Institute of Transport Economics
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Summary

Road traffic incidents, delays and benefits of faster notification

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In this report, we examine the extent of incidents on the road network and the consequences these have for traffic in the form of queues and delays. The purpose is to highlight the benefits of faster notification of incidents – both to those clearing the road and road users. We conduct analysis of selected cases in the form of individual incidents on the E18 west of Oslo with significant consequences for traffic, as well as more general analyses that illustrate the total extent of incidents and their consequences. The results show that there are very many incidents, some of which have major consequences, while most probably have minor or no consequences. In order to provide concrete estimates of the benefits of faster warning, we need more knowledge about the consequences of a typical incident.

On a typical day, several hundred incidents are registered on the Norwegian road network. Most of these are insignificant to traffic, while some have major consequences. In this report, we examine the extent and consequences of the incidents in more detail, with the purpose of illustrating the benefits of faster notification. Firstly, faster notification means that those who need to clear the road can move out more quickly, and that the road can thus be reopened earlier. Secondly, it means that travellers are informed about the incident more quickly, and that they thus have increased opportunities to adapt. We only look at unforeseen events, and only at the consequences for traffic in the form of queues and delays. We do not consider other impacts or the cost of the improvement.

The cost of a traffic incident depends on:

1. The duration of the event
2. How many vehicles (and any other road users) are affected
3. The impact (time loss) per vehicle
4. The cost of the time loss

For some types of incidents, the impact per vehicle will be greater the longer the incident lasts. This applies if the road is completely closed or there are major capacity problems, road users have few alternatives, and queues form. For other types of events, the consequences are the same regardless of duration. This applies if the road is only partially closed, or road users have good alternatives to driving this link.

There is some previous literature on queuing costs and delays, but not many studies combining empirical analyses of the consequences of events and cost-benefit analysis. In a relevant study from the Netherlands, the authors calculate the effect of the duration of individual events on congestion throughout the motorway network. They find that events contribute significantly to non-regular queuing, and that a minute's shorter duration would yield a gain of €57 for an average event. For congested stretches, the gains can be significantly greater. However, the dataset only includes events of known duration and stretches where there is also some regular queuing, which implies higher gains.

There are large amounts of data that can be used to quantify the consequences and costs of traffic incidents. This includes data on individual incidents, travel time data and data on traffic volume. However, there are few established *methods* for combining and analysing such data. For example, it is not obvious how an incident at a geographical point should be linked to consequences on a road link. Another challenge is to distinguish the consequences of different incidents from each other and from other factors that affect traffic. Developing a framework for statistical analyses of the entire range of events is outside the scope of this project. Instead, we combine different methods and data sources to get an idea of the extent and consequences of incidents. This can form the basis for more formal analyses in future studies.

We analyse selected cases in the form of three individual incidents (traffic accident or car salvage) on the E18 highway west of Oslo. We identify the events in time and space and combine this with travel time data and data on traffic volume for the route. The examples show that even with this procedure it is not clear which event is the cause of the delays, but in all three examples there seems to be a causal relationship. For the most extensive incident, an 80-minute delay has been measured in afternoon westbound traffic. The volume of traffic is also significantly lower than normal, suggesting reduced traffic flow. For this incident, the gain from two minutes faster warning would have been in the range of NOK 90,000–160,000.

Furthermore, we analyse the total extent of delays on the E18 between Skøyen and Asker, regardless of the cause. For westbound traffic, we see – as expected – that it is primarily during the afternoon rush hour between 2pm and 6pm that delays occur. Here, 9 percent of observations involve a delay of at least 15 minutes. For eastbound traffic, most of the delays occur during the morning rush hour. Here, 14 percent of observations involve a delay of at least 15 minutes. Outside of rush hour, there are very few cases of long delays.

We have been given access to data for all recorded incidents on the road network in the period October 2021-September 2022. In total, there are approximately 111,000 incidents, divided into different categories as shown in Figure S1. The data includes information about the time and duration of the event. In addition, we have calculated traffic volume per incident based on nearby counting points. We find that

- Roadworks, obstacles and 'internal notifications' are the most common categories of incidents
- Roadside assistance incidents are usually of relatively short duration, but occur on high-traffic roads and often during the afternoon rush hour
- Incidents involving obstacles and traffic accidents are also of relatively short duration and occur on medium-high traffic roads. Traffic accidents also often happen in the afternoon
- Incidents related to ferries, driving conditions, technical equipment and 'internal notifications' have a long duration, but occur to a greater extent on roads with relatively low traffic, such as county roads

To get a more complete picture of the extent of traffic incidents and their consequences, we have also looked at media coverage using the media archive Retriever. A delimitation that

seems to work quite well is to search all the sources in Retriever that are named something with "NRK" (the national broadcaster) and "short message", for example "NRK Møre og Romsdal short message". This gives us news messages about the events the first time they are reported, but not other news stories about, for example, advice for Easter traffic or court cases about previous accidents.

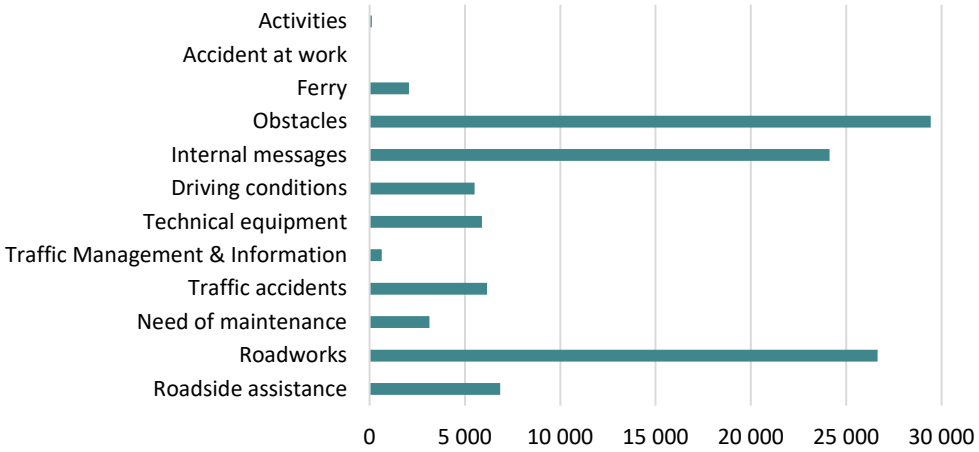

Figure S1: Number of events per category in the event data.

Figure S2 shows the number of articles per week that contain the word "queue" and at least one of the words "car*" and "traffic*". This equates to 627 total hits in 2022, averaging 1.7 per day. A spot check for a selected day shows that eight out of ten hits can be linked to traffic incidents. When we narrow the search to include only cases with words that can be linked to traffic accidents and car salvage, we get 223 hits (0.6 per day). More than a third of the incidents that create queues and that are reported in the media hence appear to be related to traffic accidents or car salvage.

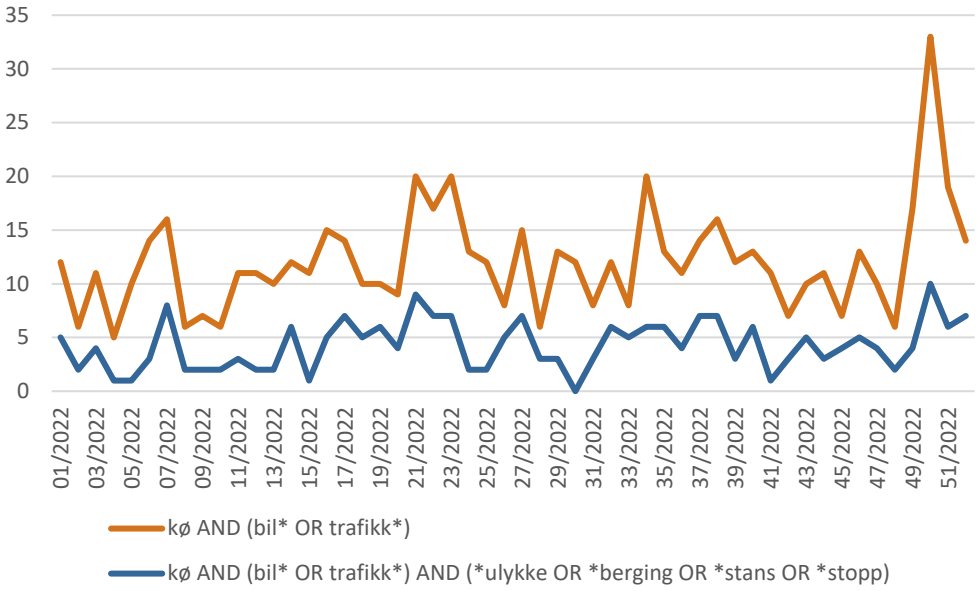

Figure S2. Number of short online news messages per week from the public broadcaster NRK, by search keywords. Source: Retriever.

Based on these results, we show computational examples where we illustrate how to quantify the benefits of faster notification for the entire range of incidents. We do not include road-works, as these are typically announced in advance. The results depend largely on what one assumes about the consequences of a typical event. Some of the incidents have major consequences, while the vast majority probably have very little or no consequences. The uncertainty is particularly high in relation to the category "Obstacles", which is the most common category of unforeseen events. Our lower estimate of the gains of two minutes faster notification is NOK 5 million per year, while our higher estimate is 50 million per year. We emphasise that there is considerable uncertainty in these estimates. In order to provide concrete estimates of the benefits of faster warning, we need more knowledge about the consequences of a typical incident.

This report shows that there is a large number of unforeseen events on the road network, and that the benefits associated with avoiding or reducing the consequences can be large for some types of incidents. The analyses also illustrate that there are large amounts of data related to traffic incidents that have been exploited to a fairly limited extent previously. There may be many opportunities for further research here, both related to traffic management, traffic safety and socio-economic analysis.