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

PRESORT

PRESORT
Improving the use of third-party data by NRAs
Baseline report

October 2023

Document control

Document Title	PRESORT: Capture Baseline report
Owner	PRESORT consortium
Distribution	Project team
Document Status	Final

Version	Date	Description	Prepared by
0.1	16/11/2023	Draft for comment	C. Spillard
1.0	19/01/2024	Final	S. Stephenson

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Executive summary

The objective of PRESORT is to deliver an evidence-based decision support guide that can be used to enable National Road Authorities (NRAs) to make better decisions regarding how and when to acquire and use third-party transport data. The project is in response to the CEDR Transnational Road Research Programme Call 2022 – Data.

This report covers the project's first stage: a literature search to capture the current state of third-party data usage, and feedback from a questionnaire to relevant organisations on their experience of the use of third-party data, including:

- Quantitative research of NRA third-party data utilisation and transport data, including its reliability
- NRA challenges, for example issues around GDPR constraints

Sources of information include NRAs' own sites[1], government reports and legislation (throughout the EU), standards (for example ISO), industry and professional news, academic papers, and industry reports.

This report is intended for strategists and planners within NRAs, data providers, data-related service providers, urban transport authorities and planners, and road user organisations.

After a brief introduction and background section, the following sections cover the scale of third-party data use by NRAs; data use examples; challenges, and relevant standards and legislation.

This report highlights the use of third-party data by NRAs is a rapidly-evolving field with a large number and wide variety of agents. Identifying robust reports and analysis was challenging, including detailed use cases with thorough evaluation, but future phases of PRESORT will explore this area in more detail.

[1] A list of relevant NRAs can be found here: https://www.cedr.eu/data-surveys

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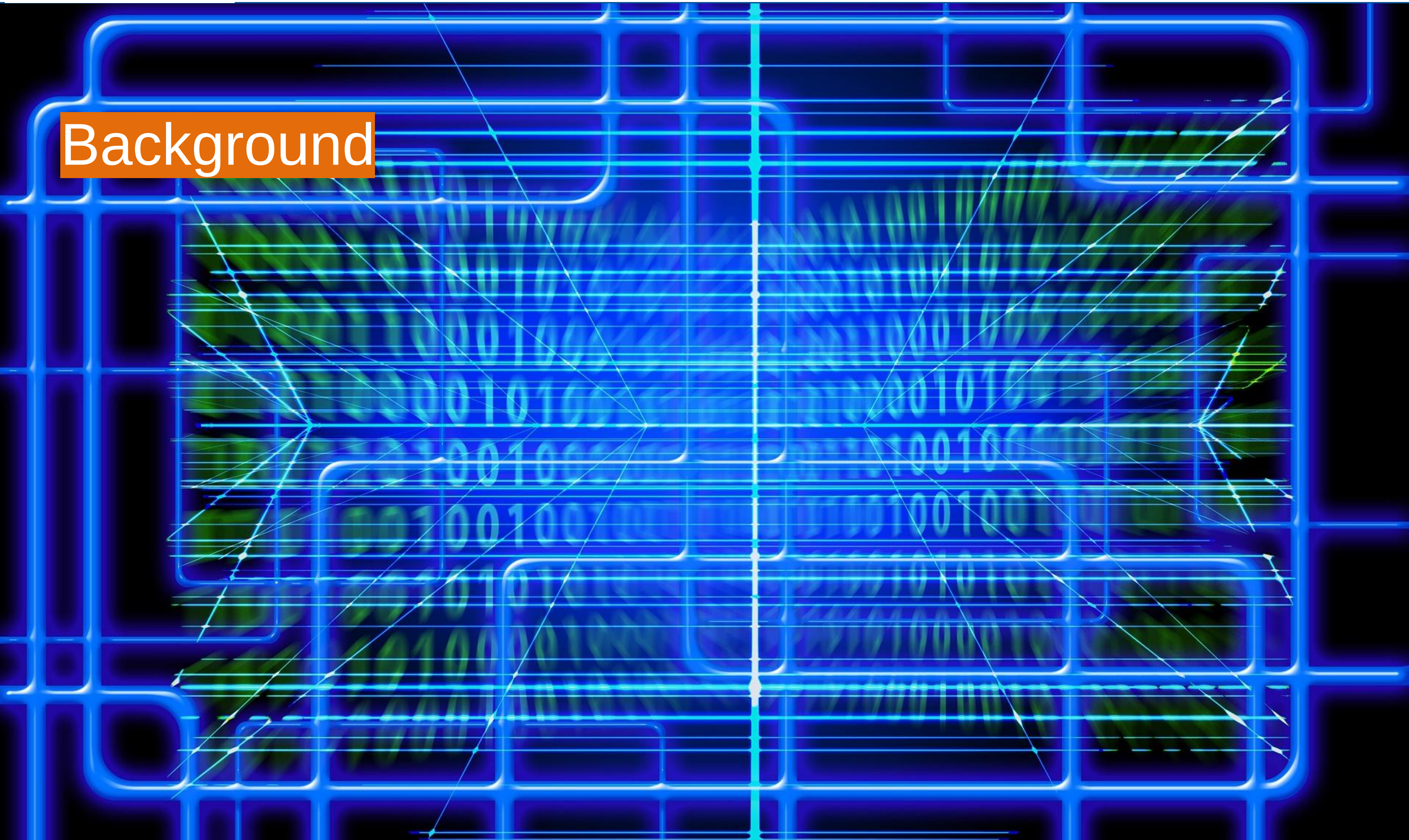
Background



Introduction

Purpose of this report

The objective of **PRESORT** is to deliver an evidence-based decision support guide that can be used to enable National Roads Authorities (NRA)[1] to make better decisions regarding how and when to acquire and use third-party transport data. As part of this work a survey of sources and current use of third-party data, as well as legislative and standards considerations, was carried out. This report details the findings.

What is third-party data?

Third-party data is aggregated or collated by a provider not involved in the original collection of the data. The data is then provided to an NRA. It includes data from sources such as:

- Vehicle manufacturers
- Suppliers of in-vehicle technology (for example Bosch, AISIN, NIIRA Dynamics)
- Navigation and fleet management systems (for example HERE, TomTom, INRIX)
- Private mobility providers (for example, Uber)
- Specialist road condition data including weather (for example, NIRA Dynamics, Vaisala, Meteorological office)
- Other environmental monitoring services (for example, for air quality and noise)

Who is the intended readership?

This report can be used by those in the following roles:

- **Strategists and planners**. Creating long term plans and strategies for data use on highways, for example in the fields of transport planning, safety, and environmental factors such as air quality.
- **Scheme developers**. Completing feasibility studies, supporting procurement decisions.
- **Road pricing system providers**. Strategic (price setting) or operational (billing)
- **Road safety system providers**. Prevalence and type of collisions and near misses.
- **App developers**. Using data as input to apps, for example on road condition or parking availability
- **Data providers**. (Owners of data) making data available for use by any of the above parties

[1] A list of relevant NRAs can be found here: https://www.cedr.eu/data-surveys

The definition of third-party data for PRESORT

The term third-party data has a varied definition depending on the domain. For the purposes of PRESORT, the following definitions apply.

First-party data

Data which the NRA collects using their own equipment or resources. For example:

- Location and type of roads on the network
- Cycling infrastructure
- Location and type of signage
- Temporary conditions (for example, diversions and speed limit changes due to road works)
- Hazard locations (accidents, adverse weather)
- Traffic counts and real-time data

Second-party data

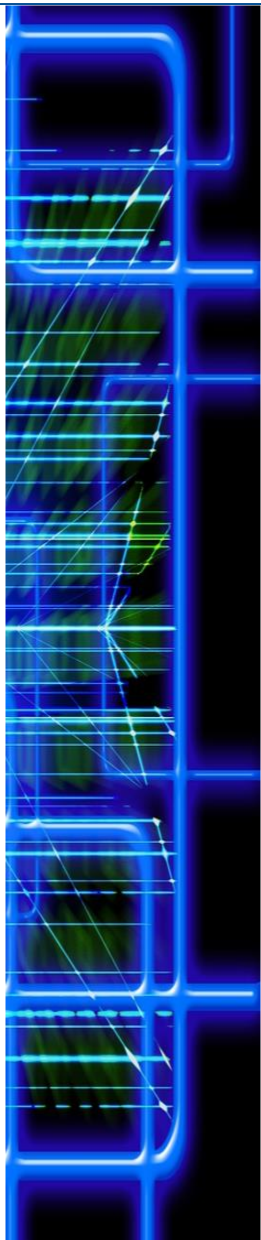
Data which the NRA gets collected for them by others, most commonly as part of a commission. For example:

- Traffic data collected by subcontractors (for instance, a survey company)
- Traffic data collected by citizens (for example, due to safety concerns)

Third-party data

Data aggregated or collated by a provider from other sources. The provider may not be the original collector of the data. For example:

- Data from sensors on vehicles, from mobile phones, and navigation systems
- Environmental data (for example, weather or air quality) from specialist providers
- Data from public transport
- Data from other NRAs and other road operators



Data source: Traffic data

Third-party data is created from sources which collect, process, use and share data, such as:

- Vehicle manufacturers and their tech suppliers
- Navigation and fleet management systems
- Private mobility providers
- Providers of specialist road condition data including weather
- Telecom operators
- Other environmental monitoring services (for example, for air quality and noise)

The use of such data is common in countries such as Sweden and the UK for traffic management entities. It provides a more accurate real-time picture of the traffic situation than legacy approaches.

However, NRAs have not yet fully exploited the above listed data sources, which have the potential to contribute to their core goals relating to road user safety, traffic management and optimisation, and environmental impact. GDPR and data validation and quality are commonly stated issues, if these data sources are to be used.

For example, NRAs have explored the use of *Floating Vehicle Data* (FVD), also known as Floating Car Data (FCD) or Probe Vehicle Data (PVD). This is data generated by vehicles, each one of which is used as a sample to assess the overall traffic condition. Typically, this data comprises basic vehicle telemetry such as speed, direction and, most importantly, the position of the vehicle. FVD can be obtained by tracking devices based on GNSS or cellular positioning data. The latter generally results in lower-accuracy data.

NRAs interest towards FVD data rises from its good network coverage and its potential to substitute for costly roadside equipment (for example, for the measurement of journey time). FVD has strong potential to provide more accurate data than fixed monitoring equipment, it is dynamic, fills in gaps between fixed nodes, is essential to transport planning, and can provide a wider network level overview.

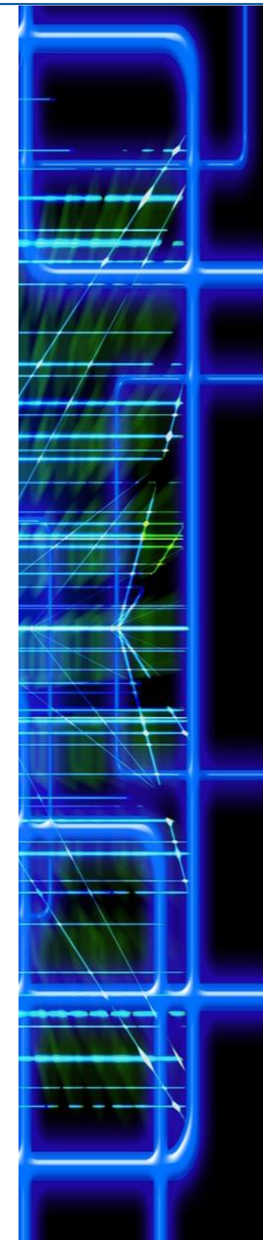
Data source: Connected vehicles

The report Driven by Information (part 2) defines connected vehicles as:

'*any type of vehicle or person that can generate, transmit and receive/process data. Connection can be with other road users and vehicles, with infrastructure, and with vehicle manufacturers, data providers, insurers and services like mapping and satnav companies, generally over existing cellular networks.*

Data generated by or about a vehicle might include road condition (for example, from detecting poor grip), traffic conditions (from vehicle speed and location) and about driver behaviour (such as aggressive acceleration and rapid braking). Data transmitted into the vehicle is generally aimed at informing the road user's decisions (for example, via satellite navigation, or satnav, services) and, in due course, is set to play a fundamental part in enabling highly automated systems.'

Connected vehicles[1] are rapidly becoming more common and therefore their ability to provide data with good event and network coverage is expected to increase in the near future.



[1] SAE J3216_202107 defines the updated term as cooperative automated driving system (C-ADS) equipped vehicle.

Data source: Public transport

For public transport, third-party data is data collected by a party who is neither the operator nor any party directly connected with them – for example, subcontractors. Public transport data is commonly collated by government organisations for unlicenced use. The differences between first-, second-, and third-party data are described below:

First-party data include the operator's own data, such as:

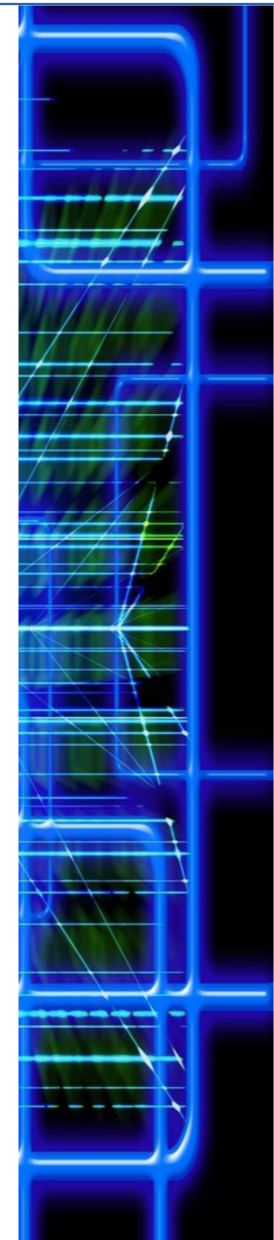
- People counting data including turnstile/entrance counter data, surveillance camera data, sensor data, QR code, smart card data, surveys, Wi-Fi probes and manual tallies.
- Payment or ticket sales data.
- Smart card data, if it has not been outsourced, in which case it would be second party data.
- Schedule and route data.
- Vehicle condition, historic servicing and location data.

Second-party data include:

- Data from repair vendors around specifics of servicing costs.
- Demographic data from payment providers on riders' socioeconomic factors.
- Data from equipment vendors on servicing costs from other transport systems.

Third-party data include:

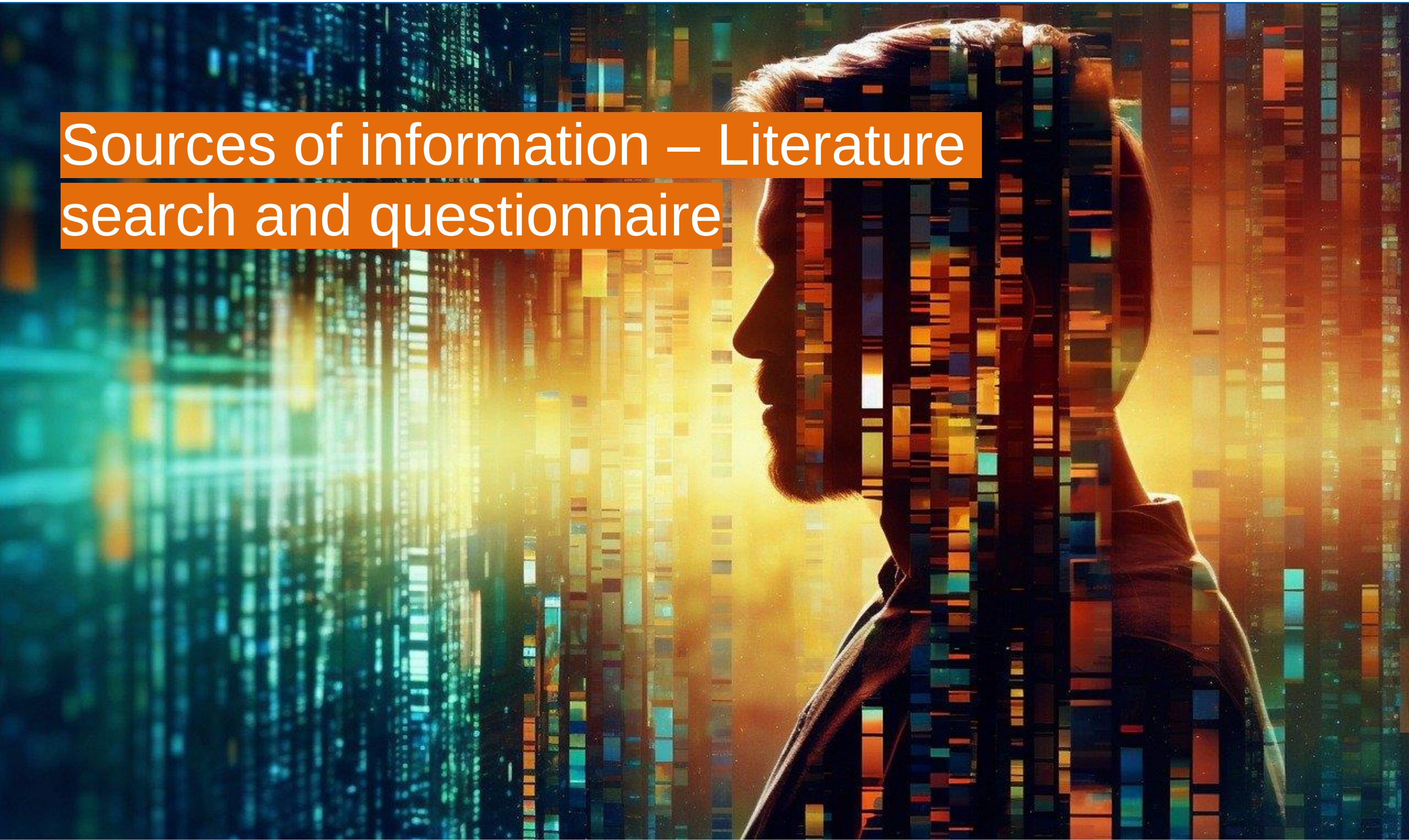
- Geolocation or geospatial data like satellite data and General Traffic Feed Specification data to track exit station/stop.
- Mobile phone geolocation data to track the actual number of people boarding the system, how far they travel to reach a station and how many unique riders there are.
- Credit card data from data aggregators to track overall transport revenue compared to similar systems in other cities or countries.
- Web scrapes of fares from other transport systems over time.
- Weather and traffic forecasts to back delay and cancellation predictions.
- Social media data for passenger sentiment analysis.



Opportunities and challenges in the use of third-party data

Opportunities	Challenges
- Improved sustainability of transport systems. - Improved resilience of transport systems. - Improved security of transport systems. - Greater trust from road users of transport data such as journey times. - Increased road user satisfaction. - Exploitation of data already being generated. - More efficient use or transport systems. - Reduced investment in new infrastructure. - Access to mature or maturing markets to drive improvements in quality and lower costs. - Timely use of data being collected by vehicle probes. - Wider network coverage. - Access to new business models.	- Most data from third-party sources not being readily available to NRAs. - Poor or unverified quality and reliability of third-party data. - Limited accessibility due to technical, commercial and/or legal reasons for example, no common use of standardised exchange formats. - Lack of compatibility of third-party data with legacy data or data management systems. - Lack of NRA understanding of third-party data sources. - A shortage of in-house data skills and experience. - The need for appropriate data governance to ensure ownership, security, trust and privacy. - Lack of an established procurement processes to acquire data from third-party sources. - Lack of comparable evidence on cost and benefits. - Limited understanding of appropriate business model and/or service level agreements. - Legislative barriers, for example GDPR. - Privacy considerations, leading to possible concerns about public acceptance.

Sources of information – Literature search and questionnaire



Sources of information – Literature search

A search of available academic, commercial and government literature and reports on data legislation, provision, and use was carried out.

The search was phrased as a 3-part question:

1. What is the extent of use by NRAs of third-party data (for instance, what third-party data is used by NRAs at scale today?)
2. What are the sources of third-party data?
3. What are the legislative constraints, and what are the possible solutions to these?

Search terms included:

- National road use of third-party data
- National Highways
- National Roads Authority
- <country-name> roads digital
- “Third-party” roads digital
- “Third-party” roads digital database
- Transport data ecosystem
- *Transport donnees*
- *Daten zum Thema Transport*
- *Gegevens over transport*
- “Third-party” transport digital
- Transport data sharing
- <firm-name> system data

The search yielded a total of 280 items, of which 150 were relevant for this report.

Sources of information – Questionnaire

The purpose of the questionnaire was to gauge the extent of the use of third-party data, and to elicit participants' experience and attitudes to its use.

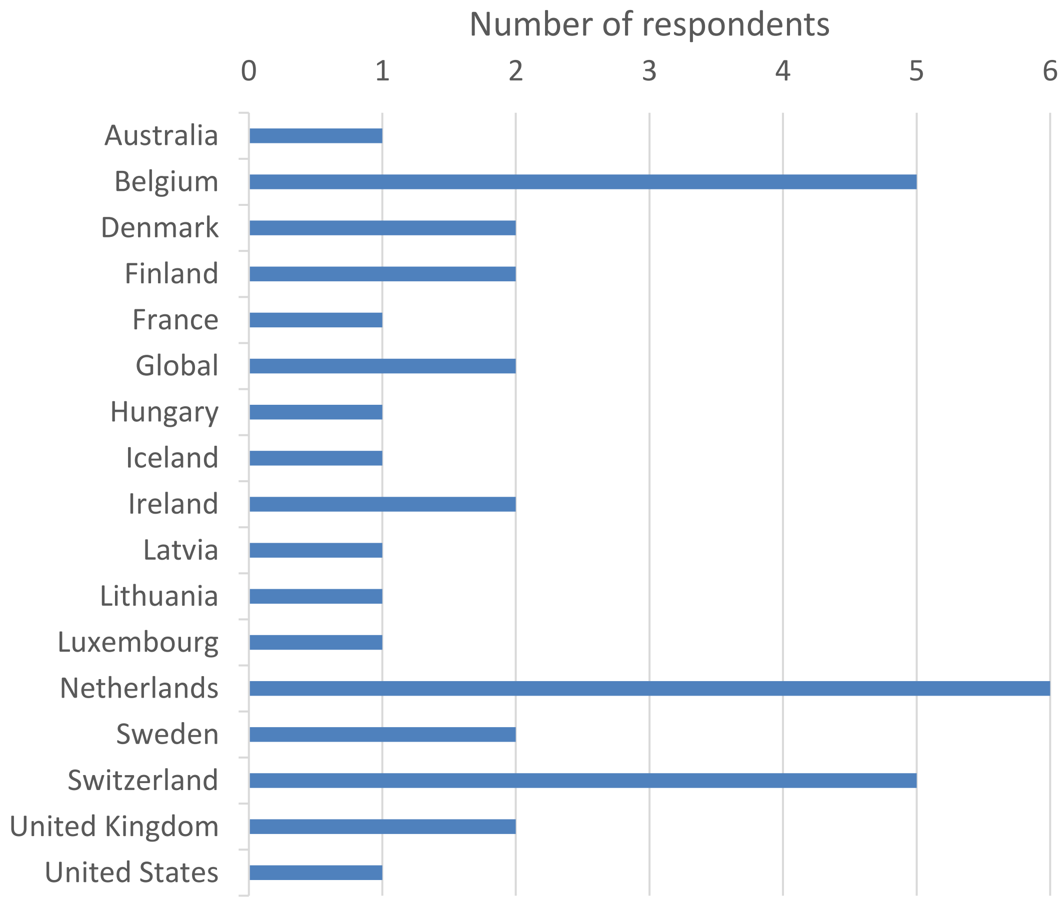
Recruitment was targeted at 79 individuals identified as experts in this area, as well as distribution within the sponsoring NRAs through the PEB. The result was 34 responses. The questionnaire included both narrative and multiple-choice questions. Selected quotes from responses to the narrative questions are included in these slides to add context for each section (highlighted in purple boxes, as shown below).

The questions included:
- What is your involvement in relation to third-party data?
- For what purpose does your organisation use third-party data?
- Which organisation(s) provide the third-party data? (Narrative)
- What type(s) of third-party data are used?
- Do you have any comments regarding reliability? (Narrative)
- What barriers or challenges are there to using third-party data?
- Rate your organisation's maturity level in using third-party data (1 – 5)
- What are the risks to using third-party data? (Narrative)
- Are data management systems ready to handle third-party data? (Y/N)
- Do the people in your organisation have the skills to use third-party data? (Y/N/Other)
- Do third-party data providers understand the needs of NRAs? (Y/N/Other)
- What activities could NRAs improve with third-party data? (Narrative)
- Are data standards fit for purpose regarding the use of third-party data? (Y/N/Other)
- Do you have links to any literature or reports covering any of the topics mentioned? (Narrative)

Questionnaire feedback
These purple boxes provide examples of narrative feedback throughout this report.

Questionnaire respondents

Responses came from a broad variety of sources.



Administration des ponts et chaussées

Agency for Roads and Traffic - Flemish government

ASTRA Filiale Zofingen, Erhaltungsplanung

Bridgestone Mobility Solutions

CDM Smith

Compass IoT

ERTICO - TN-ITS platform

F2S2 gcv

Federal Roads Office, Switzerland

Finnish Transport Infrastructure Agency

Flemish Road and Traffic Agency

Gaist Solutions Limited

GEWI AG

Hungarian Public Roads

INRIX

Latvian State roads

Lithuanian Road Administration

Monotch

NDW (Dutch National Road Data Portal)

Rijkswaterstaat (Dutch National Road Authority)

Swedish Transport Administration

The Danish Road Directorate

The Danish Road Directorate - The Traffic Statistic Department

Transport Infrastructure Ireland

Scale of NRA third-party data usage

National strategies and action plans

A wide variety of national and international bodies have drawn up strategies and roadmaps for the coordination, promotion, and implementation of digital roads including the use of third-party data.

The EU Data Strategy includes the creation of common European data spaces in key sectors, including mobility. Data spaces bring together the governance and infrastructure to facilitate the pooling and sharing of data in a controlled and secure way. The first stage involves gathering and coordinating all data already available. The creation of NAPs (National Access Points) is a key part of the strategy. More aspects of this strategy, including the relevant actions, are detailed on the site *EU Transport – Road page*.

Some notable strategies include:

- In the Netherlands RDW, the national vehicle authority, have a three-pillar strategy: innovation based on continuity; customised service, and collaboration in networks. This includes consideration of ICT and connected and autonomous vehicles.
- In Germany die Bundersregierung Strategy for Automated and Connected Driving has objectives specific to vehicle connectivity. These are to remain a lead provider, to become a lead market, and to implement connectivity on the road network.
- Belgium has separate strategies for Flanders and Wallonia.
- In the UK, National Highways' Digital Roads Strategy, involving construction and asset management and operation of the Strategic Roads Network (SRN) was announced in 2020. This includes the delivery of *Digital Roads 2025*, the relevant sections of which are *Single view of the network*, *Every customer has an option (ECHO)*, and *Enabling a connected and autonomous future*.
- EU-wide, the Network-Wide Road Safety Assessment Methodology sets out the method used to ascertain the road network rating and ranking for all strategic roads throughout the EU. It specifies what data needs to be collected to provide this information.
- The EU-wide initiative Data For Road Safety (DFRS) provides for the dissemination of live information on road safety throughout the European Union and the UK.

There are also cross-border initiatives such as the C-Roads Platform that may involve the use or third-party data. The C-Roads Platform brings authorities and operators together to harmonise the deployment of C-ITS across Europe. Objectives include the effective exchange of data.

National strategies and action plans

Country	Name	Aims	Immediate actions
EU (Ongoing)	Intelligent Transport Systems (ITS) framework	Establish a common European mobility data space.	Collect data already available. Establish NAPs.
Austria (2018 and 2022)	Austrian action programme on automated mobility, Action Plan – Digital transformation in mobility	Comprehensive testing of new technology, with an emphasis on safety.	Transparent information, active participation of the public sector and society.
Belgium (2023)	Mobilidata (Flanders) Data strategy for all sectors (Wallonia)	Improving road safety and reducing both congestion and emissions.	Boost cooperation between public and private actors
Finland	Digitraffic	To produce improved services for traffic telematics	Data platforms are now publicly available, for example here.
Germany (2015)	Strategy for automated and connected driving	To remain a lead technology provider; To become a lead market; To put automated and connected driving on the roads.	Close coordination between government departments; keeping the public informed of progress.
Ireland (2022)	Harnessing digital: the digital Ireland framework (pp. 18-22)	*'Facilitating the development of connectivity along our main Transport Corridors to support intelligent transport services.'*	
Netherlands	Safe and reliable on the road	85% reduction in transport CO_2 emissions 1990 – 2050.	Innovation based on continuity, Collaboration in networks, Customised service.
Switzerland (2023)	Digital Switzerland Strategy	A national geodata infrastructure for transport and mobility is being set up as part of Switzerland's future mobility data infrastructure (MODI).	Start of the realisation in Summer 2023 with completion of the project and entry into force by 2026.
UK (2021)	Digital Roads; Transport Data Strategy	Digitise Design and construction, Operations, and Customer experience.	Co-ordinate incident information to enable up-to-the-minute signage

Strategies and action plans – mobility

'EIB Technical Note on Data Sharing in Transport', a report commissioned by the European Investment Bank (EIB) in 2021, sets out information necessary to support and advise local authorities on data acquisition in the field of urban mobility.

The document covers the following topics:

- Strategic, budgetary and capacity requirements in data acquisition initiatives.
- Data types and standards, and their relation to commonly used data sources in the field of urban mobility, for use in mobility dashboards and other applications.
- Alternatives to straightforward procurement of data, and a division of data acquisition models into seven categories.
- Contracts and licensing models for data acquisition, including data privacy and the General Data Protection Regulation (GDPR).
- EU policy framework in relation to data acquisition by urban authorities.
- Future data trends to consider.
- A concise roadmap for urban mobility data acquisition

Many examples and case studies are included, and the coverage of legal and privacy issues is particularly thorough – although since the document's publication in 2021 some of the legislation, for example EU Directive 2010/40/EU, has been amended.

Questionnaire feedback
'Need for strong oversight. Costs and benefits need to be carefully measured before and after. Enforcement and oversight of all stakeholders will be necessary.'

Strategies and action plans – governance

The governance of digital ecosystems means, of necessity, creating rules and conditions for users, and implementing sanctions for those who break the rules. This holds for transport, as for any other field.

Digital ecosystem governance entails the management of complex, dynamic power relationships. As entrant platform providers seek to cultivate an ecosystem, they must navigate various power relationships when dealing with governance tensions. An example of this process can be seen in Twitter's and Facebook's exclusion of participants who do not adhere to the platforms' rules. There is a need to specify at which points the power of the data ecosystem's owners end and when they begin to interact with those of other players. Examples include specifications for the formats of external contributions in third-party development, use of control points to exercise dynamic control over value creation, and strategies for the use of shared resources.

The European Data Governance Act came into force in June 2022. It seeks to increase trust in data sharing, strengthen mechanisms to increase data availability, and overcome technical obstacles to the reuse of data.

In a study of the public transportation sector in Sweden in the 9 years following its deregulation in 2010 – a disruptive process which triggered a shift towards digital service development involving external developers – it was found that:

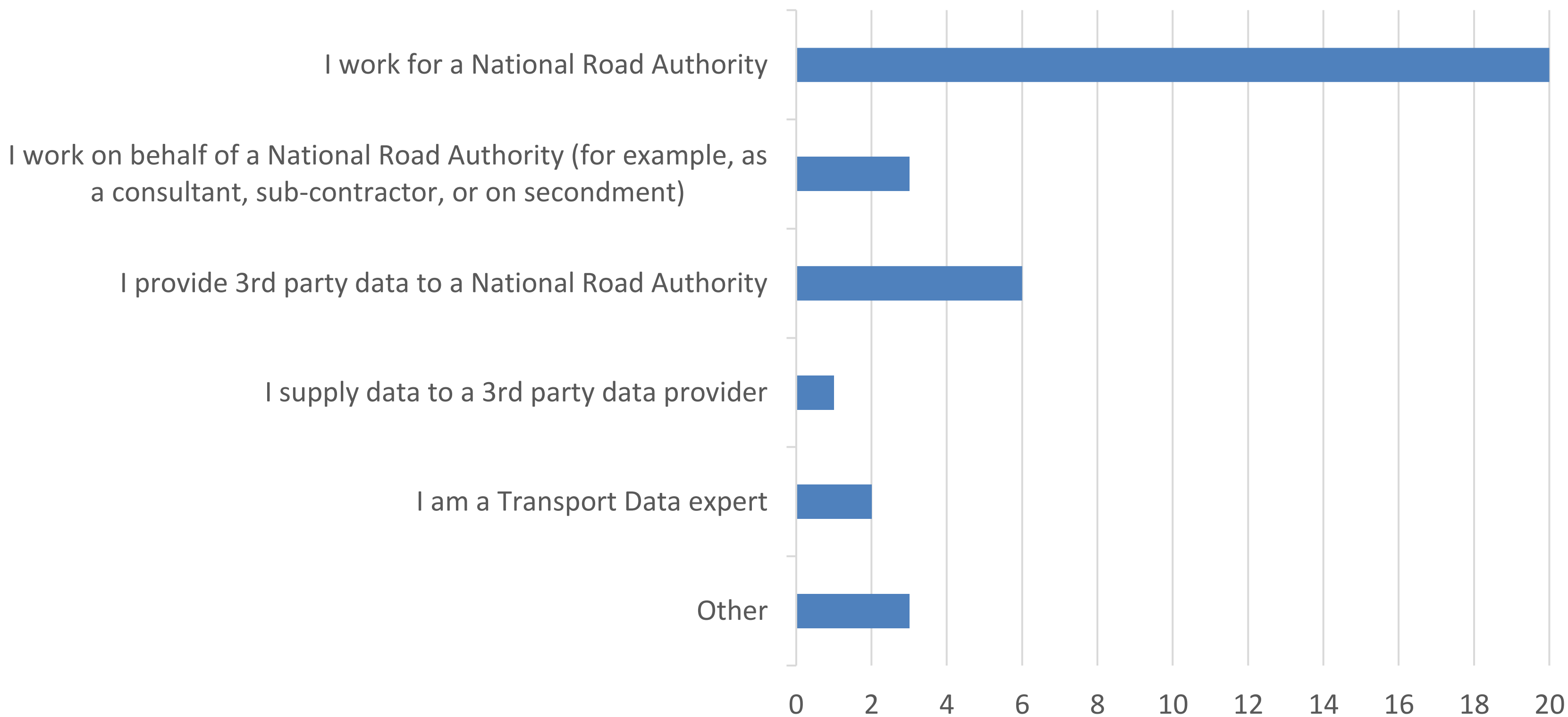
- The privatisation coincided with the rise in smartphone use, alongside travellers' desire for dynamic information.
- One major player in the field emerged. This entity – Samtrafiken – created its own data ecosystem: Trafiklab. This was done to prevent data scraping (unauthorised third-party use of data) and to specify data formats and quality.
- Trafiklab lacked sufficient power to force an end to data scraping, so had to prevent it by presenting third parties with a more attractive option. Trafiklab's weblogs revealed the evolution of rules guiding developers in service development, data formats, access to APIs[1], set-up of new APIs, and how these rules shaped incentives. Trafiklab cultivated communities of users, via meetups and hackathons. The rules were designed to promote better practices rather than penalise undesired behaviour.
- The case study shows that entrepreneurial threats related to *disruptive technologies* are important drivers of change, and illustrates the importance of power dynamics (between, for example, established holders of data and new players who wish to use it for profit) in this process.

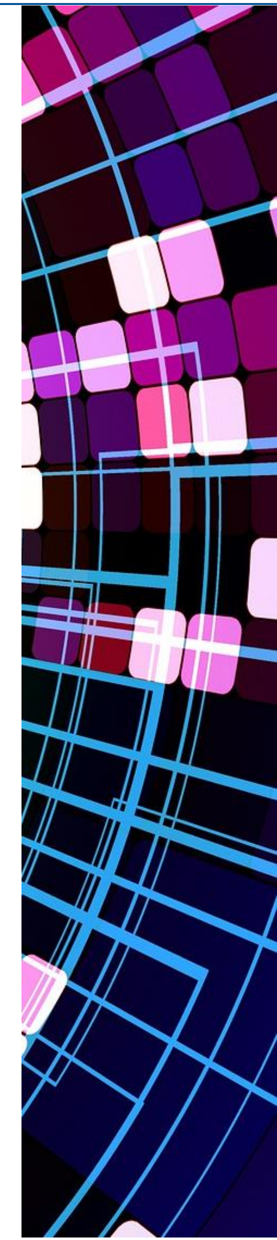
[1] API: application programming interface — a software intermediary that allows two applications to talk to each other.

Extent of third-party data use among questionnaire respondents

Of the 35 respondents, 30 said their organisations use third-party data.

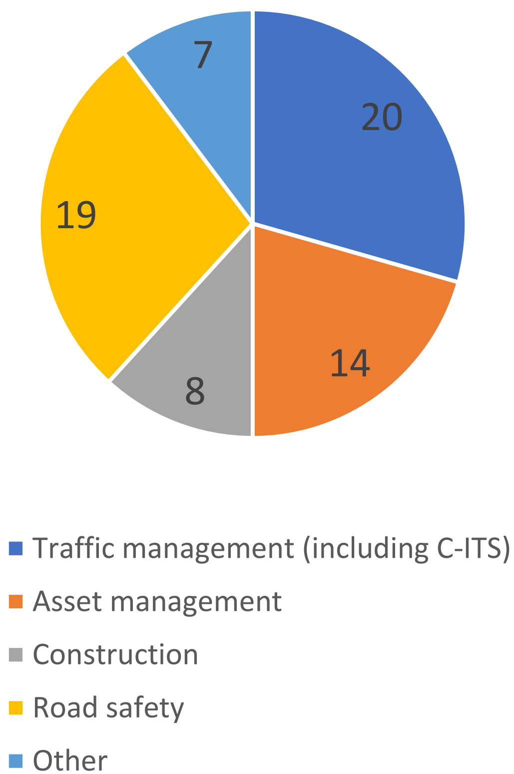
The roles of responding individuals are shown below.





Current use of third-party data

'For what purpose does your organisation use third-party data?'



'Which organisation(s) provide the third-party data?'

'Private service providers'

'cities, neighbouring road operators, weather forecast, toll service'

'...police and hospitals etc. for road safety...'

'Government'

'national institutions: Land register, emergency centre, geospatial public data etc'

'Vehicle connected software providers'

'Mainly other federal offices'

'Traffic data companies, Cities, municipalities, provinces, local authorities'

'Vendors of roadside equipment, road authorities, automotive, service providers'

'Flanders road and traffic agency, federal police'

'mobile phone providers, navigation providers, automobile providers'

'Google Streetview, Cyclomedia Mobile Mapping Images, Waze Notifications, KMI meteo data for winter services

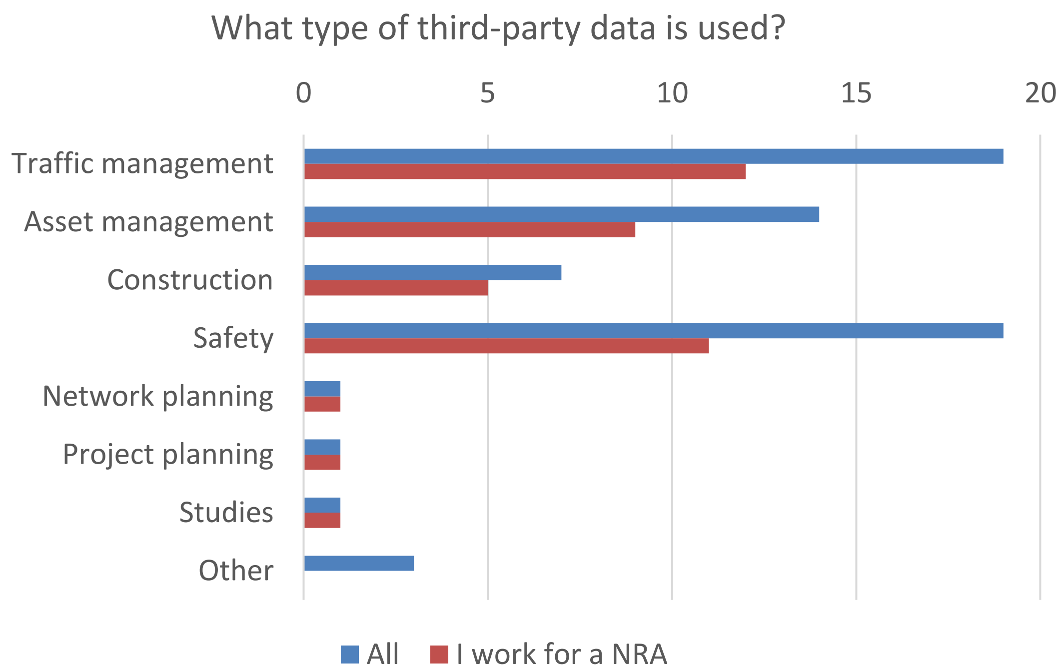
'digital map providers, OEM data aggregator'

Finnish Statistics, National Land Survey, Finnish Environment Institute

Current use of third-party data

The respondents' use of third-party data was analysed by type of respondent. Most respondents reported 'I work for an NRA'.

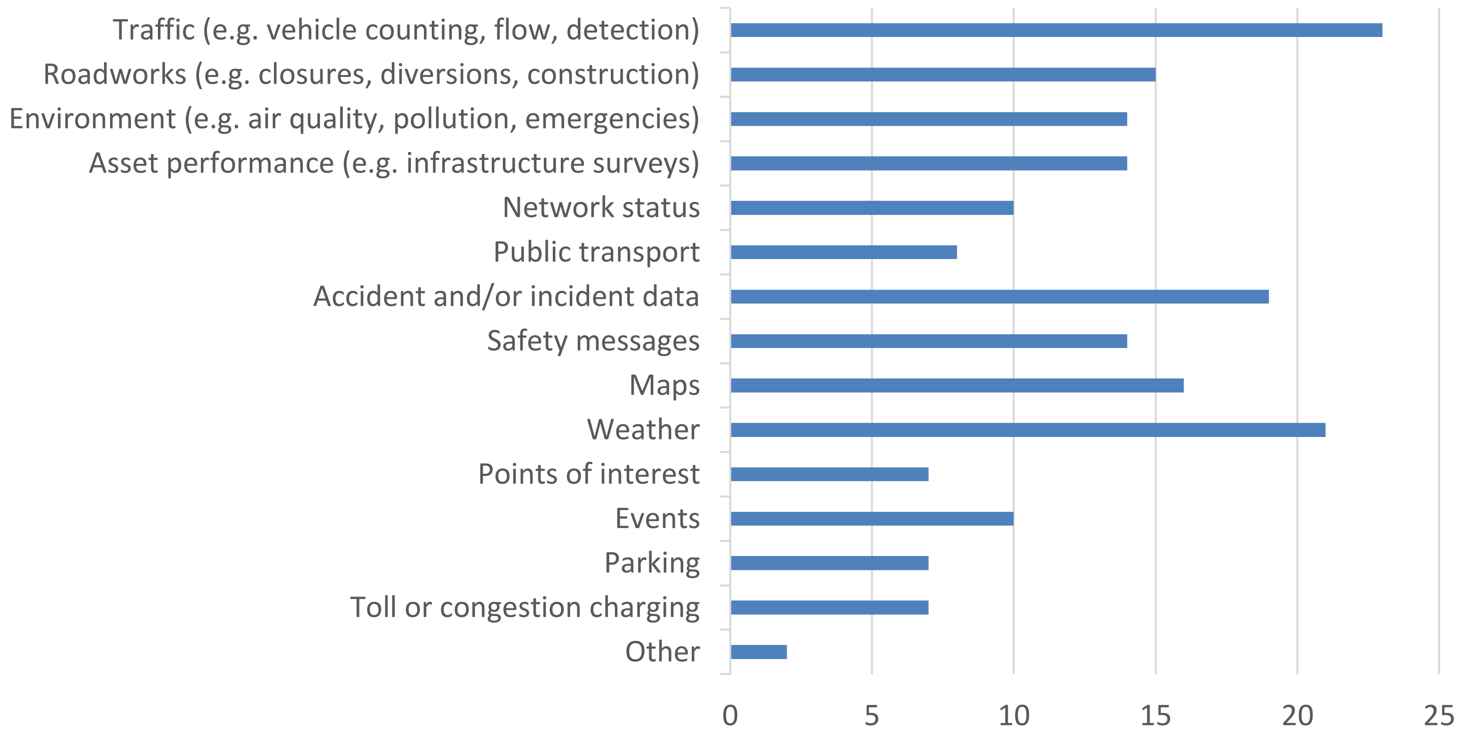
The chart below shows that their use of the different data types differed little from the average use of all respondents. The category *Other* included data on *User behaviour etc*, *Data for Charging*, and *User information services*. These data types were used, respectively, by two transport data experts, and one provider of third-party data to an NRA.



Feedback about future use of third-party data

Of the 35 responses, all but 4 have considered using third-party data in the future.

'What types of third-party has been considered? (Tick all that apply)'



Third-party data providers

Third-party data providers

Third-party data are available from a variety of sources:

- Data aggregators
- Navigation and fleet management systems
- Private mobility providers
- Providers of specialist road condition data including weather
- Other environmental monitoring services (for example, for air quality and noise)
- Government bodies other than NRAs
- Vehicle manufacturers
- Electric charging and H_2 providers, including trade groups and local authorities
- Telecom operators
- Data for Road Safety Ecosystem (DfRS)

In this section, each type of source is dealt with in turn.

Questionnaire feedback
'If business models change, suppliers may stop collection, production and delivery.'

Data providers: Data aggregators

These organisations generally provide products or services underpinned by raw data.

One network shared road management platform, collects data for their products. These enable customers to plan roadworks and incident response, monitor them in real time, communicate road conditions from Local Authorities to navigation platforms such as Google maps, and analyse the impact of traffic management to improve future planning.

VivaCity labs provide Intelligent Traffic Systems, including AI-assisted traffic monitoring infrastructure to help in the evaluation of traffic management schemes such as LTNs and School Streets. Their activities include the collection of detailed traffic data.

AirSage provides a service which, using FVD and mobile phone location data, models and predicts parameters such as activity density and origin-destination matrices. Their service is primarily aimed at LAs, Transport Authorities and businesses, rather than consumers. Armis Group's service Way4Smart and Eloy's range of modular connected vehicle products are geared to the provision of data for smart cities.

Post Luxemburg acts as a European-level data aggregator of safety-related data in the Data for Road Safety ecosystem, where the data feed can be accesses by partners on the basis of reciprocity.

Questionnaire feedback
'(Risk of) Unreliable data due to quality issues – accuracy, correctness, completeness, compliance with specifications; Potential unknown/unclear license terms; Dependency risk - e.g. if a single provider has monopoly.'

Data providers: Navigation and fleet systems

INRIX Traffic is a global traffic dataset which is largely based on floating vehicle data from a variety of data sources. INRIX has developed a front-end software package, Roadway Analytics, which enables the data to be used by entities such as local transport authorities.

HERE provide data necessary for their navigation, routing and real-time traffic services. Their facility UniMap allows users to augment the map built by HERE with their own map content, allowing creation and customisation maps with '*unmatched freshness*'. HERE also aggregates data from other providers and offers the data for users and developers through their Open Location Platform.

TomTom produce maps and related services for navigation and traffic information/management services. BeMobile provide smart city data.

WayMo open dataset can be accessed using software available on GitHub.

Google produce and freely distribute traffic and other road-related data (for example speed restrictions, road works and diversions – hover over layers to see all) in real time.

Waze (owned by Google) is a navigation app that also crowd sources data such as incidents and congestion. For NRAs Waze has initiated an ecosystem called Waze for Cities through which they share both traffic incident data and travel time data without charge on the basis of data reciprocity. Many European road operators have joined the ecosystem and are using the data in their traffic management operations.

Data providers: Private mobility providers

Uber's data facility, Movement provides data and tools for cities to more deeply understand and address urban transportation challenges. Datasets include travel times, vehicle speeds, and road mobility heat map which includes cycles and pedestrians.

Lyft is presently not available in the UK or the EU. It stores much of its data – including raw data and normalized data — in AWS S3, and it uses AWS EC2 to process the data.

In an interesting aside, allegations have been made that both companies tamper with the Heat Maps provided to their drivers to make it appear that there are more potential customers than really exist, thus encouraging drivers to stay on.

Other ride-hailing apps include Free Now, TaxiEU, Gett, who are in a strategic partnership with the Volkswagen group, G7 Taxis, Bolt, and BlaBlaCar, who built their data into a data mesh framework.

The amount of data collected by apps can vary enormously – from the most basic to a complete dossier of user behaviour across many applications or services.

Questionnaire feedback

'Detailed knowledge on the data creation method and delivery parameters is important as well as other non-data related factors (reliability of data provider, contract/SLA, energy delivery, connectivity/network … etc.) in order to estimate reliability of 3rd party data. The implementation of a good/sufficient reliability is framed within a project by cost and public/private interest.'

Data providers: Specialist road condition data

These are providers who generate data, rather than facilitate sharing of others' data, for example, by aggregating data in a hub.

Weather and road surface information may include:

- Visibility
- Air temperature and Relative Humidity
- Atmospheric pressure; Wind speed and direction
- Precipitation type and intensity
- Lightning and storms
- Pollution and air quality
- Black ice or refreezing of moisture
- Friction or grip
- Chemical concentration and freezing point of solution on pavement surface

Questionnaire feedback

'(Reliability) varies depending on the data type. For example, ambient temperature data is readily available, but it is less easy to acquire reliable road surface temperature for gritting decisions. Roughness depends on type of surface and can be difficult to know what it is caused by in order to take appropriate action (or no action).'

Data providers: Specialist road condition data

Many data providers include information on road condition and weather as part of a more general navigation service for drivers, as well as for NRAs and smart city initiatives.

In the UK, the Meteorological Office is beginning to '*engage with organisations in the Connected and Autonomous Vehicles and Mobility-as-a-Service sectors to develop and integrate weather and climate capability*.'

Vaisala's xweather API provides specialist weather information for road users, including road surface temperature, friction estimates and water/ice depth.

HERE provide weather information as part of their mapping services.

Geonica's SAFE ROAD System is a Road Weather Information Solution (RWIS) which offers precise meteorological and environmental data for road safety, operation and maintenance.

Vehicle manufacturers such as Volvo cars and specialised data aggregators/analysts such as Nira Dynamics provide real-time data on temporarily slippery road in the Data for road Safety (DFRS) ecosystem. They also provide data commercially.

Data on air quality and noise can be used to inform temporary traffic measures as well as road design changes.

Questionnaire feedback
'Reliability for the same data may vary if used for different purposes. Information for asset management may have different reliability then for incident management.'

Government bodies other than NRAs

Transport for London (TfL) have implemented an open data approach in public transport. Interviews with relevant participants revealed that the underlying philosophy of the project's success was a clear commitment to the idea that the data belong to the public and that third parties should be allowed to use and repurpose the information. Findings also showed the value of a strong digital strategy and creating strong partnerships.

The National Parking Platform (NPP), is a UK local authority owned and DfT funded pilot project that facilitates data exchange, digital payments, and a new way of delivering better parking and mobility services. Although this platform is not currently relevant to NRAs.

Many UK local authorities outsource their traffic data collection to private enterprises, such as vivacity already mentioned. Digitisation of Traffic Regulation Orders (TROs) in the UK will enable rapid set-up of temporary restrictions, for example in the event of road repairs.

The Open data platform mobility Switzerland provides data on individual mobility and is expected to gradually expand. The platform currently offers real-time data from automatic counting stations and traffic lights.

The Data For Road Safety (DFRS) safety-related traffic information ecosystem is a data aggregation platform established by EU member states, public authorities, and industry players to provide a contractual infrastructure for the exchange of safety-related roads data. Its agreement with NAPCORE is representative of the type of collaboration it aims to foster. Details of its architecture and the types of data which it is designed to exchange are laid out in its technical documentation. Safety-related data include temporary slippery road, animal or other obstacle on the road, breakdown, short-term roadworks, reduced visibility, wrong way driver, exceptional road blockage (for example landslip), and exceptional weather conditions.

Questionnaire feedback
'Public data is mainly as it is (usability is to be decided on the client's side), but commercial seems to be more client-orientated.'

Data providers: Vehicle manufacturers

These generally take the form of a shared data ecosystem across all vehicles of their make.

Vehicle manufacturers (OEMs) initially struggled to get potential customers to see the value of these systems, which from the end users' point of view offered little that they could not already access from their mobile phones. Implementation also requires a whole new skillset to be available within the company.

Mercedes-Benz ITS offers information from the fleet of Mercedes on the road, including road surface and weather data, road safety hotspots, and hazard warnings.

BMW in-vehicle sensors collect data including video, radar, ultrasound and infrared, which enables warnings of adverse conditions such as icy roads. The Volvo cars app concentrates more on in-vehicle monitoring, such as climate control and scheduling servicing.

At present, these datasets are not always made available for use by other parties. However, legislation – in the form of an amended version of the European Commission's Data Law – is being proposed that will grant consumers and businesses access to and use of connected device data for aftermarket and value-added services such as predictive maintenance, or for use in the designers and operators of smart cities.

Vehicle manufacturers face a dilemma when setting out to include data-related services, in that if they outsource the development entirely, for example to Google or Apple, they become reliant upon outside services such as updates or security patches, or in an extreme, the survival of the company; whereas beginning to develop the services in-house requires a whole new skillset and even culture.

One way through this is to invest in start-ups, as was the case with Renault-Nissan-Mitsubishi's corporate wing Alliance Ventures investing in Coord, the US mobility data platform. This buys-in more control over the data and systems but carries a higher risk of the start-up itself ceasing to exist.

Data providers: Electric charging and H_2 locations

These are of particular importance in the effort to decarbonise transport. Because of this, many NRAs will already hold this type of data.

A wide variety of other organisations offer data about electric vehicle charging points (such as Zap Map) – whether static (location only) or dynamic (location with occupancy or queue).

Datasets are offered by private companies (for example EcoMoment, HERE and Vattenfall), vehicle manufacturers (for example Mercedes), and specialist apps. Google Maps can also display charging points.

The European HRS availability System provides dynamic data on Hydrogen fuelling points throughout the EU.

H2 Mobility GMBH (Germany) provide a dynamic map of Hydrogen refuelling stations for private vehicles (gas supplied at 700 bar pressure) and commercial vehicles (350 bar). The map also includes sites which are proposed or under construction.

Data providers: Telecom operators

Mobile network operators follow the locations of mobile phones and other connected devices as they move along the telecom network cells. Some operators anonymise and aggregate this data into people flow data and offer this data as a service to municipalities and transport authorities for various use cases.

Nordic telecom operator Telia has developed the Crowd Insights service, that offers information about people movements that can be located on transport networks. Their market share of mobile devices is 30-40% and the data can be extrapolated to the whole population.

The identified use cases include provision of Origin-destination matrixes (to be used in for example, transport modelling), routing reports, activity reports and crowd movement patterns.

In Finland, the national road operator Fintraffic Road Ltd has implemented a public procurement of telecom network derived mobility data and will be using the acquired data to enrich the national '*general traffic counting service*'. This service uses permanent induction loops, movable microwave counting stations and modelling methods to provide estimates of daily average traffic volumes for the whole national road network of 78,000 kms. Telia's data is used as a new input to enrich the modelling processes with for example, accurate data regarding seasonal traffic variations and traffic volume growth/decrease estimates in different parts of the network.

In the UK, Vodaphone has developed STEP – an application compatible with all third-party map apps and in-vehicle navigation systems, which provides up-to-date safety and traffic information.

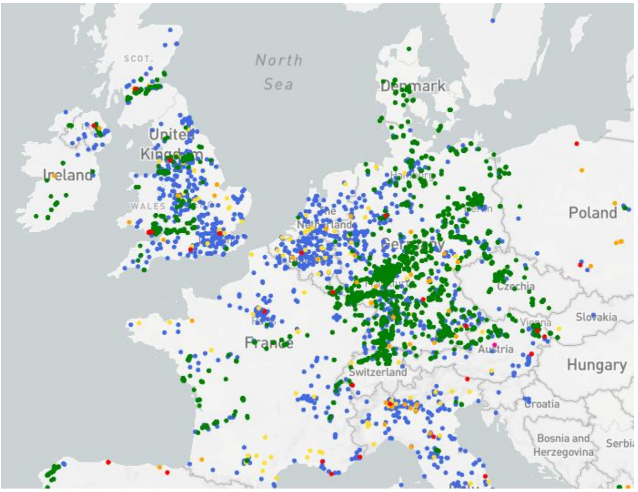
It has been estimated that the use of mobile network data can reduce the costs of general traffic counting service by up to a third, as the need for physical road traffic measurements is reduced.

Data providers: Data for Road Safety ecosystem

The Delegated Regulation of European Commission (886/2013) establishes the specifications necessary to ensure compatibility, interoperability and continuity for the deployment and operational use of data and procedures for the provision, where possible, of road safety-related minimum universal traffic information free of charge to users on a Union level.

Based on the work of Data Task Force, the European Ministers of Transport together with industry players established the Data for Road Safety ecosystem in 2020 to cater for the requirements of the Delegated Regulation and to facilitate the use of in-vehicle data for the creation of Safety Related Traffic Information (SRTI).

Data is exchanged within the SRTI Ecosystem for the sole purpose of road safety, without any financial compensation between the parties and within the agreed data privacy policy following the principle of reciprocity.



A snapshot of SRTI event information shared through the Post Luxembourg live data stream

Multi Party Agreement is in place to set the terms and conditions for data exchange in detail.

Currently there are many industrial players active in the ecosystem. Including ACEA, Geotab, Mercedes-Benz, Nira Dynamics, BMW, Inrix, Ford, Volkswagen, Tomtom, HERE and Volvo cars, and the count is increasing. Many European Road Operators and authorities are also active members as well as cooperative organisations such as CEDR and Ertico.

data for road safety

Use of reliable third-party data

Uses of the various types of data

The table below, adapted from EIB, shows which data sources (columns) can be used to obtain which useful information (rows).

	Mobile app data	In-vehicle data	Bluetooth / Wi-Fi	Mobile data	Inductive loops	Floating vehicle data	(ANPR) cameras	Ticketing systems	Automatic vehicle location	Air quality	Weather	Citizen-collected data	Telecom data
Volumes					X		X	X				(X)	X
Speeds / travel times	X	X	X		(X)	X	X	X	X				
Origin-destination	X		X	X		X	(X)	X	X				
Individual trip information	X	X	X	X		(X)	X	X					
Parking usage	(X)	(X)					(X)						
Contextual data		X								X	X	X	
Human behaviour	X	X		X		X	(X)	X	X			X	
System and infrastructure data	X	X											
Service provisioning	X		X	(X)		X	(X)	X	X			X	

Google Autonomous Services and other data services in vehicles

These services are usually paid for by the vehicle owners on a subscription basis.

Google Automotive Services (GAS) is a licensed product sold to car OEMs consisting of Google Maps, Google Assistant, the Google Play Store and other applications. GAS runs on top of Android Automotive OS (AAOS), which is an open-source operating system.

Many auto makers, for example Volvo cars, have Google Android Auto built into their new vehicles. Volvo are also currently expressing an interest in other collaborative projects in data sharing.

There are dedicated applications being developed to run on Android Automotive that capture data from the vehicle. An example start-up is Aiden.

Jaguar Land Rover (JLR) have partnered with NVIDIA to develop AI-enabled connectivity services built on the NVIDIA DRIVE™ software-defined platform. This includes monitoring of traffic lights and other road infrastructure, as well as monitoring the driver. JLR are working towards self-driving cars, for which they are partnering with Waymo.

Examples of additional services include Audi's partnership with cities in Germany to add GLOSA (Green Light Optimised Speed Advisory) to their in-vehicle data services.

Questionnaire feedback

'Reliability, in the sense of being "complete and accurate" always needs to be double checked by the user. This is sometimes problematic, as it often requires different statistical or other methods to validate reliability. This is often also time consuming. It may be considered to be part of the data provider responsibility to provide results from meta-analysis on reliability.'

Use of Floating Vehicle Data by government bodies

Government bodies can use available data for operational and strategic purposes.

The Transport Technology Forum (TTF) in the UK brings together data providers and local authorities to facilitate the implementation of data-related technologies for traffic and street management. Their guide, the Manual for Smart Streets, includes everything from a decision tree of objectives through to detailed case studies.

BeMobile have developed FlowControl, a traffic management platform which has successfully been deployed in the city of Ghent.

Talking Traffic is a collaboration of stakeholders, including local authorities as well as companies such as Be-mobile and Mercedes-Benz, with the Netherlands Ministry of Infrastructure and Water Management (I&W) to facilitate connectivity between vehicles and traffic infrastructure, as well as data exchange between different entities. I&W will use anonymised FVD to feed road maintenance and safety programmes. An example of this collaboration is enabling navigation app providers ANWB, BeMobile, Hyundai, Inrix, Kia and TomTom to include warnings to drivers of the approach of emergency vehicles on call.

TfL has been supplementing their data, used in the running of London's public transport, with input from navigation app Waze since 2016. Waze in turn collects data not only from drivers using their app, but also from volunteers who scan the news or report incidents.

Questionnaire feedback
'Incident detection in areas not covered by NRA ITS equipment; Use to supplement NRA gathered data for improved analytics.'

Vehicle connectivity systems

These systems use Floating Vehicle and internal vehicle data to offer complete connectivity solutions. The providers work with vehicle manufacturers or other bodies.

ZF provides product and software systems for established vehicle manufacturers, in Vehicle Motion Control, Integrated Safety, Automated Driving, and Electric Mobility.

The Compass IoT Road Intelligence product combines four Compass previous products which monitor congestion, collisions and near-misses, journey times, and pavement quality. It uses Floating Vehicle Data to enable NRAs or local authorities operationally (for example by predicting possible trouble spots) and strategically (for example by tracing journeys' origin and destination points).

Thales connected car technologies work with vehicle OEMs to provide connectivity products including cybersecurity products, digital car keys, and secure electric vehicle charging software.

The EU mobility data hub The Mobility Data Space (MDS) is a data marketplace where equal partners from the mobility sector can exchange data. The data provider remains the owner of the data and can decide whether and with which participant to agree a data exchange. The goal is to '*create a cross-company data economy to realise and further develop innovative, environmentally and user-friendly mobility concepts*.'

Questionnaire feedback
'Standardization of data is necessary to make it easter to share.'

Use of data in apps

There are many smartphone apps which tap into various data sources to provide services for users. These examples are in addition to the private mobility apps already mentioned.

Appyways app provides dynamic parking information Their Smart City Parking app has proven a success in its first use – in Harrogate (UK). This project necessitated liaising with two local authorities: one covering the city itself, and one covering the county, namely Harrogate Borough Council (HBC) and North Yorkshire County Council (NYCC).

GLOSA (Green Light Optimised Speed Advisory) has been incorporated into an app for cyclists in Copenhagen.

See.Sense produce smart bike lights which include ride statistics, safety alerts, and anonymised ride insight functions via an app. They have been providing advocacy group British Cycling with insights on ride numbers, quality, and safety, enabling evidence-based campaigns for specific improvements in cycling infrastructure.

Aghayari, Kalankesh et al (2021) identified 913 apps related to road traffic health and safety which were available at the time from Google Play. They classified them into a version of the Haddon Matrix – a 3-by-3 grid of before, during and after incidents versus human, machine and environmental factors. Of these 913 apps, 190 fell into the category of monitoring real-time traffic data to alert the driver to road traffic issues such as congestion, road construction, accident, and weather conditions to inform drivers in near-real or real-time for preventing potential hazards.

Questionnaire feedback

'Using probe vehicle data to optimise traffic light switching cycles requires quite a lot of processes to be put in place to be fully in line with the GDPR regulation. But it can be done. And with C-ITS deployments relying on mobile networks to community with the vehicle (4G or 5G, "long range" model) one can safely deploy without a European C-ITS PKI infrastructure in place, as long as there is tight governance on the ecosystems (who can connect under which conditions?) and all data exchanges are secured using TLS tunnels.'

Use of data for safety applications

Safety-related use of data is the first to be implemented and rolled out, because not only is it the most beneficial use of data, it is also the one most likely to gain wide-scale public acceptance.

The eCall SOS alert system is being installed on all new cars and vans throughout the European Union since 2018 . It enables emergency calls to be activated either by a user, or automatically if it detects an incident.

AISIN uses Floating Vehicle Data in its AI-assisted RoadTrace™ safety insights software to enable NRAs to predict times and places where incidents may happen.

Road surface quality can be critical for safety. The RoadBounce app measures this using a phone’s in-built accelerometer. It can be used by NRAs as an alternative to more costly measuring methods.

Mercedes-Benz provides the Netherlands Ministry of Infrastructure and Water Management with road monitoring using vehicle data. The Road Monitoring program ROMO covers a network of more than 130,000 kilometres, using anonymised data from vehicles and other sources such as weather stations managed by Dutch authorities. It has applications across road safety, winter management, and asset management.

The Swedish Transport Administration has agreements with NIRA Dynamics and Volvo Cars to use friction data to support the winter maintenance of roads. An innovation agreement for connected road surface measurements is also in place with NIRA, Mercedes-Benz, and Univrses/Zenseact.

Questionnaire feedback

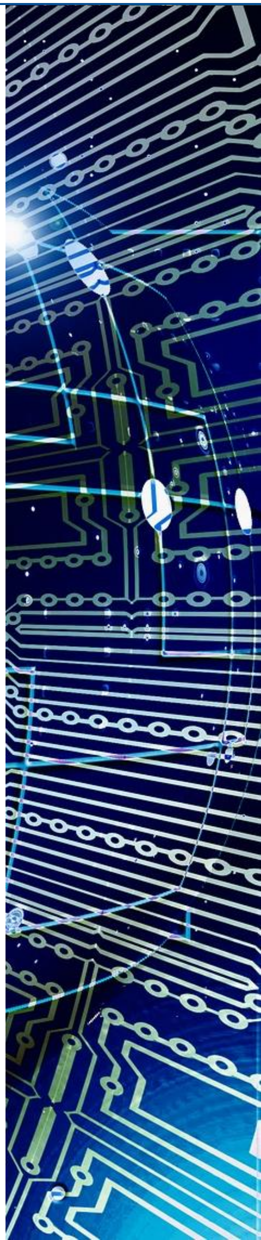
'We could reduce the time it takes to detect an incident and get a better location. Then in turn we can send out precise safety related traffic information sooner, set variable message signs and mark and clear incidents faster.'

Challenges for the use of third-party data

Challenges identified in the questionnaire and literature

These are challenges identified from a list of options gathered from the literature and presented to participants in the questionnaire.

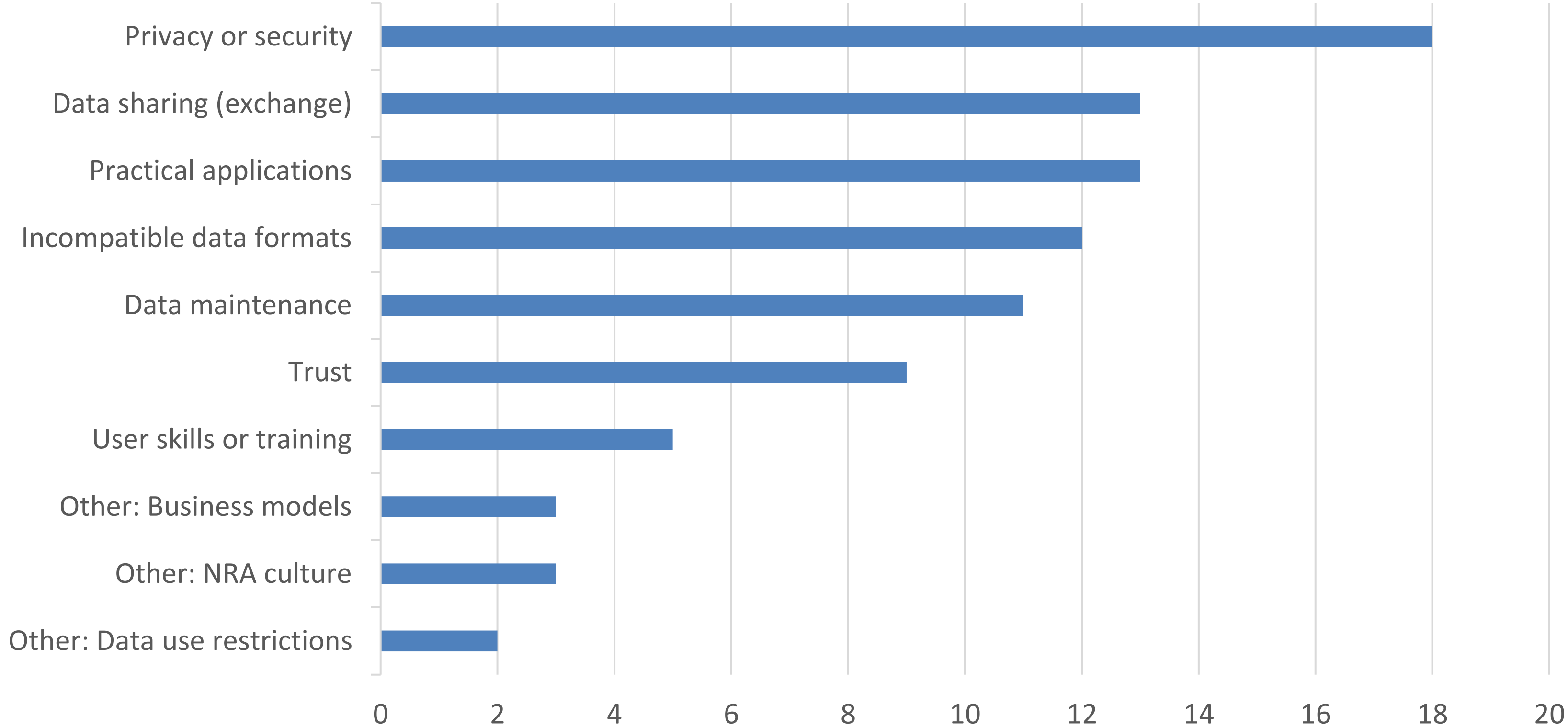
	Challenge	Description
	Privacy and security	The GDPR (and UK equivalent) apply if the data has not been anonymised. Anonymisation is reversible in the case of very small datasets or sections.
	Data sharing	Parties may be reluctant to share data or have little incentive to share. The EU Data Act (and EC B2G data sharing initiative) puts legal requirements on commercial stakeholders for data sharing.
	Practical applications	A common issue is the existence of seemingly useful third-party data without a specific application. A solution in search of a problem.
	Incompatible data formats	This may result either from the data type, or from the method used to collect it, for example different timeslots, leading to the need for interpolation.
	Data maintenance	Use of third-party data entails outsourcing this to the third-party, with no control over its consistency or indeed continued availability.
	Trust	Many respondents identified trust in third-party data's integrity and continuity as possible issues.
	User skills & training	Extra training will take time and resources away from the main functions of NRA. Extra recruitment may be needed.
	Business models	Building the business case for the use of third-party data and investment needed to enable the use of third-party data.
	NRA culture	Uptake of new ideas can depend upon the culture within the organisation. The need for extra data may not be obvious to the relevant decision-makers.
	Data use restrictions	NRAs may want to re-use or re-purpose the data for other needs. Often there are restrictions on such activities.

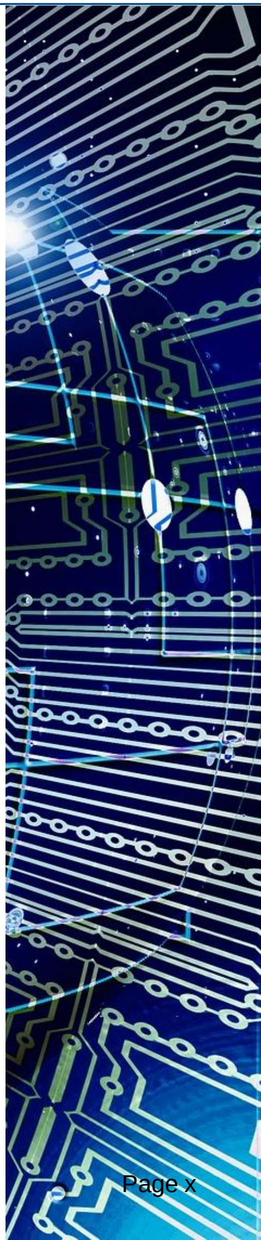


Feedback from questionnaire

The chart below shows the issues most selected by the questionnaire participants.

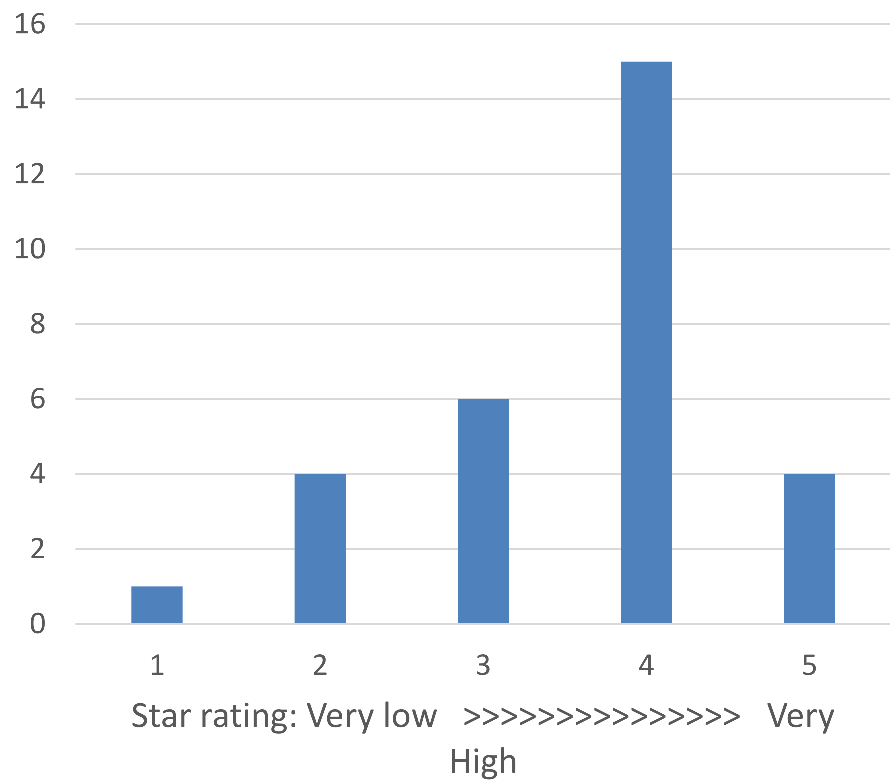
Participants were asked what challenges there are to using third-party data. They were given several options to tick as well as the option to provide additional issues. *Privacy or security* was the most selected issue, although the small questionnaire sample size and characteristics of the respondents does not make this a quantifiable finding. Notably, the results of this question highlight the broad range of challenges to the use of third-party data for NRAs. Participants took the opportunity to highlight issues related to business models, NRA culture, and data use restrictions.



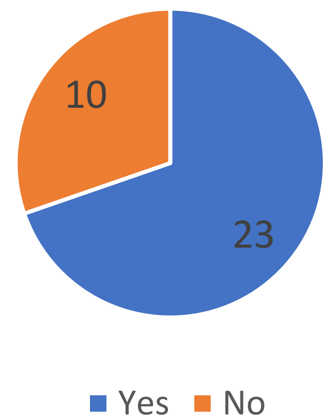


Feedback from questionnaire

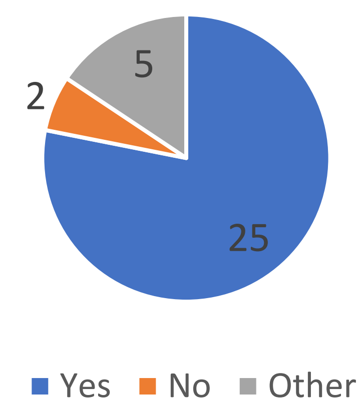
'Rate your organisation's maturity level in using third-party data'

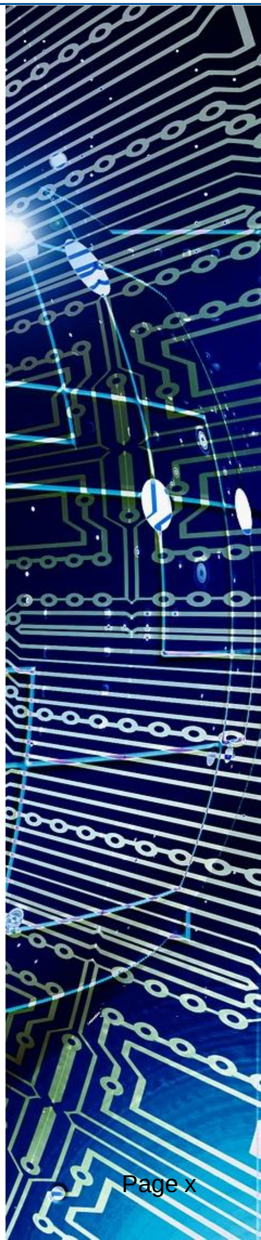


'Are data management systems ready to handle third-party data?'

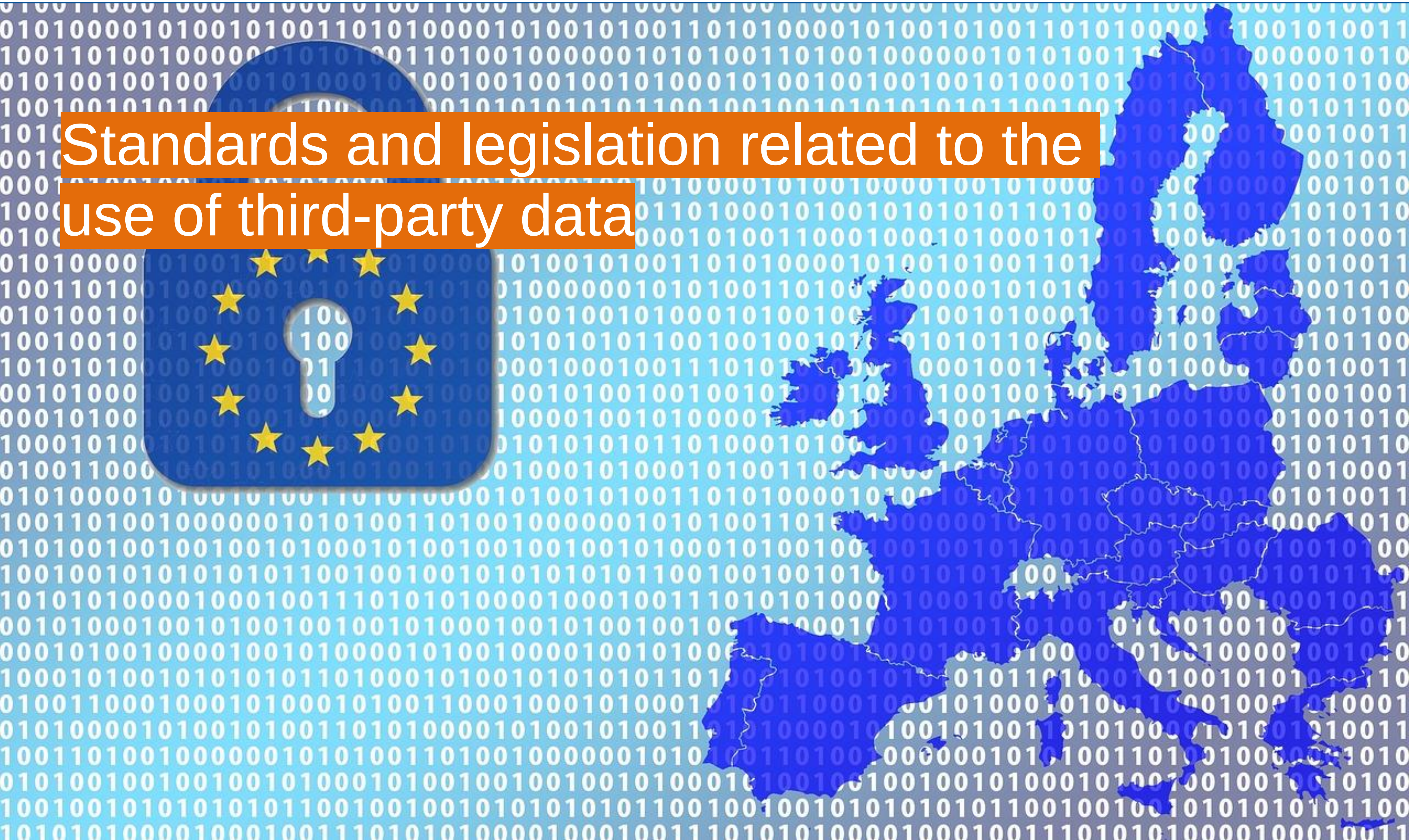


'Do the people in your organisation have the skills to use third-party data?'





Standards and legislation related to the use of third-party data



Data standards

The various standards for the exchange of data in the field of intelligent transport – for example, in traffic control management – are summarised in the EU-ICIP Guide to Intelligent Transport Systems Standards.

Of these, the standard EN ISO 17268 '*defines the content specification for the exchange of road-related spatial data, and especially updates thereof. Based on the content specification, it defines also a physical exchange format (structure and encoding) for the actual data exchange. In addition, it defines web services that are needed to make the coded data on updates available. Exchange of dynamic information is not in the scope of this document*.'

The Sensoris sensor interface specification is managed by ERTICO – ITS Europe. It represents a group of 35 organisations from the global vehicle industry, map and data providers, sensors manufacturers, and telecom operators. It published the latest version of its interface architecture standards in November 2022.

Navigation Data Standard (NDS) standard NDSlive is a standard for the exchange of vehicle-generated map data for use in applications ranging from Intelligent Speed Assist to fully autonomous vehicles.

Datex II (see also this User Guide) is the pan-European standard for exchanging traffic and travel information, for example between NRAs, and to navigation apps. It covers traffic flow, traffic measures, roadworks, accidents, and parking. By developing and enhancing the use of common Recommended Reference Profiles European stakeholders strive to harmonise the data to foster its exchange and re-use.

Data quality standards: Events

Quality guidelines are different for event information (for example, incidents) and traffic flow information.

Event information quality is defined in the document '*Quality of safety-related and real-time traffic information services*', published by EU ITS Platform (EU-EIP).

This document lists the following aspects of data quality for event information:

- Timeliness – time span from the occurrence of an event until it is detected and accepted at the traffic centre.
- Latency – time from the acceptance until the information about the event is available at the CAP/SPA
- Location accuracy – whether the event has been classified as happening at the correct location
- Classification correctness – whether the event has been classified as the correct type
- Event Coverage – to what extent events are correctly detected and published

Event information data are shared on the platform TN-ITS – the map update exchange hosted by the European Road Transport Telematics Implementation Coordination (ERTICO), who also host a users' forum for propagation and exchange of information.

The NAPCORE project of TN-ITS harmonises the way data are collected and handled at EU countries' National Access Points (NAPs). It was launched in 2021.

Data quality standards: Vehicle position and state

Data collected from connected vehicles and FVD may be of varying standard.

If the mobile phone is not equipped with or cannot use GNSS data, the location data is obtained using cellular triangulation or by interpolation using successive hand-off times (for instance, the time at which a phone connection is handed off between one base station and the next as the vehicle moves). This can be significantly less accurate than using GNSS data.

Both of these data types can be used to estimate vehicle speeds and hence, along with vehicle numbers, the degree of congestion. No one standards body is at present responsible for standards in this specific application of GNSS or cellular / mobile phone data.

In-vehicle satellite navigation systems typically combine GNSS data with dead-reckoning systems (using vehicle sensors) to gives more accurate location, and hence speed, than cellular positioning.

Vehicle state data (for instance, lights or wipers on/off, engine speed, brake application, or ABS activation) may also be transmitted and collected. These data are generally of higher quality than data collected from mobile phones.

Legislation: General Data Protection Regulation

Issues of data protection, privacy and security are regulated in the EU by the EU-GDPR, and in the UK by the UK-GDPR.

In the UK, The DPA 2018 sits alongside and supplements the UK GDPR, for example by providing exemptions. Part 2 of the DPA is essentially the GDPR, while Part 3 is a separate regime for law enforcement.

The GDPR harmonises data protection laws across EU member states and provides a robust framework for the responsible handling of personal data. At the time of its enactment in 2018 was the strictest data protection law in the world.

It enshrines the right of individuals to withhold consent for their personal data to be gathered and processed, the right to access and rectify their data, and the right to be forgotten. It places the onus on data controllers and processors to implement appropriate technical and organisational measures to protect personal data and demonstrate compliance. It also introduces the concept of privacy by design and default.

These restrictions do not apply if the data have first been anonymised, for instance, transformed in such a way that information is no longer traceable to an individual.

However, a thorough analysis and assessment of the anonymisation techniques the third parties employ is needed if the NRA is to be sure that the resulting data truly falls outside the scope of the GDPR. This can involve assessing the risks of re-identification, considering factors such as the data set's size, nature, and any available re-identification techniques (including the use of AI).

Legislation: EU Directive 2010/40/EU

(European Parliament)

***'This Directive establishes a framework in support of the coordinated and coherent deployment and use of Intelligent Transport Systems (ITS) within the Union, in particular across the borders between the Member States, and sets out the general conditions necessary for that purpose**.'*

This directive dates from 2010 but was updated and adopted by the Council of Ministers of the EU in October 2023 in the light of technological progress (such as connected and automated mobility, on-demand mobility applications, and multimodal transport), changes in other legislation, and the need to decarbonise the transport sector.

Further specific reasons for the changes were:

- (i) the lack of interoperability and lack of continuity of applications, systems and services
- (ii) the lack of concertation and effective cooperation among stakeholders
- (iii) unresolved issues related to the availability and sharing of data supporting ITS services

Legislation: EU Directive 2010/40/EU

National Access Point (NAP)

***Agreement has been reached that each member state make certain types of data available at a* NAP (National Access Point).**

The data types are specified in EU Directive 2010/40/EU, and are:

- Static and dynamic traffic regulations (access conditions for tunnels and bridges, speed limits, freight delivery regulations, HGV overtaking bans, direction of travel on reversible lanes, traffic circulation plans, Permanent access restrictions)
- Data on the state of the network (temporary road/lane closures, roadworks, other temporary traffic management measures)
- Data on secure parking places for HGVs and commercial vehicles (for instance, static data on locations, dynamic data on availability, information on safety and other facilities available at the location)
- Data on road safety-related events (slippery road conditions, animal, people, object debris on the road, unprotected accident, short-term road works, reduced visibility, wrong-way driver, unmanaged blockage of road, exceptional weather conditions)
- Types of multimodal traffic data
- Locations of access points to other transport modes, with further information relating to Accessibility (such as availability of lifts)

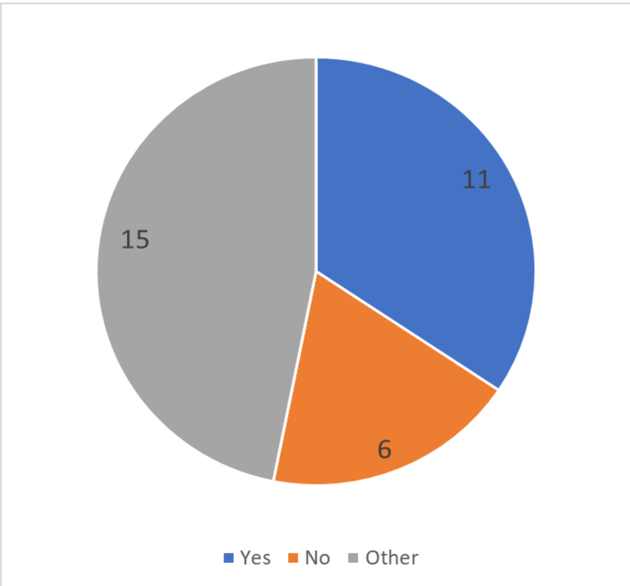
The EU Commission holds a list of the National Access Points. These activities are co-ordinated by NAPCORE. Enquiries in 2022 into how NRAs were making use of the established NAPs found that many – for example, in Sweden and the Netherlands – were already using commercially-available data. Sources included vehicle manufacturers, Waze, SMHI and SOS. Quoted users of NAP data include Waze, the French CoopITS app, HERE, and the city of Cologne (see annex 5 of the pervious link).

The French road operators were using their own system, TIPI.

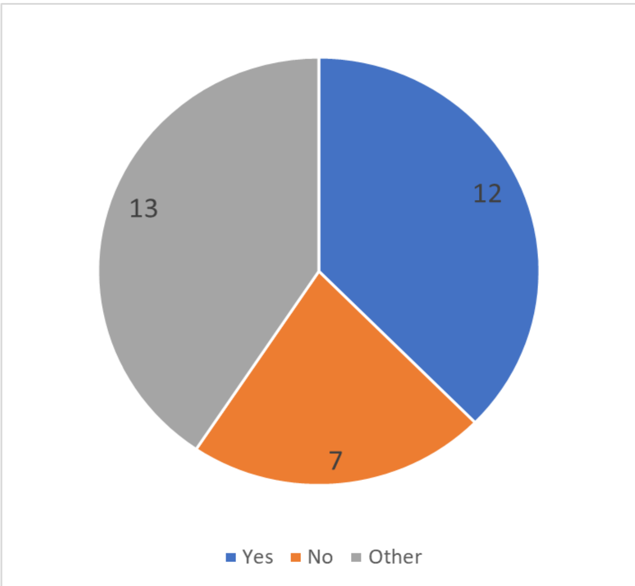
Feedback from questionnaire: Standards and understanding

Data standards and legislation may be trailing with advances in technology and data providers may not yet fully understand the needs of National Roads Authorities.

‘Are data standards fit for purpose regarding the use of third-party data?’



‘Do third-party data providers understand the needs of National Road Authorities?’



Conclusions

Conclusions

Summary of findings

Details of who used exactly which data were hard to find. It is possible that this is because it is either commercial in confidence, or else because it is suspected that the prospect of having their data shared, even anonymously, might not appeal to all road users. However, there are already many positive and promising examples where third-party data has been acquired and used by road operator or authority to complement the primary 1st party sources, which has led to, for example, more timely traffic management measures, improved traffic information and cost savings. In some cases, third-party data has been used to substitute data that has been earlier collected with costly road-side equipment.

Many third-party datasets are originally collected for internal business purposes of the collector, and the data services offered for NRAs come as side-products even though they may require extensive data analytics to cater for the specific needs. Commercial data providers are typically using value-based pricing models; hence it is many times beneficial for NRAs to use public procurement to acquire such data. There are also some data ecosystems where data can be accessed free of charge based on data reciprocity.

Summary of issues raised

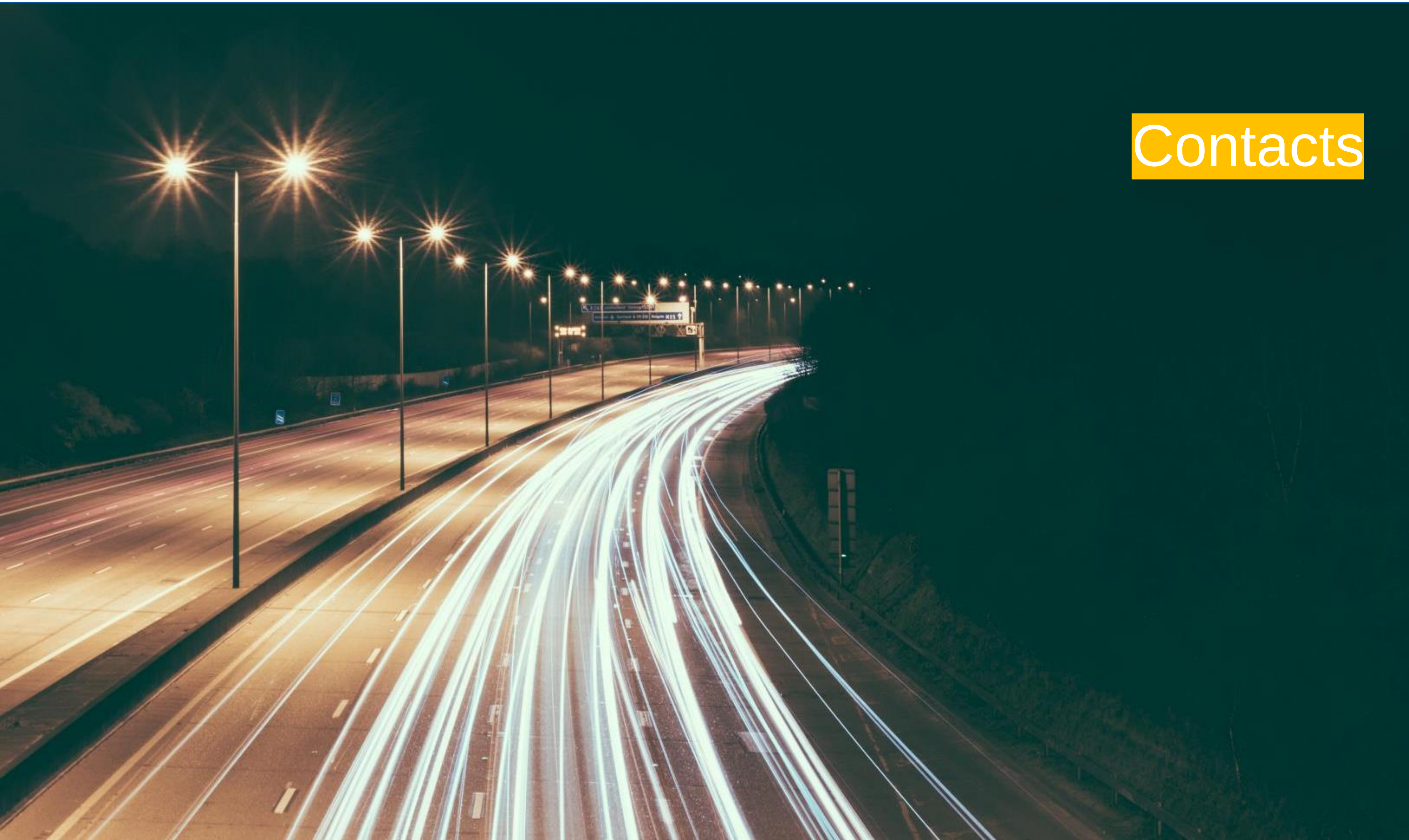
It is very much a dynamic field. However, many NRAs already have the skills to make use of third-party data. There appear to have been many attempts to co-ordinate the sharing of data, not all of which have persisted. Data standards are perceived to be trailing reality on the ground, and to not always be fit for purpose.

Literature and feedback from the questionnaire respondents suggests the NAPs need to co-ordinate more effectively and data anonymity needs to be assured.

Implications for the future (better quality of life and EU goals)

The use of data is evidently improving the journey experience for road users and making the roads more efficient (by informing of best routes, temporary obstacles, improved traffic management). It is evident that some countries are further along the road to full digitisation than others. In many cases lack of shared knowledge is not the main issue: resources and culture are also at play.

Contacts



Contacts

The list below shows key contacts for the CEDR PRESORT project.

Organisation	Country	Name	Email
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