

Can new data sources replace travel surveys and deliver the data we need to support the low carbon mobility transition?

Policy brief by Dr Anna Clark, Trivector Traffic, September 2018

Key messages

- Travel survey data is important in transport climate change mitigation work.
- We need new travel survey methods to deliver high quality reliable data, and we can take advantage of new technologies to do this.
- It is important that data for all of the (primary) modes of transport be collected, rather than focusing on modes where data is most readily available (motorised vehicle traffic).
- New methods particularly provide opportunities to better understand cycling and walking, and understand travel in context (trip chains, over days etc)
- Consideration of representativeness, privacy and data quality needs to be made in using new data sources.

Introduction

Passenger transport remains a stubbornly carbon-intensive activity, with transport emissions continuing to increase in the EU despite energy efficiency improvements of vehicles¹. In order to reduce emissions from the transport sector, we need high quality and reliable data on how people travel (how much? what mode? when? who is travelling?). Without these facts, our climate change mitigation efforts are often little more than stabs in the dark as we cannot build proper frameworks for monitoring and evaluation on the system level. A travel survey is a method that collects data on how people travel in relation to their activities, answering the questions posed above. Travel survey data is used by public and private organisations to answer a broad range of questions, to set policy, and to follow up on goals. For example, policy goals relating to creating a more equal transport system can be followed up by understanding how different groups of users (“who”) are using the transport system, and a company policy to reduce transport CO₂ emissions starts with understanding how people travel.

We need good data to support public and private organisations in pinpointing how best to reduce travel and shift travel to more sustainable modes (walking, cycling, public transport, and shared solutions including MaaS) as well as to follow-up and evaluate implemented measures. Reducing individual motorised transport, and shifting to more sustainable modes is at the core of climate change mitigation efforts in the passenger transport sector.

Today’s travel survey methods do not provide the high quality of data that is required. In 2016, the body responsible for the national travel survey in Sweden (Transport Analysis) paused their travel survey data collection. Despite comparatively high response rates for their survey in Sweden compared to other countries, there were seen to be anomalies in the data when compared with other sources, and the organisation needed to look at new ways to collect travel survey data.

” *The travel survey data collection techniques we traditionally have used show worrying signs of bias that were not earlier found. We need to investigate this further, and at the same time look to see in what way new methods can develop and supplement the traditional methods.*

- Eva Lindborg, Transport Analysis

Organisations across the world are starting to realise that a shift needs to be made in the collection of travel survey data, embracing new big data sources and taking advantage of smartphone devices that travel with individuals. However, traditional methods are still dominant. This insight focuses on the transition to higher quality transport data collection that can support us in the shift to a low carbon mobility. It is based primarily on work done in Sweden (including an international literature review) in identifying new travel survey methods^{2,5}.

What is a traditional travel survey (TS), and how is it performed today?

A travel survey is a method that has been developed to collect data on how people travel. Traditionally, data has been collected from a random sample of a population (e.g. inhabitants in a city). Respondents give information on how they have travelled through paper, phone or sometimes web-based questionnaire. The exact format differs between countries³, but it relies on the respondent remembering previously made trips (often over a 24-hour period), how (bus, car, walk, etc), why (work, school, shopping, etc) and the distance and time of each trip – in household surveys, one single individual can even be requested to remember all of the trips for their household.

There are several problems with today’s collection methods: (i) completing surveys is a burden (ii) data collection is very costly (and thus not done often) (iii) response bias is found (iv) times and distances are hard for people to get right and routes are not included at all (v) connecting trips (often walking and cycling) are often forgotten (vi) data provides only a snapshot of individual travel (sparse time series).

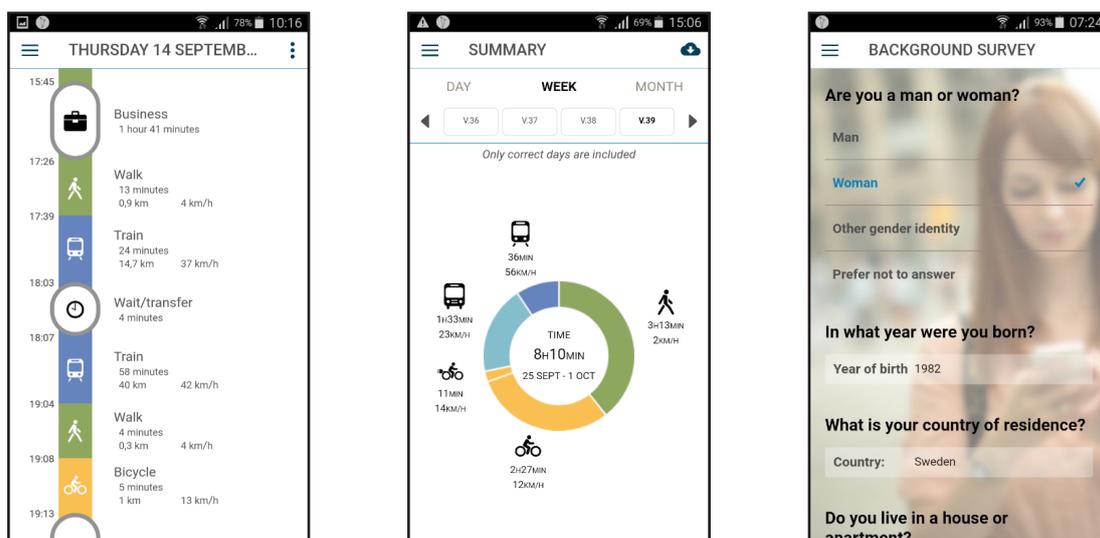


Figure 1 Screenshots from travel survey app TravelVu. An example of using mobile phones to support data collection in future travel survey techniques, including detailed individual data.

Future travel surveys

What data is needed?

For (future) travel surveys, information is needed about:

- **the trip:** geographical origin and destination, route, start and end times, duration, mode of transport.
- **the purpose:** why the trip is being made.
- **the individual:** who is travelling and their characteristics.

Relatively in-depth information about the individual and the purpose of the trip will continue to constitute a key element in travel surveys (see example figure 1), and this will require the active involvement of the person providing the data⁴.

What kind of data can be included to understand travel behaviour in the future

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There are a wide range of data sources that provide data that respond to some/all travel survey data needs (see figure 2). In most cases, new data sources improve on traditional methods by: providing better data regarding trip details and routes; reducing user-burden; providing continuous data and reducing costs⁵. Very few data sources will by themselves provide data that responds to all travel survey data requirements. It is thought that the travel survey of the future will be in the form of a platform which integrates big and small data sources to respond to the questions of interest to travel survey data users⁵.

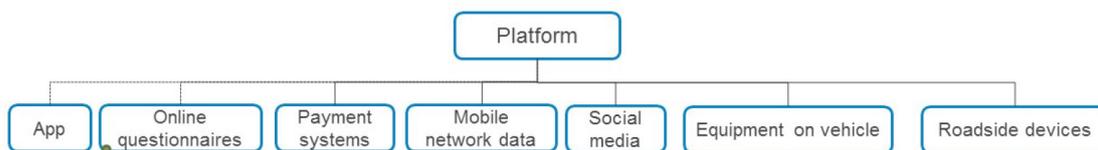


Figure 2 Different data sources for future travel surveys⁵.

What's measured counts

Today there is already a lot of data on motorised vehicle traffic, with much less understanding of bicycle and pedestrian traffic^{6,7}. This can lead to solutions being derived to optimise motorised vehicle traffic rather than transport of people. To derive an understanding of transport and support a shift to low-carbon modes, it is important that data for all of the (primary) modes of transport be collected, rather than simply on modes where data is more readily available.

Different data for different needs

Different types of data material can answer different questions, and it is not necessary to impose the same strict requirements in terms of information and accuracy in every case (although quality still needs to be assured). New types of data – particularly GPS tracks / geographically tagged data, and continuously collected data – provide new insights into how we can understand travel behaviour, and can broaden the areas of application for travel survey data (e.g. better understanding of trip chains, travel over time, and better understanding of cycling and walking trips)⁵.

Using new data sources to understand cycling

Shifting to a low-carbon transport system requires better understanding of cycling

Smartphones provide a new way to collect cyclist data. GPS positioning collected through apps on mobile phones provide a new way to collect data. But what do we need to know about the individuals? In what way is the crowdsourced data biased? What useful things can we do with the data?

In November 2017, 800 cyclists in Gothenburg (Sweden) donated data to a research project through the apps TRavelVU (a travel survey app), Strava and Moves (both fitness apps). The data collection was defined in a way so that the data could be useful to understand and improve cycling in the city, and tested different recruitment techniques to see which worked best. The data collection is biased, but since socio-demographic data on the cyclists was collected, it is possible to identify groups that are over or under-represented in the dataset⁸.

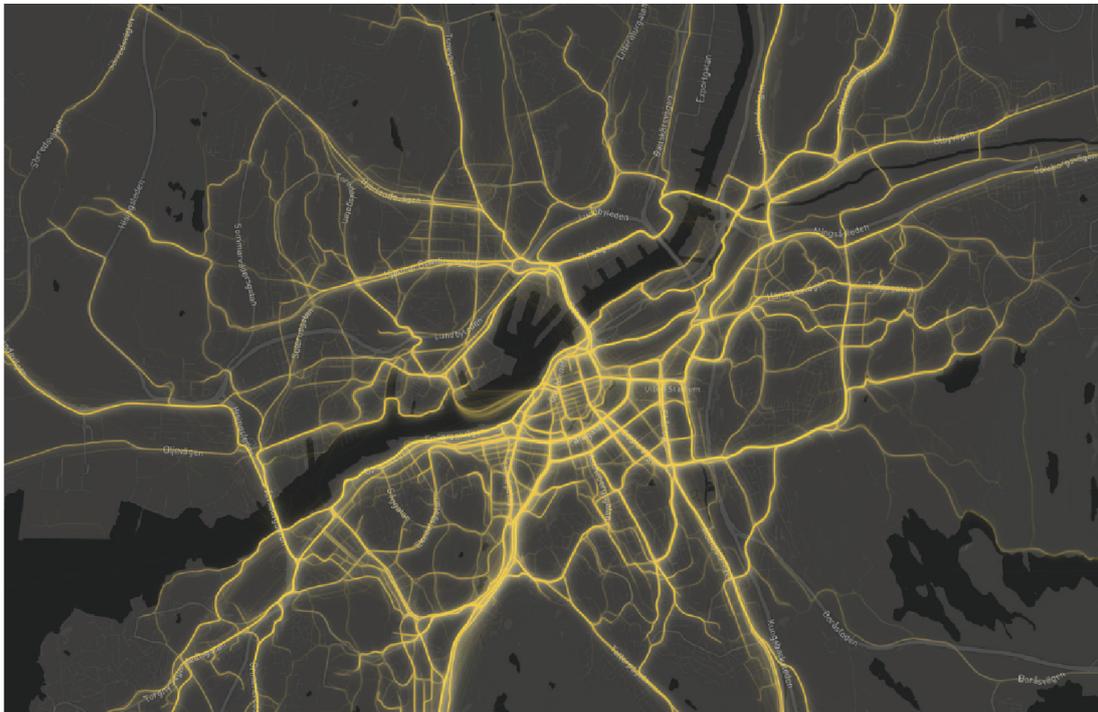


Figure 3 Donated GPS tracks from cyclists in Gothenburg, November 2017⁸.

Enabling Factors/Challenges

The main enabling factor for new travel survey methods is digitalisation, and using smart phones as sensors / proxies to understand individuals' travel. Although the technology is in place in many cases, most of the tools / methods are not mature in terms of representativeness, comparability with traditional TSs, and legal aspects.

The three main challenges regarding new methods for travel survey data are the following:

Representativeness

None of the new methods can provide a completely representative sample of the population, and this is where research / piloting work needs to be focused. How can we fuse different data sources to provide a representative sample?

Personal integrity / data privacy

One of the major advantages with new data collection methods is the possibility to have geographical information (mainly collected through tracking mobile phones as a proxy for individuals' travel). But it is important that the data collection is done in such a way that protects individuals' personal integrity. In Europe, requirement to comply with GDPR⁹ gives a framework by which to do this. It needs to be investigated how different big and small data sources can improve the protection of personal integrity, and that design of future data collection methods keep this in mind.

Quality control

Today's travel survey methods rely on established and harmonised methods for collection, and quality control of data. New data collection techniques are often managed by private actors and details regarding data cleaning, and quality assurance are not harmonised, and often not published. Quality control parameters need to be established.

Implications and Guidance

The main finding is that new data sources can provide new ways to understand travel and transport, and can provide data of a higher quality compared to current methods that better support the low-carbon mobility transition. Passenger transport remains carbon-intensive. It is not enough to have the technology and innovations (e.g. electric cars, MaaS) to reduce CO₂ emission, we need to know how best to introduce them, how to set appropriate goals and follow them up but also how to create good conditions for (e-)biking, public transport and walking, including how to promote them. We need high quality and reliable data on how people travel to do this (how much? what mode? when? who is travelling?).

To achieve the climate benefits from new travel survey data collection techniques, there are some key areas of future research:

- Pilot the different solutions in different countries and compare the results.
- Research how to fuse and weight different data sources to provide a representative sample of the population.
- Investigate legislative aspects especially concerning how protect data privacy and at the same time get detailed meaningful data.
- Develop parameters / methods for quality control that can be used to ensure comparability across different countries.
- Ensure that all modes are considered in pilots / testing, especially low carbon transport modes (particularly walking, cycling) in order to support the shift to a low-carbon transport system.

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