**CEDR Transnational Road Research Programme**
**Call 2013: Traffic Management**

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CEDR
Conférence Européenne des Directeurs des Routes
Conference of European Directors of Roads

# PRIMA
PRO-ACTIVE INCIDENT MANAGEMENT

# 2nd Progress Report

Deliverable D1.2b
December 2015

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY
TNO innovation for life
TRL Creating the future of transport
vti FINDING A BETTER WAY

# CEDR Call 2013: Traffic Management
# PRIMA
# Pro-Active Incident Management

## 2nd Progress Report
## (D1.2b)

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# Table of contents

# 1 Introduction

The aim of the CEDR programme is to realise the benefit of implementing innovation in traffic management solutions for National Road Administrations (NRAs). In this context, PRIMA targets the enhancement of current state-of-the-art Traffic Incident Management (TIM) techniques by introducing the idea of Pro-Active Incident Management with the following essential features: Anticipate, Prepare, Respond, and Monitor - anticipate that something may happen, be prepared to respond efficiently when the situation requires it, and monitor developments to minimize secondary effects.

The project work will build upon previous regulations, specifications and assessment studies regarding TIM. The **objectives** can be summarized as follows:

1. Provide clear guidance and recommendations for handling incidents and monitoring management performance and benefits, based on the assessment of risks and costs
2. Assess the technical, economical and organisational feasibility of innovative incident management based on novel technologies
3. Provide implementable solutions to facilitate proactive incident management for high-level road networks, at a transnational level.

This report summarises all activities performed in the **second reporting period from 01/02/2015 to 31/12/2015**, which includes activities in WP1 regarding organisational and management issues, as well as the research activities performed in WP3 and WP4. An outlook on future actions and work is given, before the report is concluded with a risk register and payment schedule.

# 2 Work progress

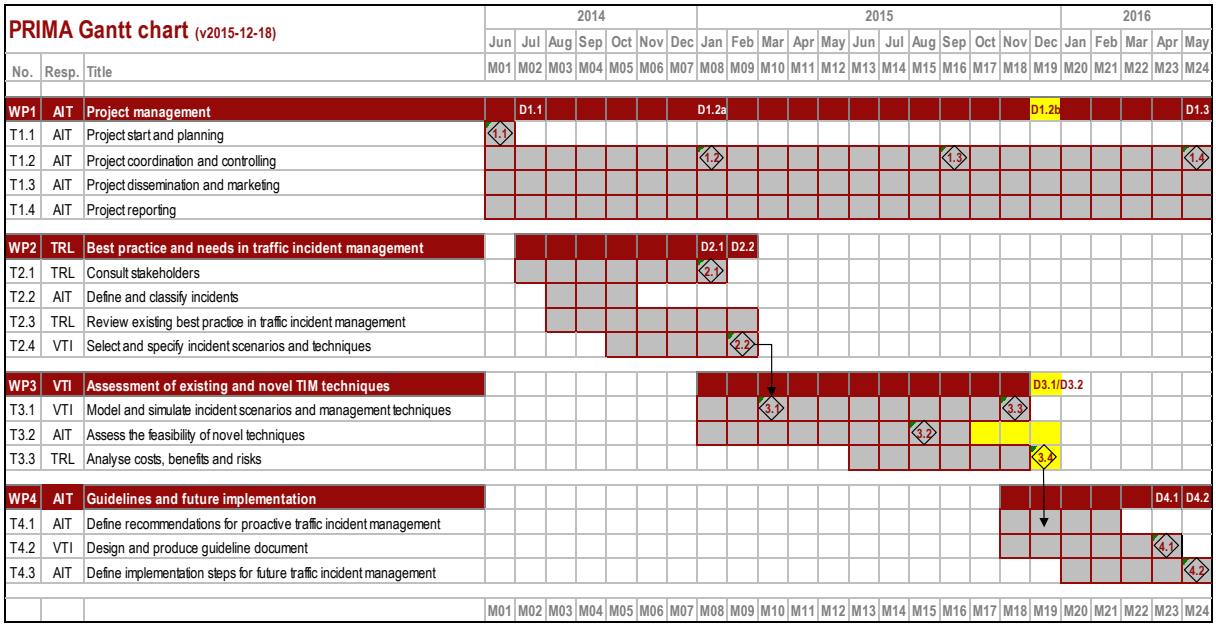
The following sections describe the activities completed in each work package and task. At the end of each section, a list of milestones and deliverables is given to show the status on work progress.

## *2.1 WP1 Project management*

WP1 involves the overall consortium management, dissemination and reporting activities.

The second interim meeting with participants from all partners was held from 28 to 29 September 2015 in Helmond, NL. In addition, monthly teleconferences are held, during which the project coordinator along with the WP leaders give updates on the work progress in the project.

The updated Gantt chart is given in Figure 1. A new milestone (M3.2) has been added to WP3, since this was found to be a crucial step towards the assessment. In consultation with the project officer, the second progress report D1.2b was moved to month 19, when WP3 is finished.




| No. | Milestone | Deadline |
|---|---|---|
| 1.1 | Inception meeting held | M01 |
| 1.2 | First interim meeting held | M08 |
| 1.3 | Second interim meeting held | M16 |
| 1.4 | Final meeting held, project ready for closure | M24 |
| 2.1 | Stakeholder needs obtained | M08 |
| 2.2 | Relevant incident scenarios specified | M09 |
| 3.1 | Specification of traffic model scenarios completed | M10 |
| 3.2 | **NEW:** Assessed performance indicators transferred to Task 3.1 | M15 |
| 3.3 | Traffic analysis of incident scenarios completed | M18 |
| 3.4 | Cost-benefit and risk analysis completed | M19 |
| 4.1 | Guidelines developed | M23 |
| 4.2 | Implementation steps defined | M24 |

| No. | Deliverable | Deadline |
|---|---|---|
| D1.1 | Inception report (DoW) | M02 |
| D1.2a | Progress report 1 | M08 |
| D1.2b | Progress report 2 | M19 |
| D1.3 | Final project report | M24 |
| D2.1 | Summary of stakeholder consultation | M08 |
| D2.2 | WP report including specification of incident scenarios | M09 |
| D3.1 | Assessment results of incident management procedures | M19 |
| D3.2 | Description and results of the CBA and risk assessment | M19 |
| D4.1 | The PRIMA guidelines | M23 |
| D4.2 | Description of implementation steps for future TIM | M24 |

**Figure 1: Gantt chart, milestones and deliverables. Changes/delays to the time plan in the previous progress report are highlighted in yellow.**

The delivery of D3.1 and D3.2 had to be moved to December 2015 due to slight delays in WP3. Nevertheless, WP4 was kicked off as scheduled. The project is expected to be finished on time in month 24 without overall delays.

In terms of organisational issues, the following updates can be reported:
Mr. Jeroen Uittenbogaard (TNO) replaced Mr. Lex van Rooij (TNO). Esra van Dam joined the TNO team. The updated project organisation is depicted in Figure 2.

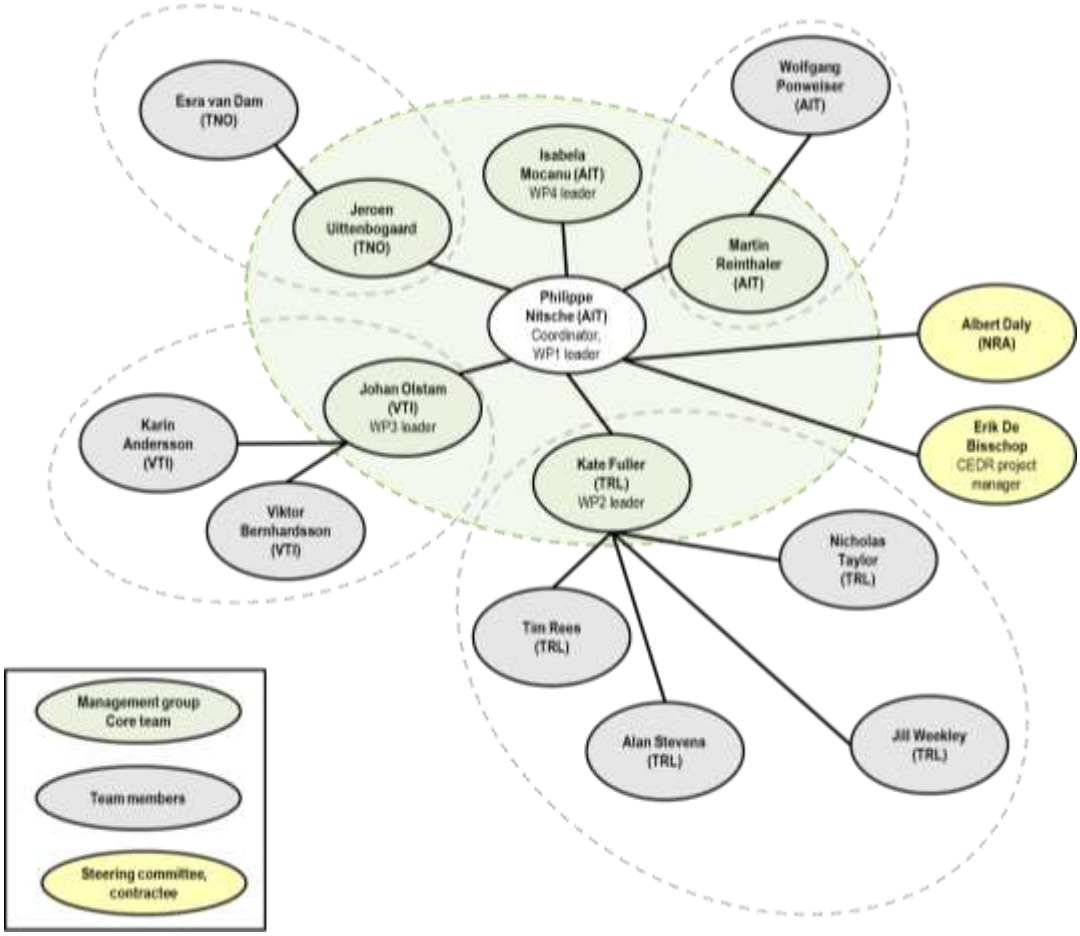



**Figure 2: PRIMA organisation chart**

**Milestones/Deliverables:**

| No | Milestones/Deliverables | Planned deadline | Status |
|---|---|---|---|
| M1.1 | Inception meeting held | June 2014 | Completed |
| M1.2. | First interim meeting held | Jan 2015 | Completed |
| M1.3 | Second interim meeting held | Sep 2015 | Completed |
| M1.4 | Final meeting held | May 2016 | On schedule |
| D1.1 | Inception report | July 2014 | Completed |
| D1.2a | Progress report 1 | Jan 2015 | Completed in Feb 2015 |
| D1.2b | Progress report 2 | Dec 2015 | Submitted hereby |
| D1.3 | Final project report | May 2016 | On schedule |

## 2.2 WP3 Assessment of existing and novel traffic incident management techniques

Planning of WP3 started at the kick-off meeting. WP3 started in January 2015, in connection with the first Progress Meeting, with aim of finalizing WP2 and handover from WP2 to WP3. WP3 looks to assess novel technologies and to estimate the risks and costs of the chosen combinations of incident scenarios and TIM techniques. An additional milestone has been added in WP3. The milestone is for the handover of results from Task 3.2 to Task 3.1 with respect to assessment of potential time and cost savings in the Discovery and Verification phases (of the TIM cycle) when using novel technologies.

In the following, the activities in the different tasks are described. For detailed results, it is referred to the deliverables D3.1 and D3.2.

**Task 3.1 Model and simulate incident scenarios and management techniques**

This task has started with planning of the framework for assessment of costs of congestion for the combinations of incident scenarios and techniques chosen in Task 2.4. The work in this task was closely related to Task 3.2 and 3.3. The amount of saved incident management time by using innovative techniques, as estimated in Task 3.2, is fed into this task of modelling and simulating the incident scenarios in order to estimate the traffic performance (e.g. travel time delay, queue length and incident duration) for different incident management techniques. Two different assessment methods were developed, one more advanced based on macroscopic traffic simulation using the Cell Transmission Model and one simpler but quicker based on a deterministic queue model.

The queue model was proven to be useful to conduct quick comparisons for different techniques given the start time of the incident, the travel demand profile, speed limit, number of lanes, etc.

In addition, the macroscopic cell transmission simulation model was applied to investigate the effect of different scene management techniques in more detail. The cell transmission model has longer execution times but gives a more detailed description of changes in the traffic state due to an incident and different incident management techniques. The simulation model takes on- and off ramps into consideration and can capture variations in the travel demand at a higher level of detail. Hence, for more complex motorway sites with recurrent incidents, a local calibrated macroscopic traffic simulation model would be a more preferable decision support tool for scene management.

As a result of this task, the overall travel delay, queue length and incident duration were calculated for a high variety of incident management techniques and scenarios. Those numbers were fed into Task 3.3, where the cost-benefits were calculated.

**Task 3.2 Assess the feasibility of novel techniques**

The objective of this task was to assess novel and innovative techniques for incident management. This involves solutions for detecting, classifying and verifying incidents based on promising technologies that are likely to be wide-spread in the near future, e.g. eCall, xFCD or C-ITS.

The assessment was carried out step-wise as follows:

- Identification and definition of performance indicators, including time relevant and quality relevant indicators,
- Categorization and pre-selection of promising novel techniques and technologies and
- Qualitative assessment to describe the feasibility of novel technologies for incident management.

The results of the qualitative assessment were compiled to possible time savings used in the traffic performance assessment (Task 3.1). In order to describe the feasibility of in-vehicle data to improve incident verification data, a method for injury severity estimation (called Advanced eCall) was analysed. The results of this task were achieved on schedule, the method and results are documented in D3.1 (Assessment results of incident management procedures).

### Task 3.3 Analyse costs, benefits and risks

The assessment results with respect to novel technologies and more traditional scene management techniques have been fed into a cost-benefit analysis, which is described in the separate PRIMA deliverable D3.2.

This task assessed incident scenarios identified in Task 2.4, the enhanced TIM techniques identified in Task 3.2, drawing on extensive recent data on incidents. Four incident scenarios were modelled assuming a range of traffic demand levels and initial response times, and applying different pro-active management techniques. Benefits of reduction of delay and secondary accidents were assessed in monetary terms and compared with the costs of interventions where available, with evidence-based assumptions about accident rates and value of time. Evidence on some technology and operational costs, including eCall, were presented, and risks that might be mitigated by the implementation of new procedures identified. While there is unavoidable uncertainty, there is evidence that pro-active techniques can deliver large absolute benefits.

The method and detailed results are documented in D3.2 (Description and results of cost-benefit and risk assessment).

### Milestones/Deliverables

| No | Milestones/Deliverables | Planned deadline | Status |
|---|---|---|---|
| M3.1 | Specifications of traffic model scenarios completed | Feb 2015 | Completed |
| M3.2 | Assessed performance indicators transferred to Task 3.1 | Aug 2015 | Completed |
| M3.3. | Traffic analysis of incident scenarios completed | Sep 2015 | Completed in Nov. 2015 |
| M3.4 | Cost benefit and risk analysis completed | Nov 2015 | Completed in Dec. 2015 |
| D3.1 | Assessment results of incident management procedures | Sep 2015 | Submitted in Dec. 2015 |
| D3.2 | Description and results of the CBA and risk assessment | Nov 2015 | Submitted in Dec. 2015 |

## 2.3 WP4 Guidelines and future implementation

The activities have commenced in November 2015.

**Task 4.1 Define recommendations for proactive traffic incident management**
This task has started with an overview of current national guidelines across CEDR, as well as a review of the questions in WP1 survey that were related to guidelines that various NRAs use.

**Task 4.2 Design and produce guideline document**
Based on the data analysed in Task 4.1, as well as consultations with the Project Officer, the general framework of the PRIMA guidelines has been defined. The guidelines would aim at Regional/National traffic managers and National Road Authorities; however it will not replace national TIM guidelines. The scope will be to guide authorities for new investments into proactive incident management, by providing the added value of novel techniques in terms of costs, benefits and risks.

It is envisioned that the guidelines will be more general for a wider target group, rather than to serve the specific requirements of a single road authority.

**Task 4.3 Define implementation steps for future traffic incident management**
The activities of this task will commence in January.

**Milestones/Deliverables**
It was suggested by the project officer that deliverables D4.1 and D4.2 should be merged into a single document. This proposal will be checked with the PEB.

| No | Milestones/Deliverables | Deadline | Status |
|---|---|---|---|
| M4.1 | Guidelines developed | Apr 2016 | On schedule |
| M4.2. | Implementation steps developed | May 2016 | On schedule |
| D4.1 | The PRIMA guidelines | Apr 2016 | On schedule |
| D4.2 | Description of implementation steps for future TIM | May 2016 | On schedule |

# 3 Planned activities

## 3.1 WP1 Project management

The next activities within WP1 include:

- Dissemination activities: Oral presentation of PRIMA at the TRA 2016 conference
- Final project meeting, May 2015 in Sweden or Vienna.
- Communication and coordination with the funding organisation and the consortium members
- Correspondence with the project coordinators of METHOD and UNIETD
- Financial management and distribution of funding to the project partners
- Risk management, including risk analysis and updated risk register

## 3.2 WP2 Best practice and needs in traffic incident management

The work within this WP has been completed.

## 3.3 WP3 Assessment of existing and novel traffic incident management techniques

The work within this WP has been completed.

## 3.4 WP4 Guidelines and future implementation

The activities have commenced in November 2015.

**Task 4.1 Define recommendations for proactive traffic incident management**
The next steps in this task include the further definition of the PRIMA Guidelines. WP3 results will be transferred to recommendations for TIM techniques. With the inputs provided from previous WPs on incident scenarios, existing and novel, enhanced TIM techniques and risks and costs analysis, the guide will convey in a comprehensive approach how to deal with different types of incidents in a proficient manner.

**Task 4.2 Design and produce guideline document**
After consultations with the project officer, it was proposed that the design of the guideline will no longer be a top priority and resources would be shifted towards the other WP tasks. In order to maximise the acceptance of the guidelines for the CEDR NRAs, a sample of the guideline will be developed and send to the PEB for feedback. If accepted, then the recommendations from Task 4.1 will be incorporated and relayed accordingly.

**Task 4.3 Define implementation steps for future traffic incident management**
The activities of this task will commence in January 2016. The objective is to identify the key control parameters that are essential in defining the business models for implementing future TIM techniques. Key control parameters define, who utilizes which resources and who does which activities and influences the distribution of cost, risks and benefits in the value network.

The scenarios and novel techniques selected in WP2 and WP3 will lead to the development of multiple business models for implementing future TIM procedures. Several applicable business models will be investigated, which will cover public, private or mixed partnerships. However, based on the assessment of risks and costs performed in Task 3.3, selected business models will be defined for specific scenarios with the most promising technologies. Value networks will be used to describe how organisations (roles) collaborate in creating value for TIM, while also taking into consideration input from the stakeholders.

# 4 Project risks

With regards to the risk register presented in the inception report D1.1, the following risks were identified (see Table 1), which were and will be relevant in the previous and upcoming project phases.

**Table 1: Risk table**

| Risk description | Potential Impact | Risk mitigation |
|---|---|---|
| Lack of accident data | Negative impact on project delivery: Novel technologies for incident classification (injury severity) cannot be fully assessed for collision scenarios | Possible incident scenarios involving collisions were considered in an early project stage. Preliminary data access requests were done by TNO to check availability. |
| Scenarios cannot be applied by our methods | Not all scenarios can be assessed and included in the guideline, which may lead to unsatisfied stakeholders | Possible incident scenarios were considered in an early project stage. 1) We only defined TIM scenarios that we can assess, 2) We might consult a subcontractor for work we cannot assess by ourselves |
| No adequate existing software tools available | Additional software must be purchased, which involved an internal shift of costs; OR not all scenarios can be assessed and included in the guideline | We only defined scenarios that we can assess. If necessary, we might purchase additional tools and shift costs. |
| Needs of stakeholders are not adressed | Stakeholders and the PEB are not satisfied with the guidelines | Regular consultation of stakeholders. Before producing the recommendations and guidelines in WP4, consult relevant stakeholders. |
| List of scenarios do not include collisions | Negative impact on project delivery: TNO cannot conduct the assessment of injury level classification methods | One of our four scenarios includes a collision incident, as it was defined as highly relevant in the stakeholder consultation phase. |
| Legal changes and their implications | Chance of legal circumstandes can lead to invalid recommendations for the PRIMA guideline, especially when it comes to data access, privacy or liability issues. | Check for legal developments in the field of TIM in order to react before writing the recommendations. |
| Delays regarding the guideline | Project end must be postponed. | The production of the guidelines must be planned ahead. Upcoming delays must be communicated early enough. A cost-neutral project extension must be discussed with the NRA/PEB. |
| Level of detail for guidelines is inadequate | Stakeholders cannot use the guide because it has not enough detail OR the guidelines are too comprehensive to be applied | Discuss with stakeholders early enough, what level of detail is desired. Also clarify the format to produce the guidelines. |
| Change of key personnel | Key tasks cannot be fulfilled due to change of level of expertise or lack of available other persons. This can results in delays and/or modification of objectives. | Brief the new key personnel on PRIMA and clarify open questions. Choose an expert who is able to fulfill the tasks in PRIMA. Extend WPs or the project end date if necessary |

| | | |
|---|---|---|
| Too many scenarios of interest | Not all scenarios can be assessed and included in the guideline, which may lead to unsatisfied stakeholders | To keep the work effort in a reasonable frame, four scenarios with an appropriate number of variables have been defined. |
| Conflicting needs/requirements of different stakeholders | Certain stakeholders and the PEB are not satisfied with the guidelines | Try to find a good mixture of different needs (covering different countries) and set the scenarios accordingly. Together with the stakeholders, find a consensus/common ground in the list of scenarios. Eventually, discard the scenarios we cannot assess with our methods and discuss it with the stakeholders. |
| Number of scenarios too low for guidelines for stakeholders | The PRIMA guidelines are not useful enough for the stakeholders, because they require more scenarios. | By choosing four scenarios with an adequate number of variables, we found a consensus between stakeholder requirements and reasonable work effort. |
| Lack of stakeholder response and/or availability | Important information is delivered too late, which may lead to delays in the project AND/OR the guideline may miss the point and is not useful for TIM | This risk occurred in terms of poor response to the web survey and led to a delay of WP2. By being more pushy and contacting relevant persons individually, the number of respondents could be increased to a reasonable amount. |
| Non-quantifiable assessment of costs, risks and benefits | TIM techniques cannot be compared, because they are not quantifyably measurable. This may lead to an incomplete assessment only based on qualitative performance of TIM techniques | At the interim meeting, we identified the interplay between the technical assessment and the cost-benefit and risk analysis. They are linked by quantifiable indicators such as improved delay/travel times, accident costs etc. |
| Non-objectives and scope become unclear | Misunderstandings within the project team, without regular communication, WP subteams may work in the wrong direction, i.e. out of the scope | The scope has been clearly defined in the inception report. The coordinator always keeps the project in scope and recognizes deviation. Discuss possible scope changes, e.g. due to inputs from the PEB, within the team. |

# 5 Finance

Personnel and travel costs incurred according to the project plan. The payment schedule is given in Table 2.

**Table 2: Payment schedule**

| Payment | Planned payment date | Status | Amount in € |
|---|---|---|---|
| First rate for reporting period 05/2014–07/2014<br>Associated with D1.1 (inception report) | 08/2014 | Paid | € 31,345.60 |
| Second rate for reporting period 08/2014–02/2015<br>Associated with D1.2a (first progress report) | 03/2015 | Paid | € 125,382.34 |
| Third rate for reporting period 03/2015–12/2015<br>Associated with D1.2b (second project report) | 01/2016 | Planned | € 125,382.34 |
| Final rate for reporting period 01/2016–05/2016<br>Associated with D1.3 (final report) | 06/2016 | Planned | € 31,345.60 |

# 6 Acknowledgement

The work presented in this report was carried out as part of the CEDR Transnational Road Research Programme Call 2013. The funding for the research was provided by the national road administrations of Belgium-Flanders, Denmark, Finland, Norway, UK and Netherlands.