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"Scientific and technical innovations for safer Powered Two Wheelers (PTW)"

Deliverable no. 1

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Executive summary

Powered Two Wheeler (PTW) riders are among the most vulnerable road users and major efforts are necessary to enhance rider safety. The use of PTWs is increasing worldwide, especially in urban environments. PTWs offer many benefits for personal mobility: less congestion, time gain, energy savings, easier parking. But these beneficial opportunities can only be capitalized if PTW safety is further prioritized. As prior initiatives to improve PTW safety have concentrated on single aspects, a truly holistic and integrated approach towards PTW safety is still lacking. Safe2Wheelers in the COST Action addresses this gap, by bringing together PTW safety experts in Europe and beyond. To achieved so the roadmap actions are divided in 5 working groups (accidentology, rider behaviour, traffic environment, technical solutions, integration)

The current document describes the first task of the Working Group 1, data harmonization. Data from accidents has been important to determine the most important causes and consequences of traffic accidents in order to improve the most critical safety aspects. To continue improving safety there is an increasing need for more detailed accident information. Moreover, many useful databases of accidents exist but with different characteristics that make them difficult to combine or compare analyeses. In the current document a comparison between many different accident databases have been carried out regarding their characteristics. As a result an accident database toolbox has been designed where useful information for further studies is recorded, such as:

- Basic information about the purpose and the responsible agency for each accident database
- Type of accident sampling information like specific geographical region or accident severity in order to know any bias in the databases.
- The type of data collected in each accident database regarding the accident, road, vehicles, and the participants

This toolbox aims at being used by any researcher with interest in the field of PTW safety so that it can help identify the most suitable data sources for the research questions but also to identify potential biases affecting the results depending on the nature of the source used.

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Glossary

EC	European Commission.
MAIDS	Motorcycle Accidents In Depth Study
ACEM	organisation representing the motorcycle industry in Europe
PTW	Powered Two-Wheelers
WG	Working Group

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1. Introduction

Introduction to Safe2Wheelers and positioning of WG1

Powered Two Wheelers (PTW) referring to motorcycles and mopeds are an increasingly popular mode of transport. In Europe, there are approx. 37 million PTW in circulation and their number is rising. PTW offer an excellent alternative for people seeking individual mobility, in particular in congested areas. PTW use has more than doubled over the last two decades. However, PTWs are one of the most vulnerable road users and major efforts are necessary to enhance rider safety. The use of PTWs is increasing worldwide, especially in urban environments. PTWs offer many benefits for personal mobility: less congestion, time gain, energy savings, easier parking. However, these beneficial opportunities can only be capitalized if PTW safety is further prioritized. As prior initiatives to improve PTW safety have concentrated on single aspects, a truly holistic and integrated approach towards PTW safety is still lacking. This COST Action addresses this gap, by bringing together PTW safety experts in Europe and beyond.

The Safe2Wheelers project in the Cost Action program is a pan-European intergovernmental framework. Its mission is to enable break-through scientific and technological developments, where all the stakeholders can follow a new collaborative approach made of shared, societally oriented objectives and evidence-based methodologies. The focus is, among others, to improve safety for Powered Two Wheelers also looking for global and harmonize these solutions through in Europe.

The Safe2Wheeelers is divided in five different Working Groups to study different aspects directly linked with PTW safety:

- Accidentology
- Rider behaviour
- Traffic environment
- Technical solutions: primary and secondary safety
- Integration across the previous mentioned working groups by influencing policies, legislation and doing dissemination.

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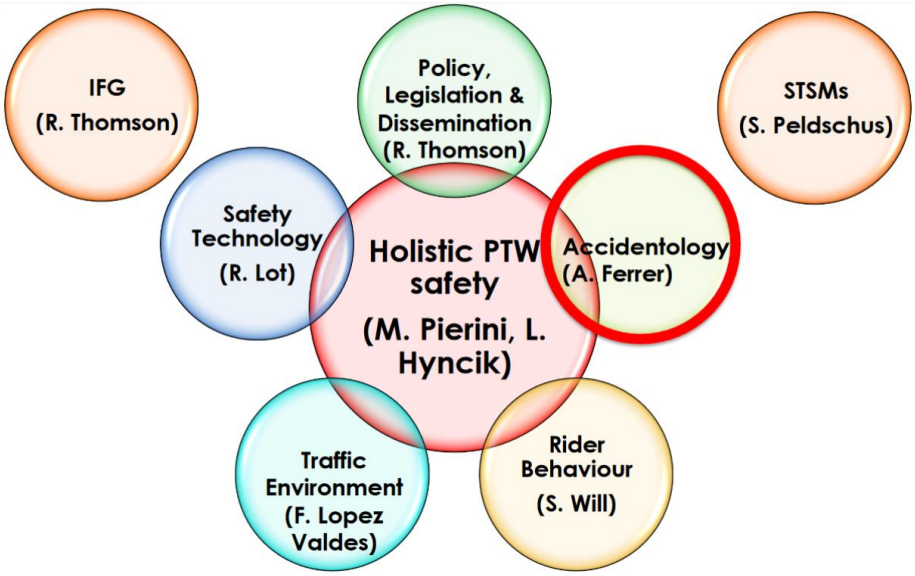

Figure 1: Safe2Wheelers working structure

Working Group 1 focusses on the accidentology study to share, consolidate and combine information available from national projects and data collection activities and integrate the accident data from these different sources with rider behaviour to allow new perspectives on accident prevention in different road environments.

The WG will focus on jointly defining criteria to arrange the accident information in order to increase the usability for PTW researchers and not to disregard fundamental information for research activities with two main objectives:

1. Combine information available from national projects, in-depth data collection activities and rider behaviour investigations.
2. To populate the new accident database during and beyond the end of the COST Action

1.1 Workplan:

Working Group 1 activity is divided in different tasks as different steps or road map.

1.1.1 Task 1.1 Data harmonization

In the first task, the consortium will adopt the database structure proposed by the DACOTA project with the aim to create a standard for data collection and analysis at international level. The WG will focus on jointly defining criteria to arrange the accident information in order to increase the usability for PTW researchers and not to disregard fundamental information for research activities.

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1.1.2 Task 1.2 Data Integration

A dedicated workshop on data integration will be held with one focus on accident data (data coming from several databases, links and input definition to simulation tools) and a second focus on combination and mutual data exchange with training-oriented and road environment data.

1.1.3 Task 1.3 Data merging and database population

Data will be entered into the common database

1.1.4 Task 1.4 In-depth analysis

After the common database will be populated, the PTW accident data will be analysed in order to extract data to be used for other WGs. A templates-based approach will be enabled, which can be used to reproduce PTW crash scenarios in a virtual environment. A systematic process approach will be generated for analysis and post-processing and to simulate the applicability of current active safety systems.

2. The need of accident data to improve safety

Although PTW users are one of the most vulnerable groups among all road users there is limited information about the associated accidents and their causation. The major research project conducted in Europe focussing on investigating such type of accidents was led by ACEM more than 15 years ago. This project, MAIDS, investigated 921 accidents in 5 countries (France, Germany, the Netherlands, Spain and Italy), which were considered to reflect the reality of PTW accidents across Europe.

The lack of accident data is of specially disturbing as in-depth accident data is essential for policy makers to enable delivering the expected information to develop founded policies. Additionally, the lack of information is an important barrier to develop new countermeasures to increase PTW safety or to assess the performance of existing systems. Furthermore, the existing information is completely atomised across Europe both in terms of data format, content and collection methods.

Safe2Wheelers aims at contributing to the enrichment of the knowledge of the accident causation factors and therefore will constitute the pillar for the development of countermeasures to increase PTW safety in the upcoming years. Additionally, one of the main outputs of the project will be the proposed countermeasures based on the project findings that can be directly implemented in a Strategic Research Roadmap.

As previously mentioned, accident data are necessary to better understand causes and consequences of accidents as well as their frequency and severity. These statistics

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are the basis required for founded decision-making and therefore data analysis results drive the safety strategies of all stakeholders (i.e. industry, policy-makers, etc.).

Accident data collection and analysis activities have been carried out since decades and drove the introduction of basic policies such as the mandatory use of helmets. Nowadays, the main causes of yesterday’s accidents are covered (i.e. helmet use) and there is the need of more detailed information to identify main issues, propose effective countermeasures and assess its performance. Aside from detailed information, a significant amount of data is needed to achieve statistically significant results.

Today’s researchers face the problem of accident data availability although many accident databases exist nowadays in different European regions, with different data collection criteria and focusing on different aspects. These differences become a significant challenge when trying to combine data from different sources, sometimes because the data is not even public or because the researcher is not able to identify which databases to combine.

To effectively improve PTW safety is necessary to identify the main PTW accident databases, the information they contain and the main potential causes for bias when analysing. This Deliverable contains the work carried out in WG1 to achieve this goal.

Linked with the first task of the Working Group 1, listed database of different accident databases with their main characteristics has been created. The aim is to achieve a database toolbox of accident databases in order to ease to the search of the most suitable accident database(s) to analyse according to the research objective in play.

3. Methods

Safe2Wheelers brings together a relevant community of stakeholders and experts in the field of PTW safety. This expertise was used to gather the knowledge on accident databases and to contact additional external stakeholders that could contribute to the collection of information. This process was based on a series of surveys as follows:

1) Working Group 1 consultation to list the most relevant accident investigation and data collection activities.
2) A survey [annex 1] to gather the most relevant information about each database characteristics was designed and presented to the consortium, which have validated it. This survey was sent to people inside the consortium familiarized with those accident databases.
3) Finally a table with all the accident databases and their characteristics has been created, in the shape of a toolbox, in order to be concentrating all the collected information in one document. The toolbox has been designed to allow selecting the most relevant variables of each database according with any characteristics and finding the different databases that study the accidents and having those characteristic

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A total of 64 relevant accident databases were identified. The Safe2Wheelers partners were familiarised or directly involved in 45 out of the total. Regarding the rest of databases, the main contacts identified were then contacted by any of the Safe2wheelers partners or collaborators to provide the database characteristics by answering a predefined query [annex 1].

Table 1 – List of accident databases

2BESAFE	EACS	LMU	STAR-D
AJBCN	EC CHILD	LMU-FARS	STATS19
ARUB	EC PENDANT	MAIDS	STRADA
BAAC	EC RISER	MSF	SUV
BIA	EC ROLLOVER	MUARC	TADS
BUS_SP	EDA-INRETS	OGPAS	TRAMS
CARE	EDA-LAB	OTS	GRAD
CASR	ETAC	PED_BCN	TRUCKS
CCIS	FALS	PVM	UDRIVE
CEDATU	FHWA	RASIF	VW
Czech National Road Accidents	GIDAS	RASSI	OTI1
CIREN	GNS	SAFERWHEELS	OTI2
COST 327	iGlad	SAFETYNET	
DACOTA	INSAFE	SCT	
DEKRA	KISS	SISS	
DGT	LAB	STA	
DIANA	LMU-GDB	STAIRS	

The information obtained through the different answered queries were organised and introduced in the accident databases toolbox. A second round of survey consultation was also performed. Finally, information from 27 accident databases were received and introduced in the of the accident databases table.

4. Results

As a result a table with a total number of 27 accident databases was achieved with many of their most interesting characteristics that give information about the accident study.

The characteristics of accident databases recorded in the final table are divided in three blocs:

- Basic information:
  - Basic information is the Complete Name of the accident database, the Short name and the organism that collects the data, which will be the

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organization to contact if anyone is interested in studding that database.

- Next level of basic information is about:

Webpage
Purpose / Objective
Specialization
Type of Database
Responsible organization(s)
Financed by
Country of headquarter
Year of foundation
Active until
Linked to project?
Total number of recorded accidents (aprox)
Data analysis service available?

- Type of accidents recorded: Which accidents are recorded?
  - The accident reported have some characteristics according with place, time, data or any other variable that may bias the statistics.

Geographical coverage
Specify geographical coverage
Minimum injury for an accident to be recorded
Minimum damage for an accident to be recorded, in €
Data set completeness
Specify data set selection

- The type of data recorded: Which data is collected
  - It has been considered as a determinant variable about the in-depth study of the accident the total number of variables collected per accident.
  - Also the type of data is defined according with the variables collected in the following aspects:

Accident
  general information covered
  accident descrition
  weather information
  withness information
Road
  general information covered
  note the Instalations for VRU
  descrive the Road state

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take mMeasurements
note hte presence of Obstacles
Vehicles in General
general covered
exterior information in general
maintenance information
impacts imformation
deformation information
wheels infromation
EDR system used
advanced safety systems information
other safety systems information
Cars & Heavy vehicles
doors and windows information
trailer information
Interior general information
Seats and safety belt information
Airbag information
Motorcycles
helmet information
protection clothes information
airbag information
Bicycle
helmet information
clothes information
lights information
Participants
general information
physiology information
psychology information
injuries information
other influences information

As a result of the collected information it can be seen that:

- Up to 22 of collected accident databases are in-depth studied accidents database. 9 are national collected accidents database and 6 local and 11 are collecting data from other geographical organization. Analysing the same fact from another point of view, it can be seen that only 5 databases have less than 100 variables per case and 8 of them have more than 1000 variables collected per accidental studied. The following Figure 2 shows in proportion that the 85% of the considered databases studies the accidents in-depth

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while the other 15% are macro studies (higher number of cases but less information collected)

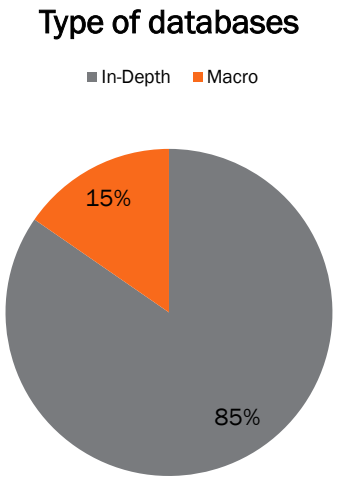

Figure 2: Type of databases collected in the tollbox

- Accident databases might be biased due to several factors linked to the operation of the data collection. For instance, the data collection criteria is usually linked to the accident injury severity ranking and this can introduce some bias towards more severe accidents. According with Figure 3 up to 4 databases only collect fatal accidents, 16 of them collect accidents with a minimum of slightly injured accidents, one database collects any kind of injury accident, another one collects accidents only with a moderate injury and only 2 don't have any minimum for injury severity to collect the accident information

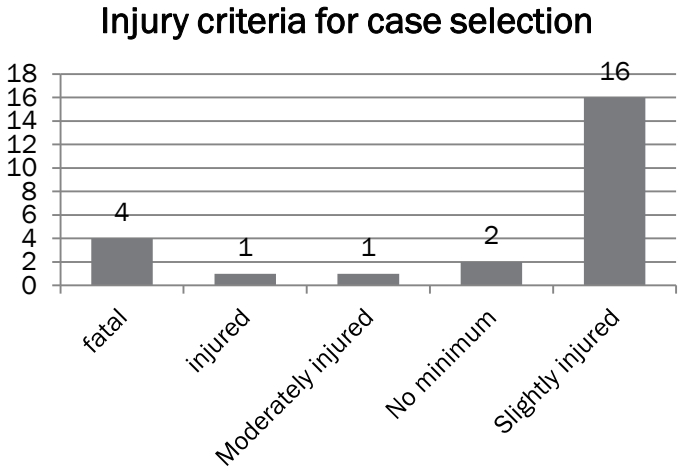

Figure 3: Number of databases with an injury criteria for a case selection

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- The main part of the accident databases in the toolbox are publicly funded, however 8% are private funding and 11% are funded via public-private partnerships and 4% have no specific funding (Figure 4).

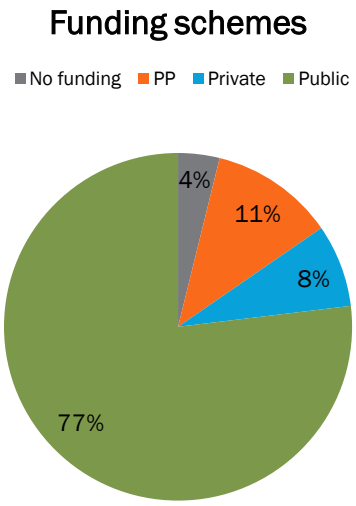

Figure 4: Funding proportion of the accident databases collected in the tollbox.

- The majority of the accident databases in the toolbox, 62%, are collected by a special data colletion team which usually assures a higher quality of information. Only 19% of the databases collect information by a public body that takes part in a traffic accident (police, ambulance or hospital). Another 19% of databases are collected by both, any public organisation or a special collection team.

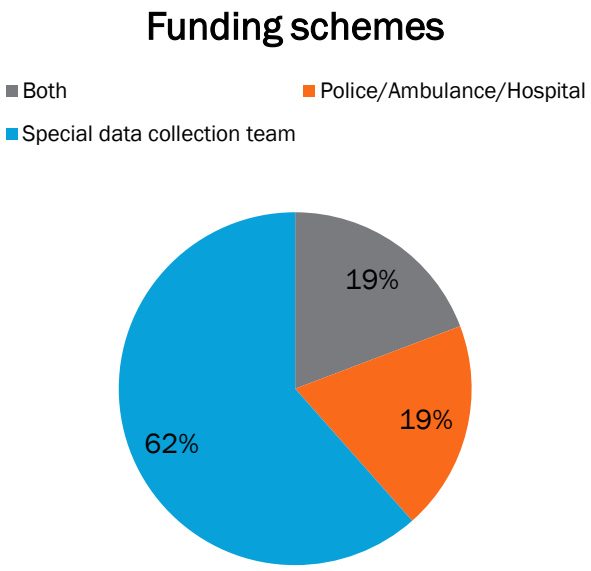

Figure 5: Organization responsible for data collecting

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Conclusions

There are many accident databases recording information from many different locations, addressing vehicles and traffic accidents with different objectives.

Some databases have a specific focus on accident causes, others on their consequences and injuries. Some are specifically looking for passenger car crashes and others analyse all kinds of traffic accidents but in a more general way and therefore have completely different variables. This presents a series of challenges when trying to combine or even use this data. In order to achieve high quality scientific results, the researcher must be aware of the limitations and main characteristics of the data bases, not only to better choose the source of the data but also to acknowledge potential biases in the results of the work resulting from the methods used to collect the information.

To this end, a common platform for all these accident databases has been designed. There, many of the database characteristics are recorded which allow identifying the usability for any specific objective.

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References

[1] MAIDS, Motorcycle Accidents In Depth Study (http://www.maids-study.eu/)

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Annex 1: Query for accident databases knowledge

Basic Information

Name of Database		
Webpage		
Purpose / Objective		*Why was the database created?*
Specialization		*Is the database specialized on certain forms of accidents? E.g. involving motorcycles, urban areas, etc..*
Responsible organization(s)		
Financed by		
Country of headquarter		
Year of foundation		
Active until		*If not ongoing anymore, date of last case collected*
Linked to project? If yes, specify		
Total number of recorded accidents		
Data analysis service available?		

Which accidents are recorded?

Geographical coverage		
Specify geographical coverage		*Names of Coutries, Regions, Cities, …*
Minimum injury for an accident to be recorded		
Minimum damage for an accident to be recorded, in €		
Data set completeness		
Specify data set selection		

Details about methodology

Data collected by		*e.g. Police, special data collection team, etc…*
Min. number of total variables per accident collected		
Max. number total variables per accident collected		
Does the amount of variables collected differ for different types of accidents? If yes, specify.		*e.g. less data collected for minor accidents, more data for severe ones. How much?*
How many types are there?		

Which data is collected?

Emphasis in data collection on		*Is data collection concentrated on certain aspects? E.g. injuries, vehicle deformations, infrstructure analysis…*

Specify number of variables collected for each variable group

	Min. Number of variables	**Max. Number of variables**	
Accident			
Road			*including infrastructure, weather, etc…*
Vehicle			
Road Users			*Injuries, etc..*
Analysis			*Computer simulations, accident reconstruction, etc..*

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	Depth of Detail	Type of recording	
General			*Time, type of accident, positions…*
Description			*Observations*
Weather			*Meteorology*
Witness			*Testimony*
General			*Name and type*
Instalations for vulnerable road users			*Type, description, …*
Road state			*State*
Measurements			*Design, Road width, etc*
Obstacles			*Obstacles for possible collisions*
General			*Brand, model*
Maintenance			
Impacts			
Measurements			*Measurements, deformation*
Exterior in general			*General appearance*
Doors and windows			*Deformations, damages*
Wheels			
Trailer			*Weight, type, …*
Interior general			*General appearance*
Interior detailed			
Seats and safety belt			*Usage, deformations, …*
Airbag			*Existence, use, activation*
Protection Clothes			*Helmets, gloves, reflective elements,…*
Other safety systems			*Existence, use, activation*
General			*Total number, involvement*
Physiology			*Age, Weight, Height, physical appearance*
Psychology			*Mental state before / after, …*
Injuries			*AIS, MAIS, time in hospital*
Other influences			*Alcohol, medication, distraction, …*

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Annex 2: List of accident databases with information collected

Name of Database	Short name	Purpose / Objective	Responsible organization(s)
Accident Analysis of Heavy Trucks Two	AAHTWO	The goal was the in-depth collection of truck accidents and gathering a control group for the identification of risk factors	TNO Automotive
Community database on Accidents on the Roads in Europe	CARE	The purpose of the CARE system is to provide a powerful tool that makes possible the identification and quantification of road safety problems throughout Europe, evaluation of road safety measure efficiency, determination of Community action relevance and to facilitate the exchange of experiences in this field	EU
CEDATU	CEDATU	in-depth accident analysis in Austria	TU Graz
Road Safety Data, Collection, Transfer and Analysis	DACOTA	A common methodology for accident investigation across Europe	VSRC
DGT dirección general de trafico	DGT accident database	Control and reduce traffic accidents in Spain	Spanish goverment
European Accident Causation Survey	EACS	European research program aimed at acquiring broader knowledge of road accident causes.	CEESAR
European Truck Accident Causation	ETAC	The aim of the study is to identify the main causes of accidents involving trucks	CEESAR
Saxony Fatals Analysis of Accidents of Lower Saxony	FAILS	Random selection of fatal accidents of Lower Saxony (Germany)	Medical University Hannover Prof.Otte
GIDAS German In-Depth-Accident Study	GIDAS	representative on-scene-data sampling for govenmental and industrial approach on accident research	Medical University Hannover and Technical University Dresden by order of Federal Highway Institute BAST and German Automotive Association FAT
Greek Road Accident Databse	GRAD	The national in-depth data collection system	CERTH
IGLAD initiative for the global harmonisation of accident data	IGLAD	global in-depth dataset to improve road and vehicle safety. Standardized data scheme enables comparison between datasets. Random/weighted sample with respect to national statistics.	IGLAD consortium
InSAFE	InSAFE	In-depth study of injury causation factors	Mobility and Vehicle Innovation Group (MOVING)
LMU-fatalities database	LMU-GDB	accident and injury research	Biomechanics/Accident Analysis Group
Pan-European Co-ordinated Accident and Injury Databases	PENDANT	The project will provide new levels of crash and injury data to support EU vehicle and road safety policy making by developing two new European data systems.	VSRC

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Road Accident In-Depth Studies	RAIDS	In-depth studies provide an opportunity to understand how crashes occur and, from this understanding, contribute to the development of safer roads and safer vehicles. Detailed information is collected about the crash site, including highway features and environmental factors. Vehicle damage can be matched to the injuries received in the crash, allowing understanding of how vehicle design can be improved. The data collected will help: •identify the crash scenarios, including contributory factors relating to the vehicle, road and road users, which lead to collisions of varying severities •identify how people are injured in road traffic collisions, the injuries they sustain, and how these correlate to vehicle characteristics and highway design features •establish the extent to which a range of safety related measures have reduced the risk of injury to road users involved in collisions •identify measures to reduce further the risk of collisions and injuries (in terms of vehicle design and safety, the road environment and traffic management and human factors)	Transport Research Laboratory (TRL)
Roadside Infrastructure for Safer European Roads	RISER	Objective of the RISER project was the set up of a detailed database for single vehicle accidents which includes data not available from national statistic data. A database was created based on the STAIRS protocol	Chalmers
Study on accident causation for traffic accidents involving powered two-wheelers and bicycles in the European Union	SAFERWHEELS	The aim of this study is to better understand the causes of accidents involving PTWs and bicycles	TSRC
Building the European Road Safety Observatory	SAFETYNET	The project will use existing infrastructure where possible to develop a broad ranging, intermediate level, fatal accident database	VSRC
Building the European Road Safety Observatory	SAFETYNET	Developed an in-depth European accident causation database to identify risk factors that contribute to road accidents	VSRC
SAFETYNET WP5.2	SAFETYNET	develop a methodology to collect accident causes	SafetyNet Partners (Chalmers, DITS, MHH, TNO, VALT, VSRC)
Swedish Transport Administration. In-depth studies of fatal crashes	STA	gather knowledge of fatalities towards Vision Zero	STA

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Stats19	Stats19	In-depth studies provide an opportunity to understand how crashes occur and, from this understanding, contribute to the development of safer roads and safer vehicles. Detailed information is collected about the crash site, including highway features and environmental factors. Vehicle damage can be matched to the injuries received in the crash, allowing understanding of how vehicle design can be improved. The data collected will help: •identify the crash scenarios, including contributory factors relating to the vehicle, road and road users, which lead to collisions of varying severities •identify how people are injured in road traffic collisions, the injuries they sustain, and how these correlate to vehicle characteristics and highway design features •establish the extent to which a range of safety related measures have reduced the risk of injury to road users involved in collisions •identify measures to reduce further the risk of collisions and injuries (in terms of vehicle design and safety, the road environment and traffic management and human factors)	GB Police Forces, Department for Transport
STRADA - Swedish Traffic Accident Data Acquisition	STRADA	study non-fatal road traffic injuries	Swedish Transport Agency
Accident Investigation with Sports Utility Vehicles		The goal was to give recommendations for improving the traffic safety of SUVs	TNO Automotive
Accident Investigation with Trams in cities		The goal was to give recommendations for improving the traffic safety related to city trams	TNO Automotive
In-depth investigations of accidents involving powered two wheelers (MAIDS)		The aim of the study is to better understand the nature and causes of PTW accidents causes of accidents involving trucks	ACEM

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