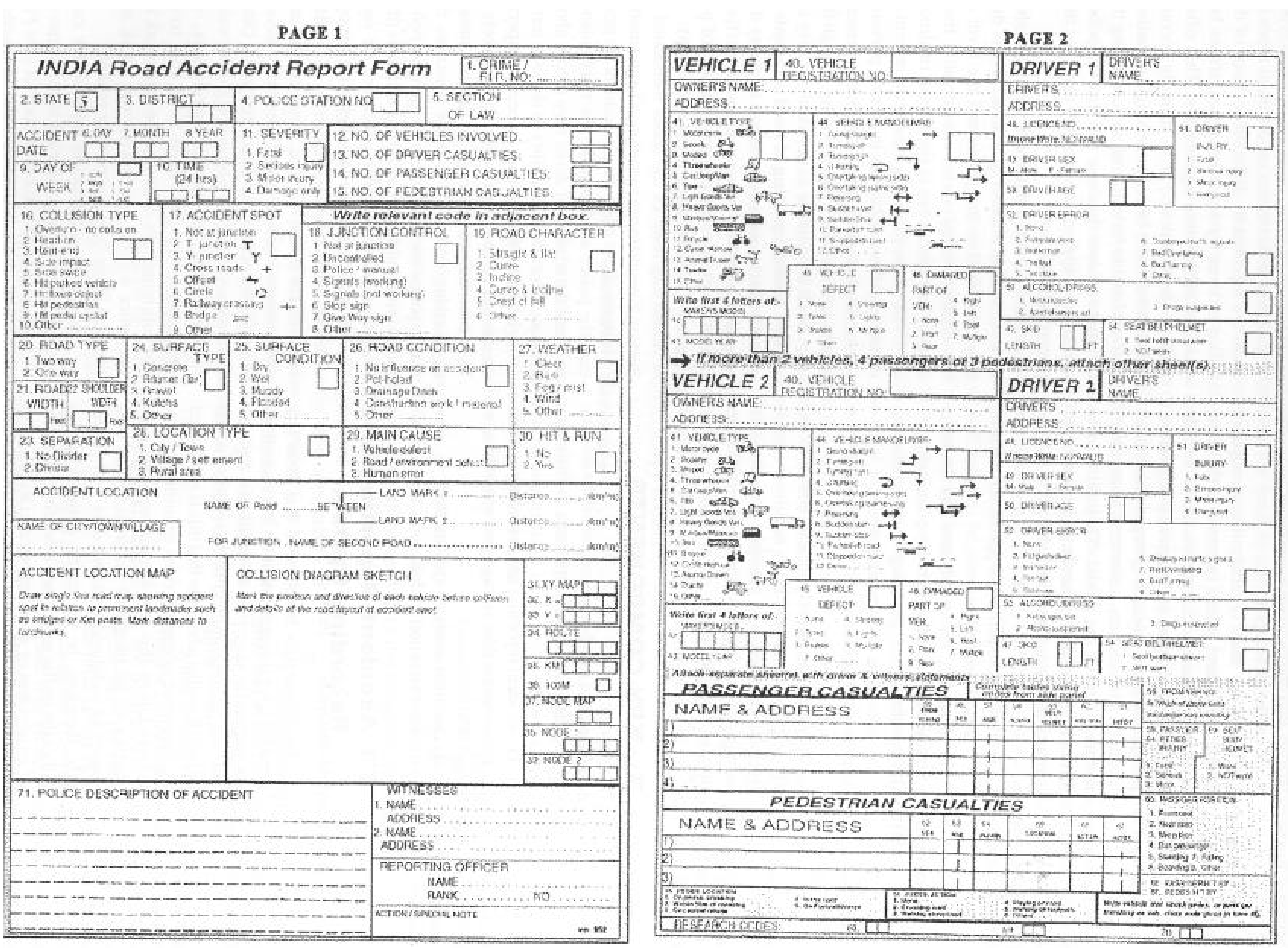
> "***a rare, random, multifactor event that is always preceded by a situation in which one or more road users have failed to cope with their environment, resulting in a vehicle collision.***"

Although relatively ***rare*** events in terms of the passage of time and traffic movements at any specific site, they add up to an increasingly worrying problem (as indicated above) for governments and the mobility of a country's population. If these events were purely ***random***, then it is unlikely that anything practical could be done to prevent their occurrence. However, research from all over the world has demonstrated that accidents tend to cluster at particular points or areas on a road network (e.g., within 50 meters [m] of a particular junction) or among particular groups of road users (e.g., drivers aged 18-21, schoolchildren, and elderly pedestrians).

Although the causes of accidents are ***multi-factoral***, there are likely to be common reasons for the clustering; i.e., why different levels of risk exist (e.g., due to poor road geometry, or lack of or deterioration in skills of a road user group). There should be potential for treating and even removing some of these problems. The targeting of road user groups, locations, routes, or areas on the network for special remedial action has proven to be effective. For example, many low-cost accident countermeasures such as chevron boards on bends have proven to be cost beneficial: the value of accidents saved in only the first year being several times the cost of the scheme's installation.

To identify particular problems that are treatable and for which specific appropriate action can be designed, a reliable accident database (that is as comprehensive as possible) is essential.

Accident data can be used at the national level by policymakers to understand the broad nature, scale, and characteristics of the prob-



PAGE 1

INDIA Road Accident Report Form

1. CRIME / F.I.R. NO: ....
2. STATE 5
3. DISTRICT
4. POLICE STATION NO
5. SECTION OF LAW ....

ACCIDENT DATE: 6. DAY 7. MONTH 8. YEAR
9. DAY OF WEEK
10. TIME (24 hrs)
11. SEVERITY: 1. Fatal 2. Serious injury 3. Minor injury 4. Damage only
12. NO. OF VEHICLES INVOLVED
13. NO. OF DRIVER CASUALTIES
14. NO. OF PASSENGER CASUALTIES
15. NO. OF PEDESTRIAN CASUALTIES

Write relevant code in adjacent box.

16. COLLISION TYPE: 1. Overturn - no collision 2. Head on 3. Rear end 4. Side impact 5. Side swipe 6. Hit parked vehicle 7. Hit fixed object 8. Hit pedestrian 9. Hit pedal cyclist 10. Other ....
17. ACCIDENT SPOT: 1. Not at junction 2. T-junction 3. Y-junction 4. Cross roads 5. Offset 6. Circle 7. Railway crossing 8. Bridge 9. Other
18. JUNCTION CONTROL: 1. Not at junction 2. Uncontrolled 3. Police / manual 4. Signals (working) 5. Signals (not working) 6. Stop sign 7. Give Way sign 8. Other
19. ROAD CHARACTER: 1. Straight & flat 2. Curve 3. Incline 4. Curve & incline 5. Crest of hill 6. Other ....
20. ROAD TYPE: 1. Two way 2. One way
21. ROAD WIDTH / 22. SHOULDER WIDTH
23. SEPARATION: 1. No Divider 2. Divider
24. SURFACE TYPE: 1. Concrete 2. Bitumen (Tar) 3. Gravel 4. Kutcha 5. Other
25. SURFACE CONDITION: 1. Dry 2. Wet 3. Muddy 4. Flooded 5. Other
26. ROAD CONDITION: 1. No influence on accident 2. Pot-holed 3. Drainage Ditch 4. Construction work / material 5. Other
27. WEATHER: 1. Clear 2. Rain 3. Fog / mist 4. Wind 5. Other
28. LOCATION TYPE: 1. City / Town 2. Village / settlement 3. Rural area
29. MAIN CAUSE: 1. Vehicle defect 2. Road / environment defect 3. Human error
30. HIT & RUN: 1. No 2. Yes

ACCIDENT LOCATION
NAME OF CITY/TOWN/VILLAGE
NAME OF Road .... BETWEEN LAND MARK 1 .... Distance .... (km/m); LAND MARK 2 .... Distance .... (km/m)
FOR JUNCTION, NAME OF SECOND ROAD .... Distance .... (km/m)

ACCIDENT LOCATION MAP — *Draw single line road map, showing accident spot in relation to prominent landmarks such as bridges or Km posts. Mark distances to landmarks.*

COLLISION DIAGRAM SKETCH — *Mark the position and direction of each vehicle before collision and details of the road layout of accident spot.*

31. XY MAP 32. X 33. Y 34. ROUTE 35. KM 36. 100M 37. NODE MAP 38. NODE 1 39. NODE 2

71. POLICE DESCRIPTION OF ACCIDENT

WITNESSES: 1. NAME .... ADDRESS .... 2. NAME .... ADDRESS ....
REPORTING OFFICER: NAME .... RANK .... NO ....
ACTION / SPECIAL NOTE

PAGE 2

VEHICLE 1 — 40. VEHICLE REGISTRATION NO; OWNER'S NAME; ADDRESS
DRIVER 1 — DRIVER'S NAME; DRIVER'S ADDRESS
41. VEHICLE TYPE: 1. Motorcycle 2. Scooter 3. Moped 4. Threewheeler 5. Car/Jeep/Van 6. Taxi 7. Light Goods Veh 8. Heavy Goods Veh 9. Minibus/Mini 10. Bus 11. Bicycle 12. Cycle rickshaw 13. Animal Drawn 14. Tractor 15. Other
44. VEHICLE MANOEUVRE: 1. Going straight 2. Turning left 3. Turning right 4. U-turning 5. Overtaking 6. Overtaking ... 7. Reversing 8. Sudden start 9. Sudden stop 10. Parked ... 11. Stopped ... 12. Other
45. VEHICLE DEFECT
46. DAMAGED PART OF VEH.
Write first 4 letters of: MAKER'S MODEL — 42; 43. MODEL YEAR
48. LICENCE NO.
49. DRIVER SEX: M - Male F - Female
50. DRIVER AGE
51. DRIVER INJURY: 1. Fatal 2. Serious injury 3. Minor injury 4. Uninjured
52. DRIVER ERROR
53. ALCOHOL/DRUGS
47. SKID LENGTH
54. SEAT BELT/HELMET

→ *If more than 2 vehicles, 4 passengers or 3 pedestrians, attach other sheet(s).*

VEHICLE 2 — 40. VEHICLE REGISTRATION NO; OWNER'S NAME; ADDRESS
DRIVER 2 — DRIVER'S NAME; DRIVER'S ADDRESS

Attach separate sheet(s) with driver & witness statements.

PASSENGER CASUALTIES — NAME & ADDRESS 1) 2) 3) 4)

PEDESTRIAN CASUALTIES — NAME & ADDRESS 1) 2) 3)

RESEARCH CODES: 68 69 70

Figure 1: Example of a two-page Indian accident report form (reduced down from original A4 size pages).

lem so that appropriate nationwide interventions can be developed.

There are also several other groups of people with road safety interests at the local level who require accident data. These include road safety officers and highway engineers, police, lawyers, research groups, politicians, teachers, statisticians, insurance companies, and members of the public. They all tend to have slightly differing needs and reasons for wanting the data. These include:

1) the investigation of particular sites or road user groups;
2) designing safety schemes and devices;
3) justification for highway planning;
4) enforcement planning or prosecutions;
5) education and training; and
6) insurance claims.

However, the underlying aim, whatever the above purpose, should be to acquire as much relevant knowledge as possible from the data to help prevent future accidents of a similar nature from occurring.

3 KEY COMPONENTS

There are four basic components to the way an accident data system operates, as follows:

1) accident reporting and recording system;
2) accident data storage and retrieval system;
3) accident analysis system; and
4) dissemination of data.

3.1 Accident Reporting and Recording System

Most countries have found that there is a need for a legal requirement for road accidents (or particular severities of accidents; e.g., involving personal injury) to be reported to the police. It is also advisable that this is reinforced by insurance company rules requiring claimants to follow this law as this encourages reporting of accidents to the police. The best source of validated accident data will generally, therefore, be the traffic police force — either the traffic policemen attending the scene of an accident or when reported to an officer at a police station by the involved parties or witnesses.

However, in some countries different types of accidents or accidents on different types of roads are reported by different sections of the police or even by separate organizations because of jurisdiction agreements. This often leads to problems and it is strongly recommended that there be only one single organization responsible for collating and compiling the national accident database and that the police are the most appropriate group to carry out this important task.

It must be noted that there will inevitably be a substantial number of road accidents that is not reported to the police and the level of this underreporting varies considerably from country to country, but is significant in almost all. Even where there is a legal requirement to report only those accidents involving personal injury, studies of hospital data have demonstrated considerable underreporting, though the level tends to increase as accident severity increases. **Underreporting of road accidents is a particularly serious problem in many developing countries** (wherever possible efforts should be made to check completeness of police data by comparing with hospital data).

Satisfying fully all the needs mentioned in Section 2 would mean recording a large number of features about every single accident. In practice, the police need to strike the right balance between the amount of detail they record about each accident and their ability to do so in terms of their available time and, in certain aspects, their expertise (e.g., few policemen are likely to have been trained to recognize relevant unsafe engineering features). In most countries the traffic police section (within the general police force) is responsible for recording accidents (this is preferable as the traffic police are the ones who can most influence safer behavior through enforcement). The prime objectives of the data required for police use (i.e., prosecutions and enforcement strategies) will inevitably have a strong influence on the details recorded. Other information, which is perhaps of greater value to engineers, education specialists, or researchers, will often need to be kept to an absolute minimum, otherwise the paperwork for the police will become too onerous a task and thus less likely to be complete or reliable.

Ideally, the information required for each accident should be completed at the scene on an easy-to-complete form or booklet (see Figure 1). It is also recommended that, if possible, a single form be designed for all purposes (i.e., used for court procedures, filing, and computer data entry) to eliminate the need to transcribe data onto, for example, a computer coding sheet. Otherwise this becomes a separate task and one in which errors could be introduced. The form or booklet will also need to provide space (or forms for attachment) for driver, pedestrian and witness statements, written summary of the accident, and sketches.

Although it is desirable that, as much as possible, the form is completed at the site (and the inclusion of all coding values on the form is helpful in this, see Figure 1), it is likely that some information will still need to be completed in the office. This is where civilian staff are often employed to complete or code the form and enter this data onto computer. Again, this is best done at the local police station. However, where this is not feasible due to the lack of computers, then the forms (or copies) will need to be sent to the police headquarters for entering into the computer. Eventually, the data will need to be collated into a national database and this can be done electronically via a network or other means of computer linkage, or simply by arranging to transfer periodically magnetic material such as floppy diskettes.

a) *Accident database*

Information for any one accident should be contained in a single accident report form or booklet. Ideally, this same form should be designed such that it can be used directly for computer data entry.

Obviously, governments, or road and police authorities, have their own and often different views on what accident information should be recorded. So it is unlikely that a single common unified report form would ever be accepted internationally (see comparison of forms from five Asian countries[1]). It is even difficult to draw up a definitive list of factors required in all cases. However, the database should be able to answer the following basic questions:

where accidents occur:
location by map coordinates, road name, class;

when accidents occur:
by year, month, day of week, time of day;

who was involved:
people, vehicles, animals, roadside objects;

what was result of collision:
worst severity of injury or property damage;

what environmental conditions:
poor light, weather, road surface condition; and

why or ***how*** did collision occur:
collision type, driver fault type.

Table 1 contains a suggested list of factors appearing on accident report forms in many countries of the world that have generally been found to be useful to various interested parties. Some of the more important factors are discussed below.

b) *Accident reference — unique identifier*

Once an accident record has been entered on computer, there is always the possibility that the record may be mistakenly entered a second time, possibly by a second computer operator, or even be copied (in error) electronically. It is important, therefore, that each accident can be identified uniquely by a particular number or combination of recorded fields, for example:

i) police station incident number;
ii) year; and
iii) police station identifier, which may require combination of station and region code.

This provides a check (which should be computerized) that no two accidents can have the same combination of values for these specified (key) fields, thus avoiding the possibility of duplication of records.

c) *Accident location*

An important detail, which is unfortunately often neglected by many police authorities, is a precise and easily-computerized accident location system.

When a roads authority is considering how to tackle accident problems at the local level, it is not possible for it to focus initially on the worst sites (in order to obtain the greatest potential saving in accidents) or ultimately to evaluate the effect of its action unless it can be certain that all accident locations have been correctly pinpointed over a network. A number of possible location coding systems is discussed in the following pages.

Table 1: Recommended Factors for Inclusion in Road Accident Database

General Details/Attendant Circumstances Police Reference	Road type	Environmental features	Precise location
Year Month Date Time Region/state Police station reference Severity Collision type Number of vehicles involved Number of casualties Contributory factors code	Class of road/road no. Carriageway type/no. of lanes Speed limit Junction type Road width Road shoulder width	Light condition Road lighting Road surface condition (dry, wet, etc.) Road surface quality (potholed, rutted, etc.) Weather Junction control Geometry (curvature, incline) Hit and run Roadworks	Map reference X-coordinate Y-coordinate Node 1 } optional Node 2 } Kilometer post To nearest 100 m (e.g., "8" = 0.8 km) Plain language location description (free text — abbreviated) Accident description (free text — abbreviated)

Vehicle/driver details	
Vehicle type Vehicle maneuver Vehicle damage Length of skid marks	Driver age Driver sex License number. Seat belt/helmet Alcohol/drugs suspected

Casualty details	
Type of road user Age Sex Severity of injury	Pedestrian location Pedestrian movement Passenger location School student

i) X-Y coordinates

It is becoming increasingly important to have data that can be plotted on maps. It is, therefore, recommended that the national grid coordinates are recorded for each accident to be able to produce accident maps or possibly incorporate the data within other geographic information systems. For the plots to be meaningful, a 10 m grid accuracy is strongly recommended. However, the level of detail possible will depend on the maps available.

ii) Kilometer posts:

Unfortunately, it is often difficult for the police (or coders) to locate rural accidents on a map. Indeed, it is advisable to have another, simpler location system in place to serve as a check on the X-Y coordinate system. On intercity roads where a good system of kilometer posts has been installed, preferably with intermediate 100 m marker posts (see Plate 1), this can be used easily by the police as a referencing system; i.e., they note down the nearest post to the accident site and the distance to it.

Where 100 m posts are not present but culverts are numbered, then strip maps (Figure 2) can be prepared that show each culvert in relation to its distance along the road. The police officer has only to indicate the distance of the accident site from the nearest culvert marker or other physical locations. The exact location can then be pinpointed in the office by referring to the strip map (see Figure 2).

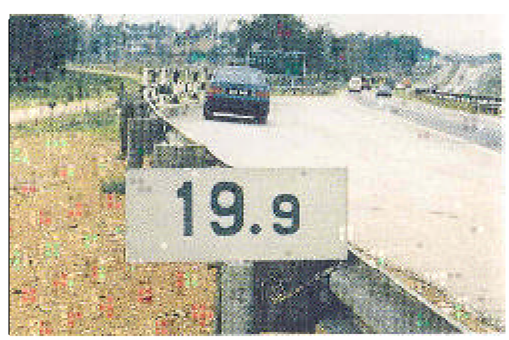


Plate 1:
100 m marker posts on an expressway in Malaysia.

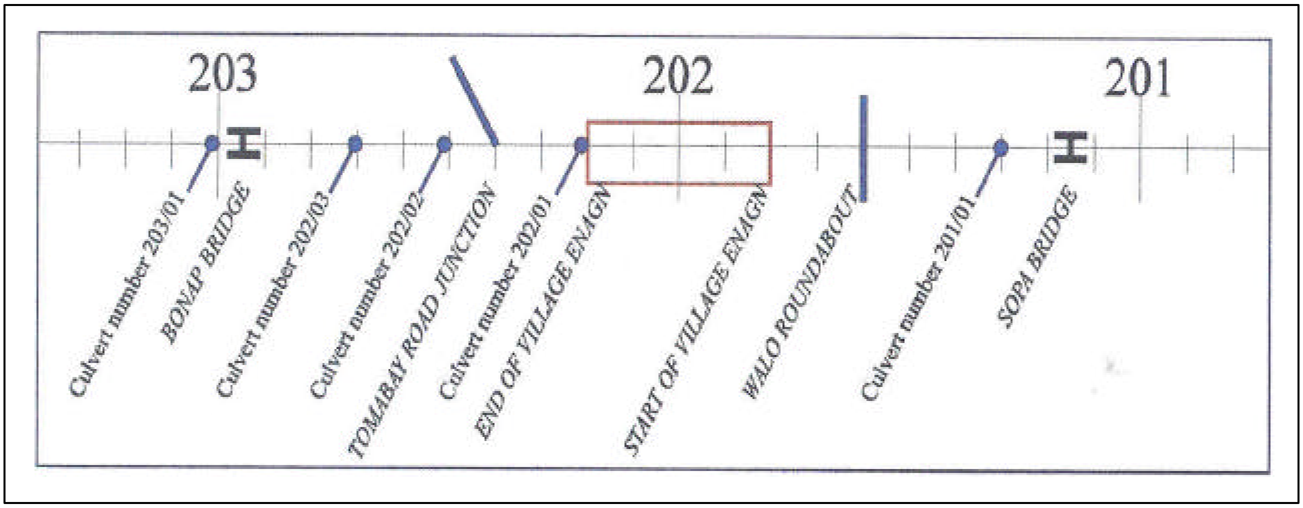


Figure 2: Simplified example of a strip map showing physical locations along road.

iii) Node-link-cell

For towns and cities, there is generally a greater density of junctions, and thus a node-link-cell system is recommended, where each major junction on a map is assigned a unique node number. Links are defined by the length of road between two adjacent nodes. Cells are the least accurate as they are squares covering, for example, a housing estate having many minor junctions. These numbered locations are much easier to read off a map with less chance of error (see Figure 3).

iv) Plain language location description

Another recommended referencing system is a free-text, abbreviated description of where the accident occurred using street names and other landmark features. These serve as a useful check on the coded location and can give a more precise description of the location of an accident.

v) Location sketch:

All police accident reports will include a collision sketch, but it is also strongly recommended that a specified space on the report form is provided for an accident location sketch. This should be a simple line drawing of the roads marking the accident site precisely in relation to prominent landmarks, such as bridges, junctions, or kilometer posts, its distance from these, and the direction of compass point north. These sketches must be sufficiently detailed to guide an investigator to the exact location of where the accident occurred, even if the investigator has not attended the scene of the accident before.

3.2 Accident Storage/ Retrieval System

Irrespective of whether the accident data are stored in a manual, micro-based, or mainframe-based storage system, the data must be easy to store and retrieve as needed. The true benefits of the data are not being harnessed unless it can be retrieved easily for analysis.

The data structure has to be such that information stored on individual accidents can be retrieved either as a single record or in combination with other records. This permits cross tabulations and other analyses to be carried out more easily, and permits more useful annual reports to be produced.

The data should be analyzed at national level and perhaps be utilized more intensively at local level to identify particular problems and tackle them specifically. The software package used to enter data, therefore, needs to be standardized and easy-to-use, such as MAAP[2,3] developed in the United Kingdom (UK) by the Transport Research Laboratory (TRL). It was specifically designed for use in developing countries but is now also being adopted by several police forces in the UK. A number of other more general software packages exist[4,5], but none provides the level of system or proven track record in developing countries of the TRL MAAP system.

The software, irrespective of the system, should facilitate standard analysis techniques

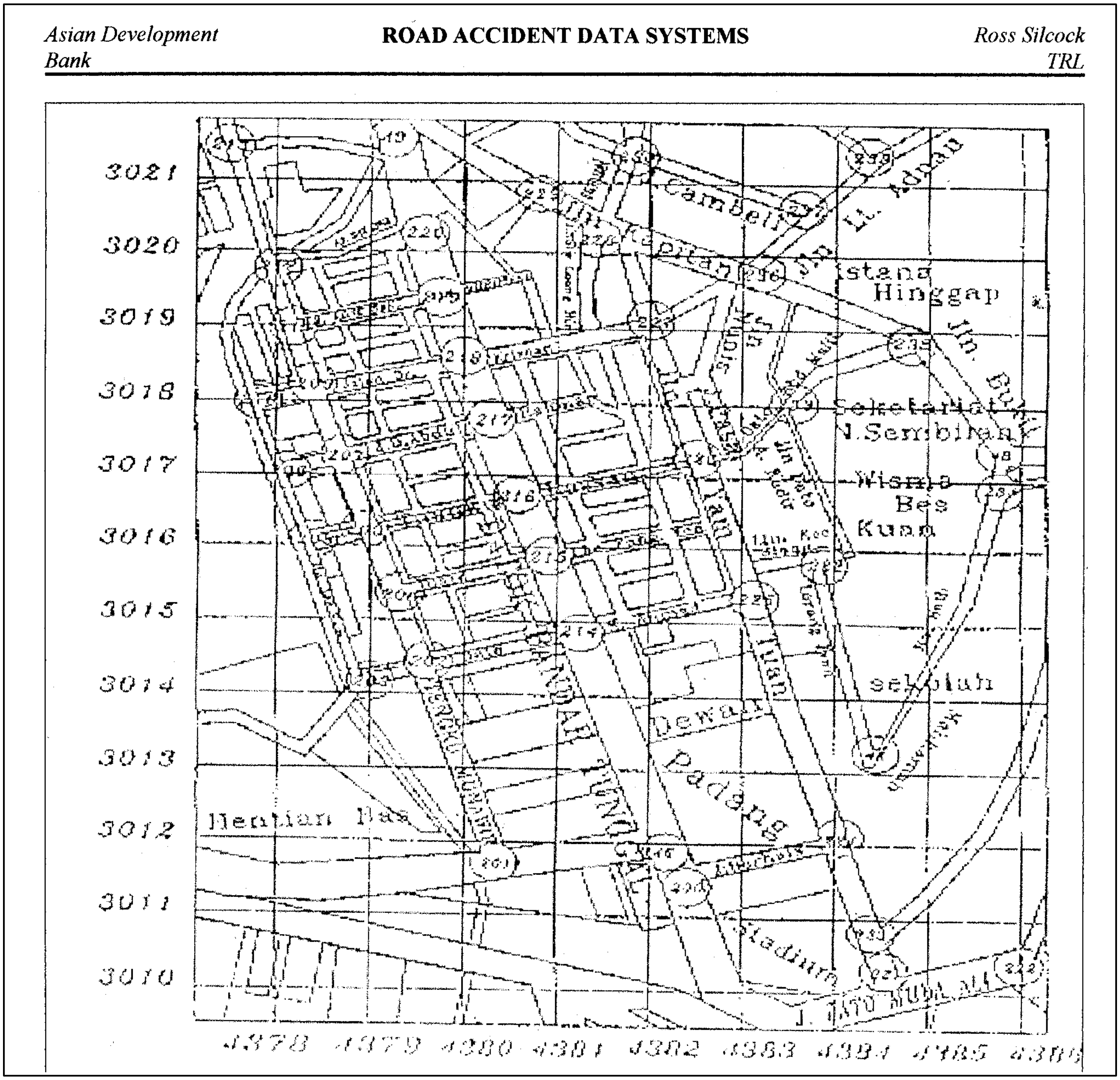


Figure 3: Example of node and coordinate map.

such as the listing of worst accident sites and stick diagrams analyses. Some of the main features are discussed below.

3.3 Computer Software Package Analysis Facilities

a) *Data validation*

As mentioned above, the package should be simple to use, enabling easy data entry, full editing and back-up facilities, and logical internal checking routines to ensure that the data are as accurate as possible at the entry stage.

It is also important to validate the data, which is easier done close to its source so that queries with particular accidents can be answered as quickly as possible. Ideally, the software should contain a number of standardized logical checks automatically applied on data entry to try to ensure the data are accurate from the outset. However, it is important to try to ensure that staff are conscientious and will apply their own checks, and complete forms with minimal missing data fields.

b) Tabulations

One of the main features of general accident data analysis is the ability to provide cross-tabulations that can be done by accident frequencies, casualties, or the vehicles involved. Traffic police authorities will need to produce certain standard tables regularly (monthly or at least annually for an annual report), but the software must also be flexible enough to allow nonstandard cross-tabulations to be produced easily with any combination of data filters for specific studies or to provide rapid answers to ad-hoc queries. Many mainframe computer systems have failed to provide facilities to meet this latter requirement for producing relevant accident information quickly on demand.

c) Presentation graphics

It has generally become common practice to display figures and tabular results graphically in the form of bar charts or pie charts, which, indeed, can illustrate points much more clearly to the reader than columns of numbers. The database package should provide such an option, or at least make it simple to export data to proprietary software for this purpose.

d) Location identification

Another important facility of any software package is to provide the user with a list of the worst accident sites, however defined, in any area of interest. This can be done using any location identifier such as nodes or distance references along a road. It is often useful to view how accidents are distributed spatially by automatically producing a histogram plot of accidents along a road. A more recent method of visually determining where problem areas exist is by display of accident locations on road maps (i.e., accident maps). This method is gathering more and more popularity among investigators. For example, MAAP software provides such a facility and can analyze groups of accidents within any polygon drawn on a computer screen map (stored in either digital or raster-scanned form [see Figure 4]). This allows particular corridors or residential and city areas to be studied in detail directly through identification on an on-screen map.

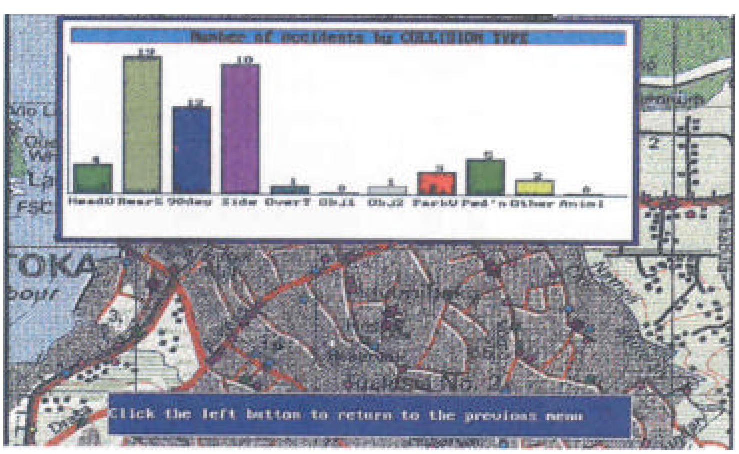


Figure 4: Example of polygon analysis using MAAP 5 software package.

e) Stick diagrams

Another useful analysis tool frequently used by highway engineers is stick diagrams, which are the representation of chosen features of an accident (e.g., type of collision or hour of day) using symbols in a column. A column or stick is produced for each accident at a site and the columns re-arranged to search for patterns of accident (e.g., predominance of side impact collisions or high occurrence of accidents in morning peak hour). This process can be automated within the computer package, enabling the investigator to perform the task quickly and easily, thus helping to design remedial action to tackle the most common accident patterns efficiently (see Figure 5).

3.4 Dissemination

In order to create a widespread awareness of road safety, it is important to publish annual reports showing clearly the magnitude and nature of safety problems, not least to justify adequate funding and resources to combat these problems. Road safety is a problem that requires activity in many different sectors for improvements to be achieved. Annual police accident reports need to be distributed widely to all agencies with responsibilities in road safety and with the ability to influence road safety. It has been shown in many developed countries that an effective way of managing safety is for authorities, not only at the national but also local level, to use a database to identify countermeasures and to publish details of their planned schemes annually.

The published document should also evaluate the effectiveness of these schemes in

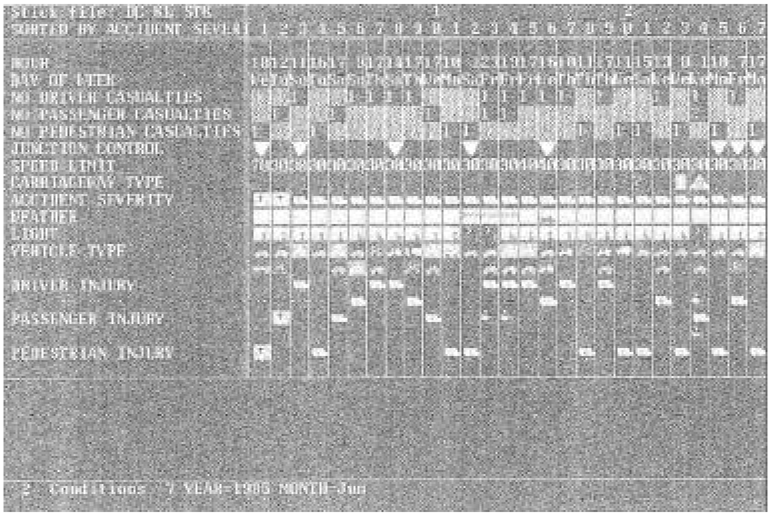


Figure 5: Example of stick diagram.

subsequent years. It is important, therefore, that the relevant accident database is made readily accessible to all organizations able to contribute to improving safety. This means setting up a mechanism whereby these organizations receive updated data regularly.

4 STAGES OF DEVELOPMENT

There are five development stages that can be identified in the development of road accident data systems.

Stage 1: Accidents Included in General Incident Reports

At the earliest stages, the police collect accident data on standard police incident reports and the data are treated in the same way as all other crime records with the focus on prosecution. Only the most basic details are collected and the standard “incident” form used is the same as for any burglary or any other incident that might occur.

There is little information of particular relevance to the circumstances leading to the accident. The concern at this stage is more with identifying the participants involved and reporting the “incident” to the authorities.

Stage 2: Basic Accident Data Form Introduced

At this stage, a separate accident data form is introduced as police begin to see the need for compiling additional information specifically on road accidents. Usually storage retrieval and analysis is manual, hence little real analysis is done of the data. Generally the only work done is to produce basic statistics tables with little interpretation or analysis of them. The data are used mainly for administration purposes within the police to be able to report how many accidents happened and in which jurisdiction they happened. Little or no attempt is actually made to analyze the data with a view to improving the situation.

Stage 3: Uniform Accident Form Introduced after Consultation with Other Parties

Eventually, as the number of accidents increases, a need is acknowledged for better accident data to be available. There is police willingness and agreement to improve the system and willingness to cooperate with other agencies, such as the engineers and others, in order to develop a form that meets the data needs of all key parties. A uniform accident form is designed in consultation with interested parties and introduced nationwide after pilot testing. Often a microcomputer-based accident data system is introduced at police headquarters. From this, an annual accident report is produced at the end of each year and circulated to all the key agencies involved.

Stage 4: Accident Data in Use in Other Agencies

By this stage, the various other road safety related agencies are beginning to use the data. Detailed annual reports would be published, distributed widely to all the agencies, and the database would be available to those who need it. An NRSC will use the data for better publicity and propaganda, highway authorities would be identifying and improving accident black spots, and police would be carrying out more effective enforcement at locations and times known to involve speeding or drink-driving accidents. It is possible that the database would be copied to other major users such as the road engineers. It would also be used by researchers from universities and research institutes to increase understanding and knowledge about the causes of road accidents and the effectiveness of countermeasures.

Stage 5: Supplementary Data Collected

Once a police data system is working well and the key agencies are using it, it will be recognized that a considerable number of accidents is still unreported to the police. Other data sources will begin to be checked to identify the scale of underreporting. This normally implies surveys of hospital data records and insurance industry records by researchers to try to assess the degree of underreporting occurring. By this stage, the police accident database will be widely accessible and in use by a number of organizations. Researchers will be active in comparing police, hospital, and insurance records, and there will be regular surveys of these records to try to reconcile the underreporting problem.

5 BENEFITS AND EFFECTS

Plate 2: Accident unit staff in Fiji entering data from police accident forms.

Plate 3: MAAP accident plot in Dhaka, Bangladesh.

Accident data are the base measure of safety and is essential in order that politicians, planners, engineers, police, education and publicity specialists, and researchers are all aware of the scale and nature of safety problems over a road network.

At a ***national*** level, the database should be used to help decision makers formulate national policy, such as compulsory wearing of front and rear seat belts, rider helmets, driving age restrictions, and other legislation, and to produce a national action plan for improving safety. Even within ***districts or states,*** the data can be used to target particular road user groups at risk; e.g., drunk-driving publicity campaigns, school education programs, motorcycle rider training, and police enforcement campaigns.

The accident database is of particular value in the **accident reduction** process at the local level. Here it should be used to draw up local action plans where the worst sites (in terms of accident occurrence) on the road network are identified. Appropriate accident countermeasure schemes should then be planned and implemented by road engineers in consultation with the police to bring about the most cost-effective accident savings. Lessons learned can be used in the design of new road schemes in order to encourage safety-conscious planning and design of roads.

There is reason to believe that accident remedial measures that are found to be effective in one country may not necessarily work well in another (e.g., solid white lines may deter dangerous overtaking in developed countries but can be ineffective in some developing countries). There is, therefore, a need to evaluate the effect of safety schemes and a reliable database is also essential for this purpose. Without proving that remedial work has been effective in reducing accidents or demonstrating that certain trial countermeasures do not work well, it is likely that money and resources will be wasted or certainly not spent to maximum benefit.

6 EXAMPLES OF GOOD PRACTICE

Although a number of commercial software packages (e.g., Arc info or Map info) are available and can be used to create accident data systems, the most common accident microcomputer-based database currently in use in the Asian and Pacific region is MAAP. Although introduced only on a pilot basis in trial areas in some countries, and perhaps with data not as complete as might be desirable in other countries, their value is gradually being recognized by many practitioners actively trying to improve safety. It already serves as the national system in several countries and is under trial for national or regional adoption in several other Asian and Pacific countries.

Papua New Guinea has one of the oldest and most comprehensive accident databases in the Pacific region. MAAP has been in use there nationally since 1986[6] when it was established as part of an ADB-financed Road Safety Project. The Royal Papua New Guinea Police work closely with the Department of Transport to maintain and utilize the database to determine effective enforcement exercises, to change the worst accident locations, and the Department of Land Transport and the police use it to target specific at-risk groups more effectively for publicity and education campaigns.

Fiji has also recently introduced the package nationwide as part of its ADB/World Bank-funded Road Safety Action Plan. Special units in the NRSC, the police, and Department of Works are actively using it to plan remedial works[7].

Malaysia[8] and **Singapore** have incorporated MAAP nationally with their existing mainframe systems, thus enabling the data to be immediately accessible to a much wider group of practitioners and researchers. In the case of Malaysia, accident data has been incorporated into the geographic information system network. MAAP is also under trial in **Bangladesh**, (see Plate 3) and has also been introduced or is under trial in parts of **People's Republic of China, India, Indonesia, Nepal,** and **Philippines**.

7 REFERENCES AND KEY DOCUMENTS

It is recommended that the annual accident statistics reports, accident database systems, and police accident report forms from several countries are reviewed before decisions are taken to change an existing system.

Several other useful documents are indicated in the appendices to these guidelines.

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Road Safety Guidelines for the Asian and Pacific Region

The guidelines cover 14 individual sectors affecting road safety, with four introductory chapters and four appendices. Information is presented in a series of freestanding documents that can be extracted for distribution and discussion.

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