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BRoWSER: Base-lining Road Works Safety on European Roads

Final trial report

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BRoWSER: Base-lining Road Works Safety on European Roads

Final trial report

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Contents

1 Introduction

1.1 The BRoWSER project

The project Base-lining Road Works Safety on European Roads (BRoWSER) was initiated as a response to the Description of Research Need (DoRN) for the CEDR Transnational Road Research Programme Call 2012 on Safety.

The aim of the CEDR Transnational Research Programme (2012 call) seeks "to significantly reduce risks to road workers with an objective of Zero Harm". BRoWSER addresses two of the topics within the 2012 Call under the heading of "Safety of road workers and interaction with road users". These are:

- Collect data on worker injuries and near misses by country, road administration and employer
- Understand the optimum road works layouts that enable road users to approach, travel through and exit works without causing injury to workers and others

The aim of the BRoWSER project is to help National Road Authorities (NRAs) take a data-led approach to managing road worker safety. This knowledge of how road workers are exposed to risk from accidents and road user error is essential for effective safety management as it allows the real risks to be managed rather than those perceived to be the problem. The BRoWSER project focuses on the interaction between road workers and traffic and will consider road worker accidents, incidents and near misses (where available) alongside data for road works practices, network characteristics and road user accident data at road works.

1.2 This document

The benefits of a European Road Worker Casualty Database (EuRoWCas) were identified in the project deliverable D1.1 (BRoWSER Benefits Case). In order to realise these benefits, and by extension to achieve the overall objectives of the research programme, road worker incident data must be collected as specified in project deliverable D2.1 (Input data definition document for EuRoWCas).

However, the collection of these data is not possible with (or without some adaptation to) the existing data collecting processes in the individual countries. Details of the existing data collection and processes in each of the funding countries (plus Slovenia) will be provided in the Baseline Report (project deliverable D3.1, D3.2 and D6.1). Therefore it was agreed that a three-month data collection trial would be carried out to demonstrate the feasibility of such data collection. Additional benefits of the trial would also be 'end-user testing' of the collection method to inform the data interface, and identification of obstacles to continued long-term data collection.

This document describes the trial methodology and reports on the outcome for all seven trial countries - the UK, Ireland, Slovenia, Norway Belgium (Flanders), Germany (Hesse) and Sweden. It is an update of the interim trial report issued in September 2014.

2 General methodology

2.1 Data collection spreadsheet

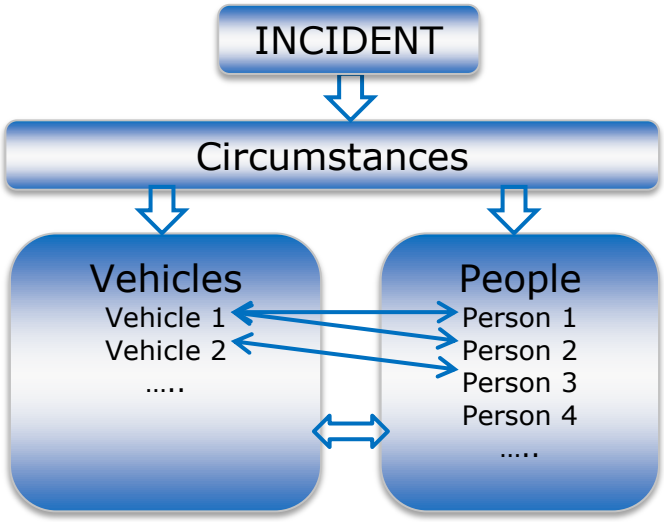
The data fields required to realise the benefits for EuRoWCas are detailed in Deliverable 2.1. This data framework was used as a basis to create the data collection spreadsheet. For this trial period, the data input spreadsheet is Excel-based, due to user familiarity and to minimise the development time. It is acknowledged that other formats (such as Access databases and / or web-based systems) are likely to offer greater benefits in the longer term, such as appearance, ease of use, future data management etc., and this will be considered later in the project.

The aim is that the spreadsheet is completed for each road worker personal injury accident or road worker near miss (hereafter referred to collectively as an incident). Since road user accidents in road works are a source of potential risk to any road workers present, these are also included where possible. Due to the different circumstances, the detail of how this is done varies by country and this is discussed further in Section 2.2.

The Excel workbook consists of three worksheets for incident recording:

- Circumstances.
- Vehicles.
- People.

The 'Circumstances' sheet is completed first and then, for each vehicle involved in the incident and for each person involved in the incident, entries are added to the respective 'Vehicles' and 'People' worksheets. Multiple vehicles (road worker vehicles and road user vehicles) and people (road workers and road users) can be recorded for one incident; reference numbers are used to ensure the correct links are maintained between vehicles and people involved in each incident. Example connections are illustrated in the diagram below.



For many of the fields a drop-down menu of options is provided from which the user should select the most relevant option. For fields where a drop-down menu is not provided, free text

is requested. Guidance for individual fields is provided on the spreadsheet itself through comments.

In order to get the greatest value from the data, all the suggested fields would be collected. However, for situations where this is not possible, core fields have been identified and these are the main focus of this trial. On the spreadsheet the core data fields are coloured orange and the remaining data fields are coloured blue. All fields collected in addition to the core fields greatly enhance the value of the data and hence the user is requested to provide as much information as possible.

The full datasets are detailed in Deliverable 2.1.The core data fields are listed below.

For each incident:

- Date
- Time
- Road Authority
- Location identifier (e.g. road number and marker post)
- Carriageway type
- Incident type
- Hard shoulder usage
- Permanent mandatory speed limit
- Temporary mandatory speed limit
- Lane closures
- Type of road works
- Incident location in work zone (longitudinal)
- Incident location in carriageway (lateral)
- Timing of incident (in works)
- Lighting
- Weather
- Visibility

For each person involved:

- Person class
- Activity (road workers only)
- Injury level

For each vehicle involved:

- Vehicle class
- Vehicle type

2.2 Data collection methods

The current level of data collection in each of the countries varies considerably and hence the approaches that have been used for the trial also vary. In theory the ideal approach to data collection is to collect new data specifically for the trial, thereby maximising the chances of getting a full data set that is fit-for-purpose; however, practical considerations cannot be ignored, such as the need to avoid duplication of effort and the need to collect these data in the most efficient and cost-effective manner. Therefore where data collection processes are

already in place these have been utilised where possible. Therefore there are three main sources of data:

- **trial-specific data collection** – where the data have been collected specifically for this trial,
- **existing data collection (road workers)** – where processes already exist for collection of road worker incident data and data from this source has been processed for use in the trial,
- **existing data collection (all accidents)** – where processes already exist for collection of data regarding all road accidents and information regarding road worker accidents have been extracted from these data.

In addition, data have been obtained using two methods – distributed, where the data are collected 'as-live' by the contractors or road workers directly into the BRoWSER spreadsheet, or centralised, where the data are retrieved retrospectively by the project team from a central database or through other methods.

Exactly how the data sources have been used, whether the data collection is centralised or distributed, and details of the post-processing required also varies significantly by country. Details of the operational arrangements and approach used are provided in the country-specific information in Section 3. For each country ratings have been provided for the following criteria:

- Trial data collection – whether the trial has successfully obtained relevant data
- Data quality – the level of quality of the data compared to the EuRoWCas requirements
- Sample size – an indication of the number of incidents recorded during the trial period
- Set-up effort level – an indication of the level of effort required to set up the data collection processes within the country / trial area
- Processing effort level – an indication of the level of processing required to transfer the data into the BRoWSER database
- Degree of difficulty – an indication of the general degree of difficulty for continuation of data collection within the country

3 Data collection trial by country

3.1 UK (England)

3.1.1 Approach

AIRSweb is the official Highways Agency web-based application for recording and reporting all incidents that involve any part of the supply chain and their subcontractors. The AIRS data in theory provide most of the fields required by EuRoWCas and are also collected in a timely manner (usually within two weeks of an incident) and therefore it was decided that the BRoWSER trial would use this existing data collection and assess its suitability for EuRoWCas. Using the AIRS data avoids duplication of effort by the contractors and those reporting the incidents and therefore is the most efficient method for the English data collection.

The AIRSweb interface has ten 'forms' for recording details:

- User details – details of the person reporting the incident
- Incident summary and location – including description of the incident, time, date and location
- Incidents – classification of the incident
- Works – details of the road works type and contracting authority
- Site and traffic – including details of the works, traffic management, speed limits, weather and visibility conditions
- Police – details of police officers in attendance
- TO – details of traffic officers in attendance
- Vehicles – details of vehicles involved
- Crash cushion – details of any crash cushion involved (including vehicle and driver)
- Investigation – details of any subsequent investigation carried out

More details of the AIRSweb system and the data collected are found in the BRoWSER baseline report.

The data requires processing in order to be suitable for use in the BRoWSER trial. Firstly, all incidents entered into the system are downloaded from the website for each month, with a delay of approximately two or three weeks. The following filtering process is then carried out to identify relevant incidents.

- There are six 'incident type' categories within AIRs – the first filter selects those that are classified as 'injury accident', 'damage/loss incident' or 'near miss'. (However, all other incidents were manually checked to ensure that this filter did not remove any mis-coded incidents.)
- Each incident in the filtered selection is then read in more detail (using the free text incident description as the main information source) to identify the relevant incidents.
- Each relevant incident is then entered on the BRoWSER spreadsheet using the free text incident description and any other completed fields within AIRS.

3.1.2 Findings

The number of incidents per month recorded in AIRS varied significantly during the trial period from approximately 40 to 175, reducing to approximately 40-70 classified as either 'injury accident', 'damage / loss incident' or 'near miss'. Of these approximately 5 – 10 per month were relevant to BRoWSER.

For the trial period there were 18 incidents recorded. 9 of these were near misses, usually incursions into tapers or lane closures by mistake. The remaining 9 incidents were collisions in the works (some between vehicles, some between vehicles and barriers/equipment), but there were no injuries to road workers or road users.

3.1.3 Issues and obstacles

There were no operational issues or obstacles specific to the trial since the AIRS data is already collected by contractors for the Highways Agency and no additional effort was required. The only issues encountered were those associated with processing the AIRS data into the format required for EuRoWCas. In theory, the data fields included in the AIRS database cover the information required by EuRoWCas, in practice incorrect and insufficient completion of the AIRS forms means that there are often gaps in the data, as well as significant effort being required to process the data.

The main issues that create difficulties for the BRoWSER trial are:

1. Both the 'Works' and 'Site and traffic' forms are rarely completed, even when the free text incident description confirms that road works were present. These two forms collect information that are part of the BRoWSER data requirements. Similarly there are often no entries on the 'Vehicles' form despite vehicles being mentioned in the incident description.
2. Following on from the preceding point, there is an over-reliance on the free-text incident description to provide all of the information and avoid the necessity of filling in the rest of the forms. This may be an obstacle to full automation in the future.
3. Inconsistencies between how contractors fill in the forms, for example the incident type classification seems to vary. Additionally incidents are sometimes recorded multiple times with different classifications.

Many of the issues have been identified by the Highways Agency on previous occasions and continual improvement is being made. During the trial period, TRL attended an AIRS workshop and these issues were fed into the recommendations discussed. Specific suggestions resulting from the BRoWSER trial were:

- An option would be to change the ordering of the forms so that users complete the individual details before the free-text incident description. When road works are selected, the 'Works' and 'Site and traffic' forms could be made mandatory, in order to encourage the details to be filled in.
- Users need to be encouraged to input details about road user vehicles (i.e. members of the public) as well as road worker vehicles. Quite often other vehicles are mentioned in the free text but the details are not recorded in the vehicles form.
- Users need more guidance on the differences between the incident types.

In addition, the trial has identified some refinements to the BRoWSER data spreadsheet to improve the functionality and maximise the information that can be entered:

1. An ‘unknown’ option would be useful, and a ‘not relevant’ option for many of the fields.
2. Additional options are needed for some fields, e.g. For where the incident occurred, there should be ‘Within works’ as well as ‘Within works – behind cones’ and ‘Within works – behind vehicle restraint system’ as we may know that it occurred within the works but not what the delineation was.
3. It would be useful to have the functionality to explicitly record a vehicle hitting multiple objects / other vehicles.
4. Near misses should be recorded separately or flagged in the database – currently the only indication whether it is a ‘road worker impact’ or a ‘road worker near impact’ is in the free text incident description.

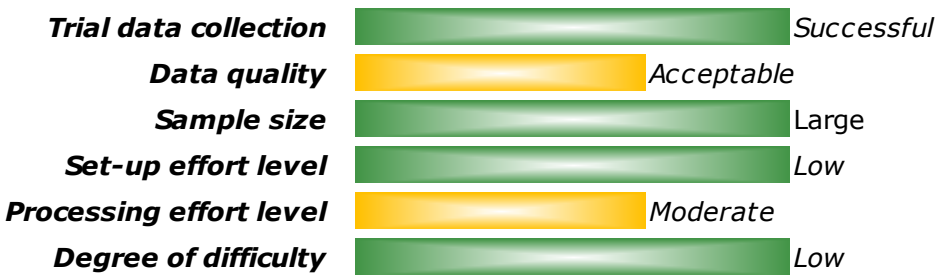
3.1.4 Discussion

In the UK the trial aimed to assess whether existing data collection (namely the HA AIRS data) was suitable for the purposes of EuRoWCas and consider the feasibility of ongoing data collection using this methodology.

Using existing data collection means no extra effort is required by contractors or road workers. The information required by BRoWSER is covered by the AIRS forms and hence in theory it would be possible to automate (or semi-automate) the process of converting the AIRS data into the BRoWSER format and minimise the effort of ongoing data collection. The trial has shown that in practice, complete automation is not yet practicable and, as it currently stands, in order to capture all the information provided in AIRS, the incidents recorded have to be manually checked and filtered. Each incident is then separately entered into the BRoWSER spreadsheet using the free text incident description as a guide and in many cases making assumptions about road works details based on expert knowledge. This is due to the fact that the AIRS forms are often incomplete or incorrectly completed. This issue also results in significant gaps in the data required by BRoWSER as well as additional processing effort. Any improvements to the level of completion of the AIRS forms will have a direct improvement on the quality of the data collected for BRoWSER, will reduce the gaps in the data collected and will reduce the time and effort required to process it. Such improvements are ongoing and hence the quality of data (for BRoWSER purposes) will continually improve.

The refinements to the spreadsheet tool will be collated with those identified in the other countries and will feed into work package 4 which will (amongst other things) develop the proposal for the database format and user input interface of the EuRoWCas database.

3.1.5 Overall summary



3.2 Belgium (Flanders)

3.2.1 Approach

As demonstrated in the Baseline Report (project deliverable D3.1, D3.2 and D6.1) the use of the data collection procedures (at the Police and at the Road Authority levels) already existing in Flanders to feed the EuRoWCas database meet several obstacles; in particular a time delay of 1.5 to 2 years before the data are available, incompatible database structures, time-consuming processing requirements and only a partial match with the EuRoWCas data requirements. Therefore, in Flanders a trial-specific data collection process has been set up for the purpose of the BRoWSER 3-months trial. The process principles as well as the subsequent actions carried out to set-up the process are described below.

Process principles

Various stakeholders are concerned with RW incidents / accidents: the road workers (RA staff or road contractor staff), road users, Traffic police, Traffic centre, RW manager from the RA. However it is considered that, for maximum accuracy, the data should be collected close to the incident, ideally by those present on-site. Considering the EuRoWCas data fields (see section 2.1) it is also useful that the person responsible for the data collection is aware of all RW related characteristics and activities and is very well informed about all RW-related incidents (e.g. replacement of impacted road signs, etc…), accidents and even near-misses impacting the safety of the road workers.

Recognising that only the road contractors and the RA staff executing the road works meet all these requirements the Flemish RA decided to request the active cooperation from these stakeholders to collect the data through the BRoWSER data collection spreadsheet. As only the local RA staff are regularly in touch with the road workers on the ground, the RA local districts, RW supervisors and coordinators were given the task to regularly remind them of the need to fill in the data collection spreadsheet.

Once filled in at the local level the spreadsheet was forwarded to the NRA office responsible for the monitoring of the BRoWSER project who itself forwarded the data to BRRC. On a regular basis BRRC carried out some validation activities to ensure data are being collected accurately and if necessary requested additional information. During the trial BRRC also continuously screened the electronic media (where accidents are usually briefly reported) to mitigate the risk of having non-reported events and, when necessary, inform the NRA central office who in turn requested additional information from the local RA services.

Data processing

As the data are directly filled in the spreadsheet they are provided in the right format and no data processing is strictly needed. However, the database must be consolidated on a regular basis; i.e. validation activities must be carried-out to check relevancy, accuracy and coherence of data. In a future version of the data collection tool these tasks should be much more automatic, and the user should be better guided when filling in the data base.

3.2.2 Findings

The official starting date of the 3 month trial was the 16th of June. However to allow for the processes to "warm-up" it was agreed that trial should continue until the end of September. As of the 20th October 2014, eight incidents were fully recorded in the database and four additional were pending a final validation. This covers a period from mid of June till the end of September. In total the eight fully recorded incidents involve 10 vehicles and 12 people, four vehicles and only one person being from the road worker side. Road work vehicles and workers seem to be also involved in the four additional events but the exact numbers were not clarified during the 3-months trial.

3.2.3 Issues and obstacles

The main issue is that the approach used for the 3-months trial was highly dependent on the level of commitment and willingness to participate of the road contractors and local RA staff and that it is very difficult to ensure that data are being (accurately) collected for all the incidents that are relevant for the purpose of EuRoWCas.

In particular it is difficult to know if the absence of data is caused by the absence of incidents/accidents or by an underreporting problem and it is therefore necessary to regularly remind all local stakeholders to confirm their commitment. The 3-months trial also demonstrated that additional information or clarifications are very often needed before validating the data; this is because of missing data, inaccuracies or incoherence between filled-in data fields.

The trial also identified some recommendations for the design of the future collection tool; these are summarized below:

- Improvements to the spreadsheet could be made by the addition of some internal validation using simple rules;
- The data collection tool should include some "help messages" inviting/guiding the user to fill in the table in the correct way; i.e. at the beginning he could be invited to mention the number of vehicles and persons concerned, so that the "Vehicles" & "People" tables would be pre-filled in with the right information;
- The final data collection tool should be designed to appropriately report accidents where several vehicles are concerned, e.g. a road user impacts a safety vehicle that is in turn pushed against a second (safety) vehicle;
- The options for some of the data fields (e.g. "Activity" in the "people" sheet) could be enlarged to better describe the incident.

3.2.4 Discussion

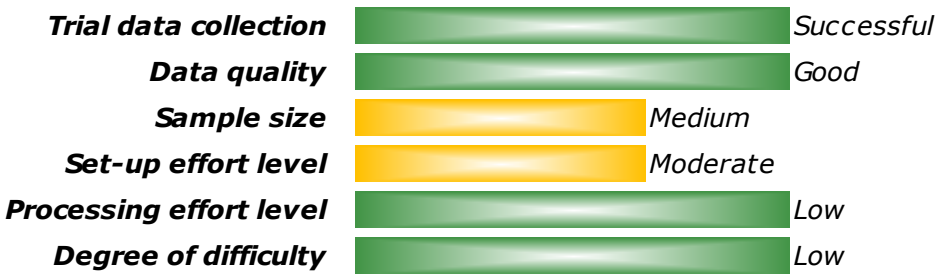
Considering the additional work required from the road contractors to collect the data, and from the Road Authority to manage the process and analyse the data, the following suggestions should be considered regarding the data collection process:

- It is recommended to that the incident and accident reporting are embedded into the on-field practices; for this it may be necessary to make the reporting mandatory;

- As far as possible, the reporting through the future EuRoWCas system should be connected to all other data collection or reporting processes; in particular considering the following practices/rules:
  - The Flemish Road Authority (Expertise Traffic & Telematics) also set up a system to try to collect data on accidents involving TMAs used for the Belgian category 6 RW (mobile road works hindering the traffic due to their low speed of frequent stops);
  - Following the Royal decree of 25 January 2001 on Temporary and mobile work sites the safety coordinator must report accidents happening on the work site.

- A control system would be useful to ensure data collection is effective and accurate. Different approaches could be considered:
  - a "sampling" procedure (short term): by checking throughout the year if some relevant events, identified by local knowledge (district, RW supervisor) or by a screening of press media, are being reported;
  - an extensive cross-checking with other data sources: e.g. use of the accident data reported by the Police (for verification in the long term); use of incident data recorded by the Traffic centre (for verification in the medium term).

3.2.5 Overall summary



3.3 Germany

3.3.1 Approach

The federal structure in Germany leads to many different arrangements for data collection and data structures etc. Not only do the road administrations of the 16 states in Germany use different data systems for their road network and work zone data, but also the police authorities use different systems to collect data on traffic accidents. In addition the employer's liability insurance associations are organised on a state level and consider accidents of their assured workers only in their region. There is no existing database or data collection that specifically separates accidents with workers interacting with road users. Near misses are also not documented.

Therefore, the federal structure of Germany and the distributed responsibilities for construction sites, traffic, traffic safety and work safety make it very difficult to gather all the information required for EuRoWCas. In some states like Hessen digital descriptions of the accident circumstances can be connected with the traffic accident data base. In addition in this state there exists also a very detailed database for all road work zones and the traffic

volume data is also available. In the free text descriptions, information regarding injured workers, damaged vehicle and often the type of work is included; however even for these data no detailed information about the roles of the injured workers are available.

It was decided to use the existing data collection in Hessen for the BRoWSER trial. A two-step methodology is used. The relevant accidents are filtered out of the traffic accidents database with the feature “work zone”; in parallel all the accidents that have happened in work zones are filtered from the work zones database. The resulting selection is limited further by looking at the documented accident types, e.g. where a collision has occurred. In addition, there are certain key words such as “Safety Trailer” or “beacon”, which indicate an accident at a work site. If it is mentioned in the free text accident description that a worker was injured by a collision with a road user, it is clearly an accident covered by this evaluation. If it is reported that a road user has left the carriageway and hit objects like beacons or road worker vehicles, it can be an indication of a near miss. Road works details are usually recorded in the free text description; additional information can also be delivered through connection with the road work management database. The location of the accident is usually recorded in great detail.

Using this methodology it should be possible to get all relevant accidents from the two parallel databases – traffic accidents and road works.

In addition, it has been agreed that information will be received on an informal basis regarding all accidents with injured personnel of the highway and motorway surveillance centres in North Rhine-Westphalia (NRW).

3.3.2 Findings

The accident database for the trial period was delivered in late October 2014. In addition to the trial period (June to August 2014), the accident database from January 2013 until May 2014 was also included to enhance the data.

This resulted in approximately 18,000 accidents on motorways in Hesse from the beginning of 2013 up to August 2014. (This includes all accidents, regardless of the presence of road works or road workers.) Using the methodology above, these accidents were filtered by work zone aspects and resulted in a total of six accidents in workzones involving injured workers during 2013. There were none in the three-month trial period. Note that this is work zone incidents in which road workers were injured so it is unsurprising that no such incidents occurred over that duration. The data will be investigated to assess the feasibility of identifying those incidents in which road users collided with road works equipment or other vehicles, which will represent near misses to road workers. The ability to achieve this is dependent on the level of detail provided in the free text incident descriptions.

Although no injury accidents were recorded in the trial period, consideration of the injury incidents during 2013 illustrated that a high level of detail was available for those incidents identified.

All accidents with injured road workers happened in short term work zones, three of them when getting on / off or working at the trailer. There were no traffic accidents recorded in long term work zones that involved road workers.

3.3.3 Issues and obstacles

The information from the traffic accident database in conjunction with the description of the circumstances are detailed enough to deliver the majority of values for all relevant fields in the spreadsheet tool. Only the specific ID-information concerning vehicle and people cannot be delivered in full, due to privacy reasons. Also the role of the road worker is not clear in all cases, but the relevant information regarding location (inside / outside vehicle etc.) are available. This applies both for the Hesse data and for the data from NRW on basis of textual accident descriptions.

As previously mentioned, near misses are not documented. (One possible method for identification of near misses is to identify traffic accidents where the road user has left the road in the direction of the work zone without having a conflict with the workers and their equipment. For this purpose, in the accident descriptions a filter with the run-off direction following the accident in combination with work zones and 'beacon strikes' may be useful.)

Similar issues with the BRoWSER spreadsheet tool as for the UK (and other countries) were identified, namely:

- Requirement for an 'unknown' and a 'not relevant' option for many of the fields.
- Additional options are needed for some fields,
- The functionality for dealing with collisions between multiple vehicles.

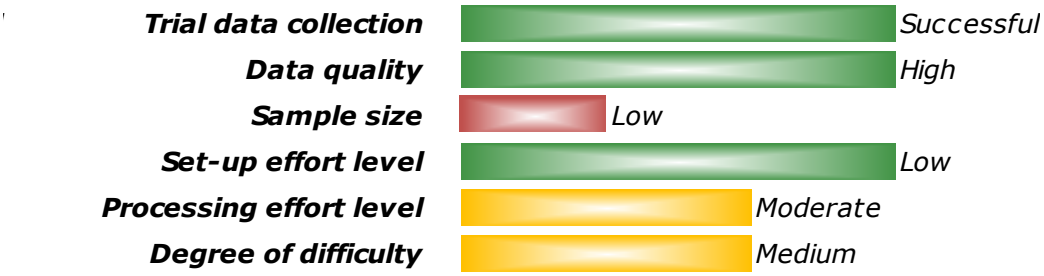
3.3.4 Discussion

The number of accidents resulting in injuries to road workers is very low. In particular, in long term road works, no accidents were recorded that involved interactions with road users. Conversely, at long term road works there were numerous accidents involving road users, where work zone equipment such as beacons were damaged, but which were not near a road worker at the time.

The initial analysis shows that most of the relevant information can be delivered by the traffic accident data or derived from the accident descriptions. The main gaps were in the specific identification information for people and vehicles (due to privacy issues), information about the role of the worker and information about the lateral distance between the traffic and the workers.

An additional issue for the use of this existing data source going forward is the delay in the database availability. Data are not available until at least several months after the incidents.

3.3.5 Overall summary



3.4 Slovenia

3.4.1 Approach

DARS, d.d. Motorway Company in the Republic of Slovenia manages the entire motorway network (which is 538.6 km of motorways and expressways). The motorways are maintained directly by DARS staff 'Section for motorway maintenance'. Large renewals are performed by Construction companies through contracts. DARS is fully aware of the importance of safety of road users and road workers. The 'Health and safety department' initiated and formed a simple database of road workers accidents and near-misses.

The first step regarding the data collection for BRoWSER project was to meet with the DARS representative, with the aim of understanding the existing data concerning road work accidents and arranging the methodology for the trial. (As a result of this meeting a list of accidents related to road works for 2013 was provided.)

It was assumed that the number of accidents in the trial period would be small. Due to the time of trial period (during the summer holidays when there is often changes of staff and only regular maintenance works were foreseen, which are performed by the DARS staff) it was decided not to train the DARS staff to fill in the BRoWSER database. The accidents related to road works were evidenced as usual by DARS staff. The additional information was collected directly from the DARS staff involved in the accidents.

3.4.2 Findings

During the trial period there were four accidents relating to road works recorded. All accidents in the trial period happened during daytime in good weather conditions, none of these was a near miss and no injuries to road workers were recorded.

In the preceding time period January 2014 – May 2014 nine accidents relating to road works were recorded. These data and available accident data will also be analysed and discussed in the BRoWSER baseline report in order to enhance the BRoWSER data base.

3.4.3 Issues and obstacles

The trial was very useful and provided the opportunity to provide recommendations for the future versions of the spreadsheet or data collection tool.

Certain difficulties arose in filling in the spreadsheet, for example since a lot of accidents happened during mobile works, some of the fields were not relevant/appropriate (e.g. Length of work-zone). It was also difficult to obtain some information such as driver's age, injury level etc.

Specific suggestions for the data collection tool were:

- The list of activities in some data fields should be enlarged.
- It would be useful to include some national-specific columns (e.g. type of road works closure according to specifications)
- It would be useful to include some data particularly important to the NRA (consequences – the size of damage)
- It would be beneficial to consider reducing some of the data fields as the spreadsheet is currently quite extensive.
- Detailed and clear instructions should be prepared.

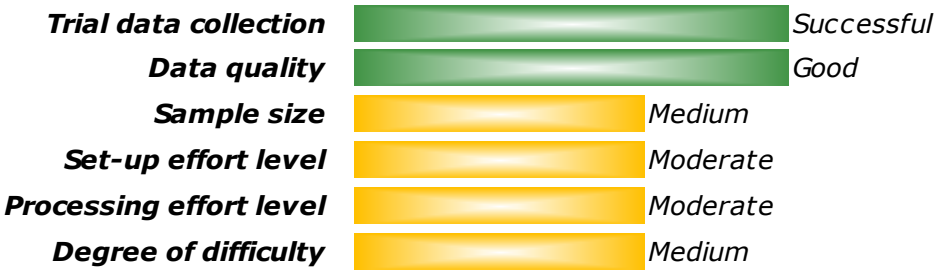
3.4.4 Discussion

It is neither practical nor possible to gather the information from the police traffic accident database. The data on RW accidents that will be used in EuRoWCas database are very specific. The most reliable information can be collected by the NRA (DARS) staff involved with the road workers safety and not by the police or Construction companies involved in road maintenance through contracts. The differences in safety of road workers depend a lot on the type of closure (temporary- moving closure) and long term closure with the redirection of traffic.

Only a very small number of near misses can be documented. Usually no digital descriptions of the accident circumstances can be connected with the traffic accident data base. Detailed data on the traffic volume at the time and location of accident are not available. Also a detailed data base of all road work zones at the time of accident is not available.

This approach was suitable for the trial period only. For long-term data collection the DARS database can be enhanced with the information relevant to BRoWSER database. For long-term data collection, the safety department staff should be trained. The staff responsible for the data collection should be familiar with the road works and road closure specifics.

3.4.5 Overall summary



3.5 Ireland

3.5.1 Approach

The National Roads Authority (NRA) was responsible for monitoring the data collection trial in Ireland. The NRA is the organization which manages the Irish National Road network. More precisely, 61% of the total length of the motorways is maintained directly by the National Roads Authority through Motorway Maintenance and Renewals Contracts (MMaRC).

The first step regarding the data collection was to meet with the NRA in February 2014, with the aim of gathering the existing data concerning road work accidents. The road accident records are provided by the National Police Service (the Garda). The Garda collects this information in-situ by means of a call centre, where trained operators enter the data into the Pulse database. All this information is shared via government VPN (virtual private network).

CT68s are the printed record from the Pulse database, which include detailed descriptions of aspects such as the collision location, vehicles involved, person involved, road surface, weather, injury severity, date and time of collision. After 2013 a specific field related to road work was added, to indicate whether the collision occurred within the vicinity of road works; nevertheless no specific information is recorded whether a road worker was injured. As a result of this first meeting, a set of 17 records related with road works in 2011 and 18 records in 2012 were provided.

It was decided that for the BRoWSER trial period, trial-specific data would be collected using the BRoWSER spreadsheet. At the beginning of June 2014, the NRA was trained in filling out the BRoWSER spreadsheet which was developed for data collection. At the end of this month, after some refinement of the spreadsheet, in consultation with the NRA, a final version was deployed and the 3-months trial began. It was agreed that accidents which had occurred in the previous months would be retrospectively included.

The contractors carrying out the road works, on behalf of the NRA, are the drivers for collection of data. On a monthly basis the NRA compiles the different spreadsheet from the contractors and sends them to Trinity College Dublin to be checked and analysed.

3.5.2 Findings

The figures of accidents related to road works obtained retrospectively from March to June 2014 (i.e. 4 months) are the following:

- Number of incidents: 6
- Number of people involved: 14, all of them without any injury sustained.

The figures of accidents related to road works collected by the trial from June to September 2014 (i.e. 3 months) are the following:

- Number of incidents: 7
- Number of people involved: 14, 10 of them with minor injury or without injury sustained. The remaining injury levels were not reported.

Another characteristic to be highlighted is that 7 incidents occurred related to mobile works; 3 related to static - medium/long daytime and 2 related to static - short daytime.

3.5.3 Issues and obstacles

Certain difficulties arose in filling out some core fields. It is noted however that certain systematic errors were detected in the spreadsheet provided by one of the contractors. This could be caused by a corrupted file which did not allow the selection among the different options. The remedial action was to provide a new spreadsheet and to correct as much as possible the existing data.

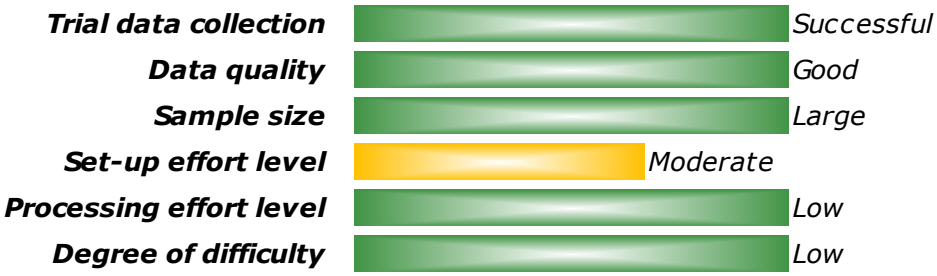
Since people involved in the data collection already have very detailed processes to follow, it may be beneficial to consider reducing the amount of information required in future versions of the spreadsheet.

3.5.4 Discussion

Due to the lack of information regarding road work characteristics, the set of data provided by the NRA before the trial (years 2011 and 2012) is not adequate to fill the core fields. Therefore, existing data collection can be considered as not being available. This fact further acts to highlight the necessity of this data collection exercise.

Although it is noted that the NRA are enthusiastic to see this data collected on an ongoing basis, and that there has been excellent engagement on the part of contractors in recording/providing this information, the collection does require an extra effort and, therefore it may be beneficial to reduce the amount of information required. This may result in data of a higher quality, with fewer missing fields.

3.5.5 Overall summary



3.6 Sweden

3.6.1 Approach

STRADA – Swedish Traffic Accident Data Acquisition - is a national information system collecting data of injuries and accidents on the road network. STRADA is based on information from two sources - the police and hospitals. Reporting from the Police has been mandatory since 2003 at a national level; reporting from hospitals is not mandatory but is increasing.

For the BRoWSER trial, since these data are already collected and due to lack of in-country resources within the project team, it was decided that the trial would be used to ascertain if this existing data collection is suitable for the EuRoWCas database. This also therefore avoids duplication of effort by those responsible for reporting.

The data used are based on the STRADA data but have been processed and enhanced by Eva Liljegren of the Swedish Transport Administration for separate research purposes. Additional data have been added through this research to the original STRADA data, such as information on injured road workers and winter maintenance. Additionally the STRADA data have been filtered to identify the incidents of relevance to this research, and by extension to the BRoWSER trial.

The data are filtered to include all road traffic collisions that relate to road works. Incidents are included whether or not they result in an injury to a road worker, for example a car hitting cones or a barrier even if no road workers are in proximity. For the purposes of the BRoWSER trial and the EuRoWCas database this means that some high potential near misses will be identified through this data collection. Most of the data collected is for accidents to road users in road works (rather than injury to road workers) which nevertheless represent potential risk to road workers. It is important to note however that only accidents with personal injuries are available; other minor accidents are not usually reported.

The data fields in the filtered data include:

- Time and location details – including year, month, day, time, county, municipality, road number/name, road owner
- Incident description – type of accident, description, cause, winter maintenance, presence of TMA or other protection

- Injury information – Severity rating of the accident, number of dead / severely injured / minor injuries
- Road worker involvement – whether road workers were involved, whether there were any road worker injuries (and severity)
- Road type – classification of road, speed on road, urban/rural
- Driving activity being undertaken – such as overtaking, reversing, stationary
- Other driving factors – such as drunk driving, learner driving, whether the car drove off the road
- Environmental conditions – such as the road surface condition, weather, daylight / lighting conditions.

The accidents are reported into STRADA by the police and hospitals with a maximum delay of two months. However these data are classified and owned by the Swedish Transport Agency.

The data then needs to be processed by the Swedish Transport Administration into the format required. Since this is done retrospectively, it is done all at the same time with a delay of approximately 3 months total. This means that the data for the main BRoWSER trial period (June – August 2014) will be available by November 2014.

3.6.2 Findings

The data for the trial period (June to August 2014) have been collated and analysed by the Swedish Transport Administration. This included the initial filtering to identify those incidents that took place in the vicinity of road works. This identified 66 incidents in the three month period, 32 of which occurred on state-owned roads.

Of these 66 incidents, 30 involved pedestrians or cyclists interacting with road works, in most cases when road workers were not present in the works zone. In the context of the BRoWSER trial and the EuRoWCas database, these incidents do not represent a risk to road workers and were excluded. Similarly, 24 of the remaining 36 incidents were rear-end collisions occurring in the queues caused by road works and were excluded as they do not represent a high potential near miss to road workers.

This resulted in 12 incidents that were relevant to the BRoWSER trial, ten of which occurred on state-owned roads. It is also notable that three of these incidents involved motorcyclists overturning on loose gravel or stones within the road works.

3.6.3 Issues and obstacles

Unfortunately, the information from the accident database is quite limited. It is, for example, seldom possible to tell what type of road works were taking place at the time of the accident. These accidents are not investigated by experts (unless they are fatal accidents) so it is quite difficult to obtain any details about the road works, signage, speed limits in place etc. Where possible, additional data are added through the additional research being carried out but this is unlikely to be feasible going forward without significant ongoing effort.

This reliance on the processing by the Swedish Transport Administration, and on the additional information that was added, may be an issue for the collection of these data going

forward. In addition, the STRADA data are owned by the Swedish Transport Agency and subject to strict data protection restrictions, which may have an impact on the data that could be used within EuRoWCas as it stands and would therefore require resolution.

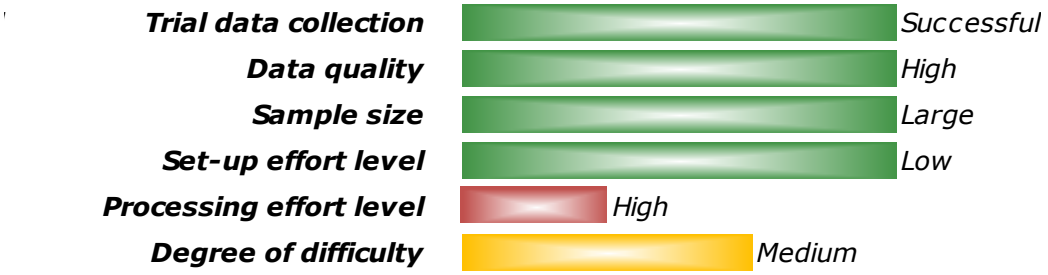
3.6.4 Discussion

In Sweden, the aim of the trial was to assess the feasibility of data collection for the purposes of the EuRoWCas database using existing data sources and existing data processes. The trial showed that such data are available through the STRADA database with additional information added by the Swedish Transport Administration during the processing procedures. The STRADA database in isolation does not provide many details on the road works themselves and, during the trial, this information was added where possible from work carried out by the Swedish Transport Administration for other research purposes. The trial therefore showed that such data collection is feasible in Sweden using existing data collection but that sufficient resources would be needed going forward to provide the added value and to achieve the data quality achieved during the trial. This is true in several other participating countries, demonstrating the increase in data quality that could be achieved through such additional efforts.

As discussed above, 24 of the 66 incidents which occurred during the three month trial period were rear-end collisions occurring in the queues due to the presence of road works. These were not considered to represent high potential near misses and so were excluded from the findings; However, further consideration of these incidents provides an interesting point of discussion. According to the free text incident description of these incidents, the majority of these seemed to occur because a road user was unaware of the road works ahead and misjudged the approach speed, causing excessive braking and rear-end collisions. For a number of the incidents, the descriptions suggested that the signing for the road works was inadequate and that this may have been the cause of the incidents. (However, the evidence for this is anecdotal at best and definitive conclusions cannot be drawn from the data obtained.)

It is also important to note that rear-end collisions in queues have not been automatically included in the trial data from other countries and so there is no evidence to suggest that this type of incident is more of a problem in Sweden than elsewhere. This issue will be considered later in the project through the work on the correlation of road works layouts and standards with incident data.

3.6.5 Overall summary



3.7 Norway

3.7.1 Approach

For the BRoWSER trial in Norway, the approach taken was to investigate the feasibility of collecting the data required for EuRoWCas using existing data collection processes. This was due to the lack of in-country project team resources to support trial-specific collection of new data.

In Norway, data on all personal injury accidents on the roads are collected by the Police. A sample of these data was provided by the PEB member for Norway covering the county of Akershus. The database has three sections – accident details, vehicles involved and people involved – which aligns closely with the three sheets in the BRoWSER data collection spreadsheet.

The data collected for each accident include:

Accident details

- Location – County, department, municipality, road, marker point
- Date / time – date, time, day of the week, date of registration (of accident)
- Accident category and code
- Casualty information – Severity of most serious injury, number of vehicles involved, number of fatalities, number of severely injured, number of minor injuries, total number of casualties
- Physical conditions – road type, surface type, presence of central reserve, number of lanes, urban / rural, road width, speed limit
- Environmental conditions – surface conditions, weather, lighting, temperature

For each vehicle involved

- Vehicle details - vehicle type, year of vehicle registration, country of vehicle registration, tyre type (summer or winter)
- Accident circumstances - number of people in vehicle, driving direction, presence of junction, purpose of journey, object hit (if relevant), distance from object hit (if relevant)

For each person involved

- Age, sex, location in vehicle, injury / damage sustained

There are no fields in the database that specifically identify whether road works were present at the scene of the accident, and hence there is no way of filtering the data to identify those accidents relevant to EuRoWCas. It is possible that road works may be mentioned in free text but this cannot be relied upon.

3.7.2 Findings

In the sample data obtained, it was not possible to identify which, if any, of the accidents involved road works. No reference to road works was observed in any of the database

entries; although it should be remembered that the sample data referred only to a single county and therefore extrapolation to the whole of the country may not be appropriate.

3.7.3 Issues and obstacles

As discussed above, the major issue encountered is that the road accident database does not include information regarding the presence of road works or associated details. In Norway most accidents in work zones are categorized as work-related accidents only and are therefore collected by a different government department. Anecdotal evidence suggests that these data may not be sufficient or appropriate for the purposes of EuRoWCas.

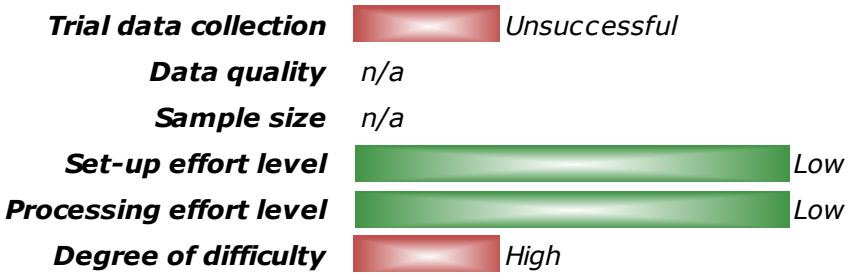
3.7.4 Discussion

The main conclusion of the trial in Norway is that existing data collection is not suitable for EuRoWCas purposes. Data on accidents in work zones are not readily available, and do not provide the information required. An additional point to note is that if these data were available they would include all road worker accidents and not only those involving interactions with road users and hence further filtering and processing of the data would still be required.

Data on all personal injury accidents on roads are collected, i.e. road user accidents, but no information is included within these to indicate whether road works are present or not. If this additional information were collected it would theoretically be possible to identify potential near misses, since road user accidents in work zones constitute a risk to road workers. However, in order to collect all the data required by EuRoWCas it would be necessary to extend the existing data collection significantly or collect bespoke data specifically for this purpose.

Fatal accidents in Norway are subject to in-depth expert analysis and therefore some information may be available regarding those accidents with a fatal outcome that are related to work zones. However access to these data is likely to be extremely difficult and not in any case available rapidly.

3.7.5 Overall summary



4 Conclusions

4.1 Overall findings

Three different types of data source have been used for the trial, depending on the circumstances in each individual country:

- Trial-specific data collection, i.e. new data that has been specifically collected for the purposes of the BRoWSER trial;
- Existing (road workers), i.e. existing data collected in-country for accidents involving road workers
- Existing (all accidents), i.e. existing data collected in-country on all accidents on the road (including those involving road workers)

In addition, two methods of data collection were employed – "distributed", where the data were input directly by the road workers or contractors in the field as close to the time and date of the incident as is practical, and "centralised", where the data were obtained retrospectively by the project team from a central database or through other methods. (Note that, in Slovenia, the data were both new trial-specific data and obtained retrospectively.)

The trial was completed in seven countries, with relevant data obtained in five of these. (Data were obtained in one further country (Germany); however, processing has focused on identifying road worker injury accidents only, of which none occurred during the three-month trial period.). Table 1 summarises the methods used and the outcome in each country.

Without sufficient information on the exposure of road workers to the potential risk, it would be premature to compare the results in each country or to attempt benchmarking activities. However, in order to provide an overall summary, the diagram below shows the estimated 'degree of difficulty' score presented for each country – this is an indication of the general degree of difficulty for continuation of data collection within each country.

'Degree of difficulty' ratings

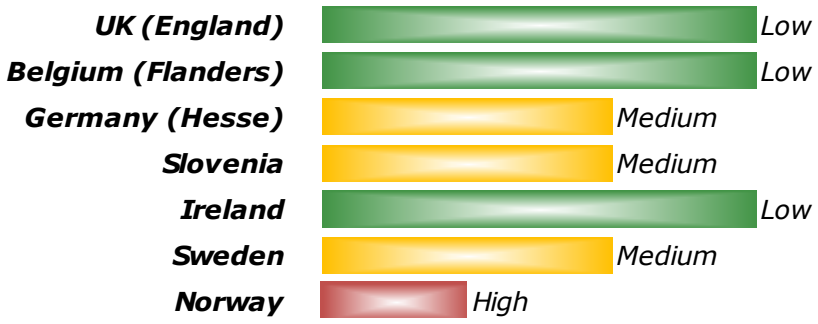


Table 1: Summary of data collection trial

	Data source			Data method		Trial outcome	
Country	*New, trial-specific*	*Existing (road workers)*	*Existing (all accidents)*	*Distributed (as-live)*	*Centralised (retrospective)*	*Trial completed*	*Incidents recorded*
Belgium (Flanders)	✓			✓		✓	12*
Germany (Hesse)			✓		✓		0**
Ireland	✓			✓		✓	13
Norway			✓		✓	✓	n/a
Sweden			✓		✓		12
Slovenia	✓				✓	✓	4
UK		✓			✓	✓	18

* Eight fully recorded incidents, with an additional four with details still to be validated

**The Hesse data have been processed to identify road worker injury incidents only, see Section 3.3.2 for more details.

4.2 Discussion

The most important outcome of the trial is that it has shown that such data collection is practicable, and that it can be achieved through a variety of methods and sources depending on the circumstances in individual countries and the extent of existing data collection. Recommendations for how this data collection could be set up will vary for different countries but the trial has demonstrated that different approaches can each achieve good results. There is an identifiable need for the toolkit that will be developed by the BRoWSER project which will provide tools that can be used as required by countries. The trial has also shown that there is appetite for collecting these data and that the potential benefits of doing so are understood by the national road authorities, the road works contractors and the road workers.

The trial has also provided an understanding of the level of costs (in terms of effort) required for both set-up of such data collection and ongoing data collection. Where data collection has been set up from scratch (e.g. in Flanders and Ireland) significant effort was required from various parties (including the project team and the NRAs) to engage with stakeholders, obtain buy-in, provide any necessary training and set up the processes and systems required for the trial to be a success. Conversely, where the approach was to use existing data collection as a base, the effort needed for set-up was, in most cases, fairly minimal, usually requiring only the necessary permissions to access the data to be granted.

However, when considering the ongoing effort required, the situation is very different. Where contractors or road workers are inputting the data directly into the spreadsheet, the ongoing effort required by the project team or the NRA is minimal as the task becomes part of incident reporting for the contractor. Where existing data are being used, the trial showed that significant effort is required to process these data in order to both identify the incidents that are relevant to BRoWSER and EuRoWCas and to convert the information into the format required. Another consideration is the level of effort required to validate the incidents recorded, that is the effort needed to be confident that the incidents recorded via the chosen data collection approach are a true representation of the incidents that actually occurred on the network, and to ensure accuracy of the data. This was considered in detail during the trial in Flanders and the conclusion was that significant effort is required to achieve this; a control system would need to be set up for ongoing data collection if such validation was deemed necessary. Since the absolute numbers of incidents during the trial are fairly low, the activities of filtering (and potentially validation) would likely be the biggest costs incurred by ongoing data collection.

For the new data collection, it is worth noting however that the ongoing effort is minimal only from the perspective of the project team; it is not minimal to the contractors or road workers who are actually collecting these data. Minimising the effort required from workers on the ground is very important, and is the principal reason why, for several countries, it was decided to use existing data collection methods rather than cause additional (or even duplication) of workload. One finding that was common to several countries in the trial was that the current size of the spreadsheet and the level of data requested seems large and is a potential barrier to ongoing data collection. Going forward it will be important to consider if the information requested can be streamlined or if more automation can be incorporated in order to minimise workload. This would be of benefit both to those inputting new data and to any increased automation of data extraction from existing sources, if possible.

In terms of the quality of the data obtained, there is a clear finding that there are fewer gaps in the resulting data for the trial-specific data collection than for the other approaches. This is to be expected since these data were collected solely for the purposes of EuRoWCas and the BRoWSER trial. However, the trial has also shown that much of the required data can be obtained from existing sources. The next work package in BRoWSER project will be developing the database design and data interface as a direct result of the trial. Modifications to the EuRoWCas data fields and, perhaps in some cases, modifications to existing data collection processes (if possible) will be carefully designed to maximise data quality without increasing effort disproportionately.

The trial has also provided an opportunity for end-user testing of the data collection spreadsheet and hence has identified specific refinements which will feed directly into the next work package. Some examples are the need to improve the usability of the tool in relation to multiple vehicle accidents and to increase or refine the number of options associated with some of the data fields in order to optimise the information obtained. More consideration needs to be given to the best way of recording ‘near miss’ events and how best to ensure consistent understanding of the definition of a ‘near miss’ as data collection continues and potentially becomes more widespread.