International Transport Forum

Use of Mobile Telecommunication Data in Transport Modelling
A French Case Study

186 Roundtable

Discussion Paper

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Paris

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Introduction

Public authorities, transport network operators and investors depend on transport models to understand and forecast the demand for passenger transport. Such models require the collection of large amounts of data on people's trip numbers, destinations and transport modes, among other aspects.

The number of mobile phone users worldwide will reach 7.1 billion by 2021 (O'Dea, 2020). In France, the proportion of people using a mobile phone already reached 95% (Gautier, 2020). The near ubiquitous use of mobile phones makes it possible to envisage the collection of mobility data through the tracking of these devices.

Using an *already existing* telecommunication equipment, capturing passenger mobility data through mobile phones could be a cost-efficient solution. Other advantages could be the timely automated data processing, and a very large sample size.

This paper illustrates how mobile telecommunication data can reveal trip numbers and destinations, but also transport modes. The authors explain the processing of mobile telecommunication data from a French mobile telecommunication company. They calibrate a method to mine the dataset and identify trips, separate trips from other activities, and infer transport mode. The paper finally compares the resulting trip information with figures from more traditional data sources.

Mobile phone geolocation technologies

One should distinguish two main technologies for the geolocation of mobile devices: one that takes place using the device's own sensors and software, such as GPS or local Wi-Fi access points and another one developed by the mobile telecommunication companies that is called in this paper mobile phone tracking.

Mobile phone tracking

The tracking of mobile devices is possible thanks to the array of telecommunications antennas – also known as cell towers – that carry voice and data in the Global System for Mobile Communications (GSM). Unlike GPS technology, GSM tracking does not lead to a greater battery use on the mobile device. GSM data quality however depends on the density of cell towers and on their complete coverage of the region.

Mobile phone tracking technology has already been used in the tourism and commercial sector providing mobile phone customers with location-based services, such as information about nearby facilities of interest: restaurants, shops, stations (Rajalakshmi and Goyal, 2018).

This paper consists in a case study from France that uses GSM data to assess passenger trip volumes at the national level. To the authors' knowledge, this is one of the first attempts performed at this scale for transportation modelling purposes with such large amounts of data. Assumptions and methods of data processing were defined specifically to capture long distance trips for the year 2018, as part of the update of a national demand model. The data analyses are conducted by the Systra consultancy for SNCF Réseau, the national rail network company that manages, maintains and develops the French rail network.

An opportunity to collect trip numbers and trip destinations

The operation of a mobile telecommunication network generates enormous amounts of data, which is extremely valuable for marketing and transportation planning. Such data could complement or replace traditional survey methods for the estimation of trip volumes and trip destinations, often designated under the term Origin-Destination (OD) trip matrices. Traditional methods include household travel surveys, passenger counts, on-board surveys and cordon surveys.

Household travel surveys are the pillar of most transport planning and modelling studies (Stopher et al., 2006) despite their well-known problems namely cost, delivery time, non-response, incomplete responses, and the limited ability from respondents to recall their trips and to bear with a lengthy survey. Such limits make it difficult to collect precise travel data, especially over a long period. Yet, to capture effects of transport policy measures on travel behaviour, it is essential to collect data over a long period (Axhausen et al., 2002).

Origin-Destination data from mobile telecommunication operators may overcome the limits of traditional survey methods since mobile phones are permanently tracked.

Deriving trip data from mobile phone tracking

One of the main problems in passenger transport planning and operations is how to obtain precise mobility data. Among such data, OD matrices are especially important and are most often estimated by means of household surveys.

Origin-Destination trip matrices include the number of travellers moving between each pair of zones in region over a defined period of time.

A method for determining OD mobility matrices would consist in the use of certain data derived from mobile phones, which is the objective of the current study over the French case.

However, transportation planning requires knowing the origins and destinations (OD) of all trips within a territory, between all internal zones and in exchange with the outside. Above all, it requires a reliable estimate of the distribution of flows between the main modes of transport.

A comparison between GSM traces and the local household travel survey in the Paris region, (Bonnel et al., 2015) conclude that mobile phone data have the potential to become a precious input for passenger transport planning.

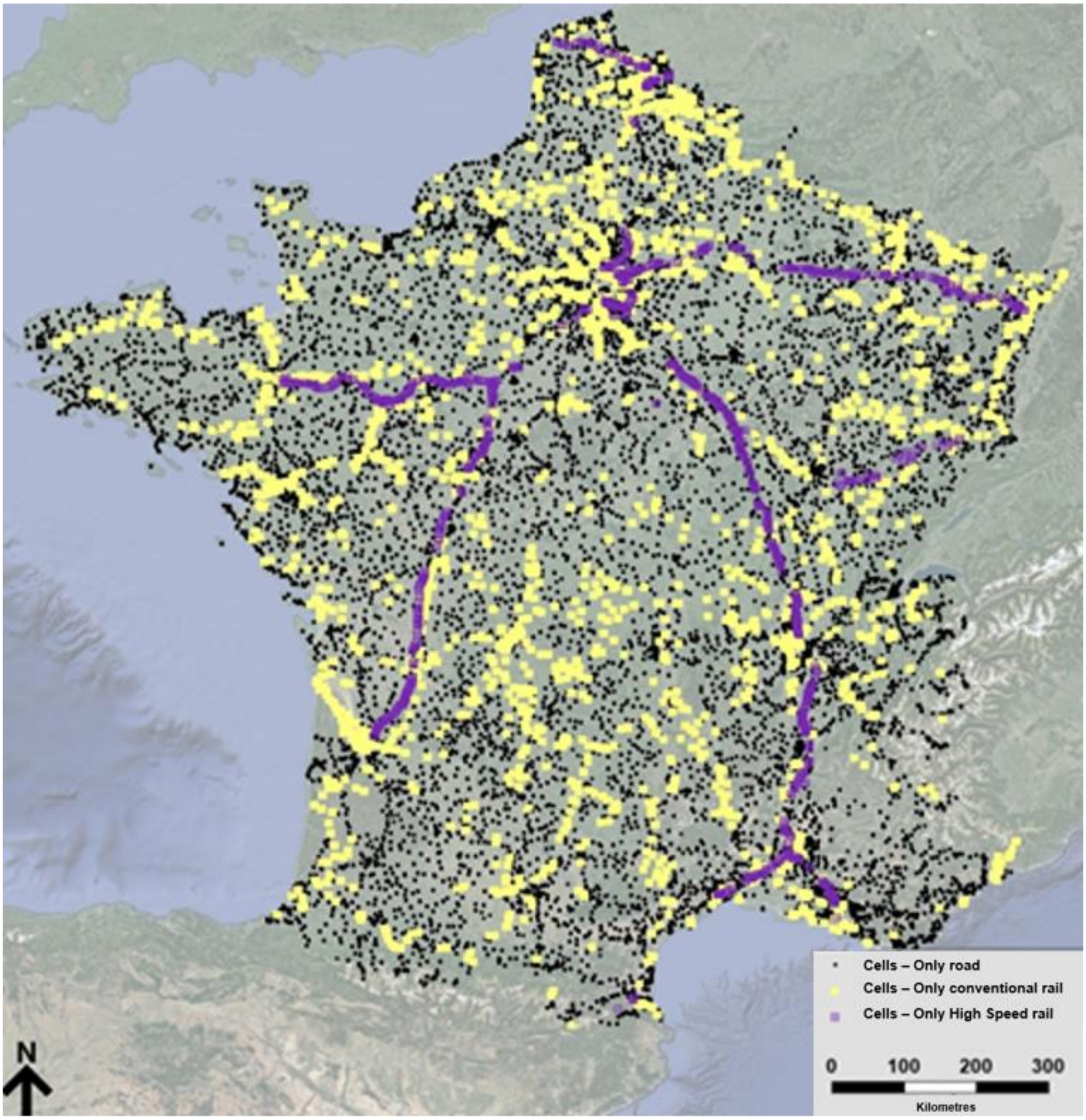
This paper examines to which extent, and under which conditions, mobile phone tracking can help the planning of passenger travel on a rail network.

Technical factors determine the precision of mobile phone tracking

The relevance of mobile phone traces is only as good as the accuracy of device geolocation, which depends on the cellular network equipment.

Mobile device tracking simply associates a device to a cell, providing no information on the exact position within that cell. Consequently, there is always a margin of error, reflecting the size of the cell: 100 to 1 000 metres in built-up areas, 5 to 20 kilometres in rural areas.

Figure 1. Cell-towers coverage – all operators – France



Source: Systra (2020).

The update frequency of location data is another important factor that determines the quality or mobile phone tracking data. The hypothesis developed in this paper is that mobile telecommunication networks generate sufficient data points to track the movement of devices and identify trips made by their owners.

Privacy protection

De Montjoye et al. (2013) investigated the anonymous nature of trip traces and concluded is that these are strongly identifying: four data points taken at random during a 15-month period are 95% likely to identify a person among a crowd of 1.5 million people.

The French National Commission for Information Technology and Civil Liberties (CNIL) requires that detailed mobile phone data are not disseminated. The Commission permit some analytical work, under the following condition: trips are aggregated, and these aggregated counts must be greater than 20 to be disclosed. No value below 20 movements can be transmitted from a mobile network operator to a third party. In the remainder of the document, this constraint will be called the "CNIL threshold". Thus, information might then be processed, without any need to reveal confidential subscriber data.

The authors wish to clarify that techniques presented in this paper align with CNIL recommendations and do not infringe on the privacy of mobile phone users. They also comply with the General Data Protection Regulation (GDPR) and the European Directive 2016/679 which regulate the treatment of personal data and protection of intimacy in the electronic communications sector.

Research objectives

SNCF Réseau commissioned Systra to investigate the potential of mobile phone traces to capture long distance trips over the whole country. The paper explores this potential, proposes some sensitivity tests, validates the results against independent data sources, and concludes on the relevance of mobile phone tracking in this context.

Raw mobile phone traces simple data points including a location and a timestamp: they provide no information on trip numbers, destination, routing and mode choice. Analysts have to make arbitrary decisions for the interpretation of the data: they divide the study area into zones, choose parameters for the separation of trips from static activities, calibrate a technique to infer transport mode, etc.

Among the technical specifications and assumptions that need to be defined in order to get trip matrices from mobile phone, the current paper focuses on the constitution of the appropriate zoning for the study purposes, and the choice of the temporal threshold to define a trip. The paper also proposes to define a set of quality indicators to control the reliability of estimated trip numbers on main transport modes.

Methods

As part of a project management assistance and consultancy contract between Systra and SNCF Réseau, Systra worked with the mobile phone telecommunication network operator Orange (the MNO) to develop all the methods presented here. The MNO provided three datasets:

- Trip volumes observed for each day of November and December 2018,
- Annual average day trip volumes (AADT),
- Three databases representing the average trip volumes during basic working days (AWDT).

The MNO adjusts the datasets to obtain a result representative of the total French population. Equipment rates and market shares fluctuate by territory and population segmentation, and some users have business mobiles. All these parameters are considered by the MNO using a customer database, which has not been transmitted to Systra. The processing of these parameters leads to the calculation of a mobile phone adjustment coefficient in order to reconstruct the population of an area according to the MNO zoning and predefined socio-demographic population segments. The calculated coefficient is used to assign a weight to each mobile phone trace.

Defining a suitable set of zones

To aggregate trip numbers while retaining trip destination details, analysts must divide the study area into zones. The choice of a suitable set of zones (a zone system) is particularly important for the elaboration of OD trip matrices. Defining excessively fine zones would yield small trip volumes for each OD pair, resulting in the obfuscation of data in accordance with data protection rules. Another consideration is to align with the geography of the cellular telecommunication network, in order to optimise location accuracy.

To comply with data protection rules, Systra and the MNO defined two zone systems:

- A fine zone system enables the analysis of short distance flows. It uses a scale varying between the municipality and groups of municipalities for the analysis of relations at short and medium distances. The population in a fine zone varies between 50 000 and 500 000 inhabitants. It includes 1 300 zones for the French continental territory (+ Corsica).
- A coarse zone system enables the analysis of long distance flows (more than 100 kilometres). It matches the French administrative division called "*département*" with zones between 100 000 and 2.5 million inhabitants. It includes 94 zones for the French continental territory (+ Corsica).

Figure 2. Fine zone and coarse zone systems

Source: Systra (2020).

To optimise the location accuracy in a fine zone system, Systra and the MNO worked together to define the most suitable zones. Two indicators guided this iterative process:

- C0, the probability that a mobile phone actually present in a zone is detected in this one,
- C1, the probability that a mobile phone that is not present in a zone is mistakenly detected in it.

The zones for which the C0 and C1 measurements were not suitable have been grouped with some of their neighbouring zones. This procedure resulted in the grouping of municipalities in sparsely populated areas. On the other hand, in more densely populated areas, some zones were defined as a single municipality. Sub-municipal zones exist in the three French largest cities: Paris, Lyon and Marseille.

Setting the immobility threshold

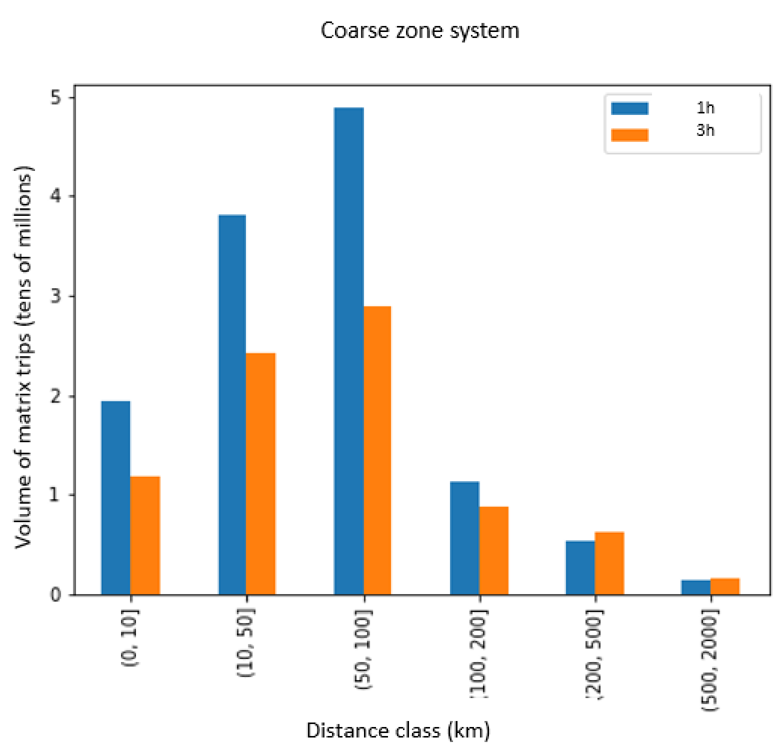
Transport planners define a trip as a movement made to achieve a “trip purpose”, such as “dropping the children off at school” or “going to a transportation conference”. The part of a trip that uses a single mode of transport, without transfer to another vehicle, is called a trip leg. However, the notions of “trip”, “trip purpose” and mode are not available in the raw mobile phone tracking data. The later consists of a series of data points, each having a zone identifier and a timestamp. The challenge is to identify trips and to infer trip purpose and transport mode(s) from the raw data.

In the exploitation of mobile phone traces, one must examine how long a device remains in a cell and decide whether this duration reflects travel time or reveals that an activity is taking place. In other words, the time spend by a device in a cell will determine whether the owner remains on trip or has ended a trip. It is essential to define this "sufficient time" called in this study "stationary time" or "immobility threshold".

There is no convention among professionals for setting this parameter. A threshold of a few minutes would be necessary to capture the trip purpose for "dropping off children at school" but will improperly classify at the end of the trip all those stuck in traffic jams. A threshold of several hours will allow air travellers to be coded as making a single trip, despite their precautionary time at the airport, but will ignore a vast number of trips motivated by an activity whose duration is shorter than that.

These following graph presents the distribution of the matrix trips obtained from mobile phone data linked to the coarse zone system in volume according to 1-hour and 3-hours immobility thresholds.

Figure 3. Influence of the immobility threshold on trip numbers (coarse zone system)



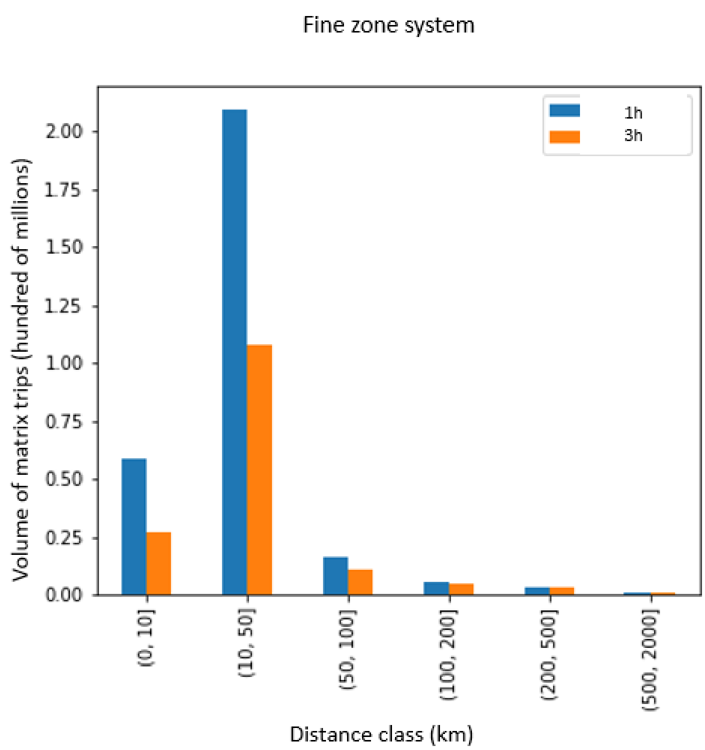
Note: Trips are mapped to the coarse zone system.

Source: Systra (2020).

This graph clearly shows that a higher immobility threshold contributes to a higher estimation of longer journeys (>200 km), which are more numerous in terms of volume compared to this same type of trip for a threshold of one hour. In fact, in the case of long-distance journeys, a high threshold makes it possible to capture a larger number of such journeys compared with a smaller threshold which would be polluted by intermediate stops and, therefore, would divide a journey of this type into several trips. Consequently, when comparing mobile phone data with survey or modelling data relating to long-distance trips, a long immobility threshold would be preferred. However, for short and medium distances (<200 km), the 3-hours threshold clearly gives underestimations of the trip volumes compared to the 1-hour threshold (up to +75% trips between 50 and 100 km at 1 hour compared to 3 hours). Indeed, all trips with a stay at destination shorter than the threshold is not recorded.

The authors carried out the same analysis on the fine zone system. Fine zones are only suited to capture short-distance trips. Long-distance trip numbers would be too small if finely diced by a large set of fine zones. The MNO would have no other choice but apply the data protection rule and obfuscate such small trip numbers. The fine zone system being limited to the analysis of short-distance trips, the 3-hour threshold loses relevance. A shorter immobility time threshold would therefore be better suited to a fine zone system.

Figure 4. Influence of the immobility threshold on trip numbers (fine zone system)



Note: Trips are mapped to the fine zone system

Source: Systra (2020).

Controlling quality in trip volume estimation

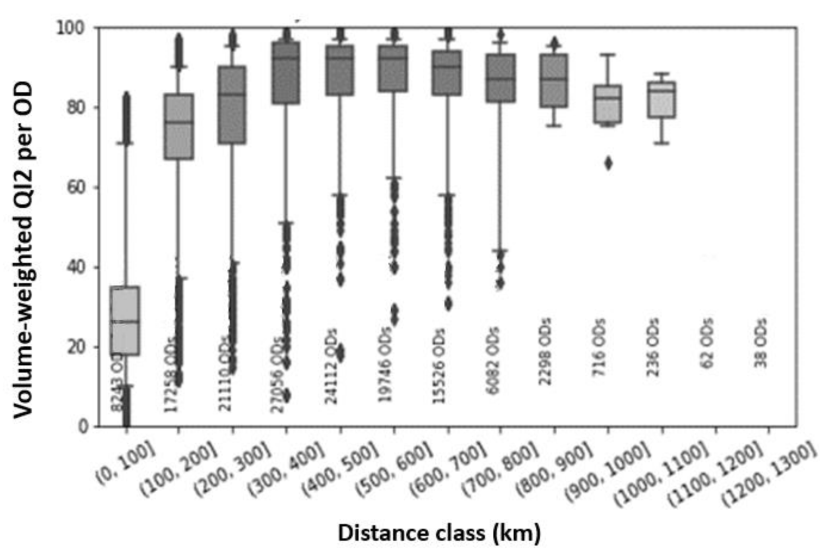
To convert the raw mobile traces into trips volumes, the MNO performed a set of operations. These include approximations, which it is not possible to judge by looking at the final data alone.

In this study, six quality indicators (QI) were developed by Systra and the MNO to understand the reliability of the trip data. Two of these indicators relate to the zoning system (C0 and C1 mentioned above) and four others relate to the quality of trip volume estimation for each OD pair:

- QI1: influence of statistical adjustment. This indicator indicates whether the flow has undergone a significant statistical adjustment to be representative of the population or not.
- QI2: modal assignment. This indicator is high when a large part of the traces can be confidently attributed to a mode.
- QI3: precision of the origin and destination areas. This indicator relates to the frequency of mobile locations. When this frequency is high, the reliability of locating the origin and destination area is better.
- QI4: terrestrial modal assignment. The modal distinction is simpler when it comes to the air. This QI focuses only on terrestrial modes. The terrestrial modal assignment is largely determined by the passage through cells which are characteristic of a given mode. For example, a signal from a cell tower that is received mainly by rail travellers is characteristic of rail. However, some mobile phone traces capture cells characteristic of several modes. This indicator expresses the ratio between the number of characteristic captures which relate to the inferred transport mode and the total number characteristic captures.

The study of these quality indicators shows that they have little correlation with the trip volume but correlate with the distance travelled. The shorter the distance, the lower the probability of capturing a characteristic antenna. As a result, modal inference quality indicators (QI2 and QI4) are better on longer distance OD pairs. Figure 5 shows that QI2 deteriorates considerably for distances below 100 kilometres.

Figure 5. Distribution of QI 2 values by distance class



Source: Systra (2020).

Inferring the main mode of transport for every trip

The mobile phone trace does not include information on the mode of transport used. This must be inferred from the trace. This mode determination work is specific to the study and to the methodological choices applied.

For each trip found in mobile phone traces, the main mode of transport is determined by the presence of the device in mode-specific cells over the course of the trip. Where a trace encounters cells that are specific to different modes, the inference of a main mode is conducted by order of priority: air, high-speed rail, classic rail, road.

Antennas that cover both the railway and the roads are considered ambiguous and are excluded from the mode analysis. Several antennas are necessary to assign movement to a terrestrial mode.

Identifying a trip by plane follows a different logic. The MNO assigns to "air" any trip where the mobile device was present in an airport zone on departure and arrival and which disappeared from the mobile network during their movement on the land zone separating the two airports.

Once this methodology is implemented, there are flows in the matrix that could not be assigned to a specific mode. Systra and the MNO did not conclude on how this flow should be distributed between the modes. It is therefore important to take this uncertainty into account in the analyses. In the next section, the focus is on long distance trips with a high QI2 where the unassigned flows are relatively low (less than 5%). The unassigned flows are not taken into account in this analysis.

Data validation

This section seeks to validate the trip numbers provided by the MNO for an average working day against independent data sources. In this validation process, the authors compare MNO data with the transport model owned by SNCF Réseau, and with air and rail passenger flows from public datasets. Comparisons will examine the volume and structure of MNO data, but also challenge existing databases.

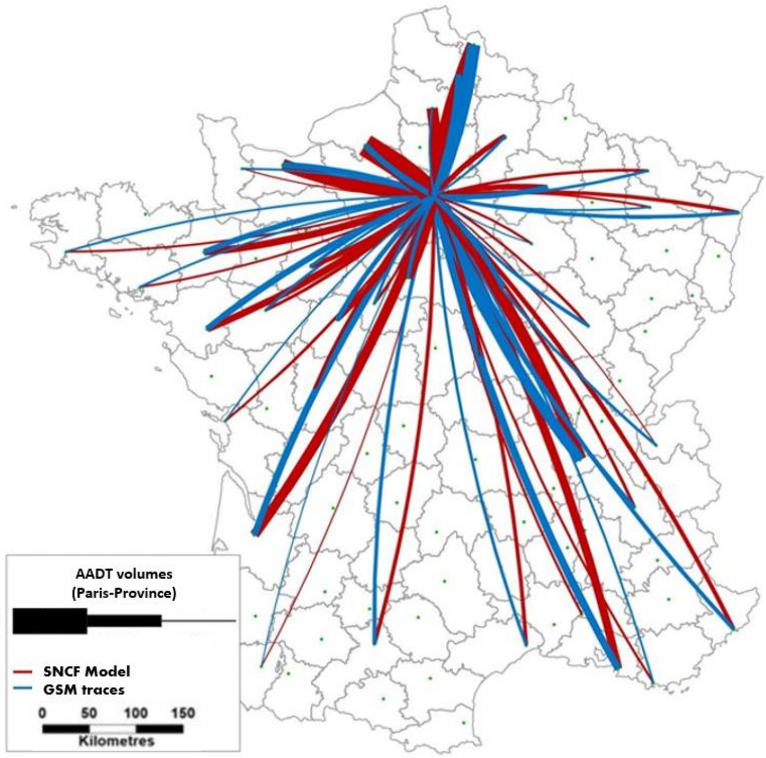
This analysis is limited to long-distance OD pairs, beyond 100 kilometres, using the coarse zoning system and the 3-hour immobility threshold.

Comparison with SNCF Réseau traffic forecasting model

The model owned by SNCF Réseau is not limited to rail trips but captures all modes of transport. The maps below compare the total number of trips across all modes, as found in the model from SNCF Réseau (in red) and in the MNO data (in blue). Only the main flows have been retained (flows greater than 3 000 trips on an average working day and beyond 100 kilometres).

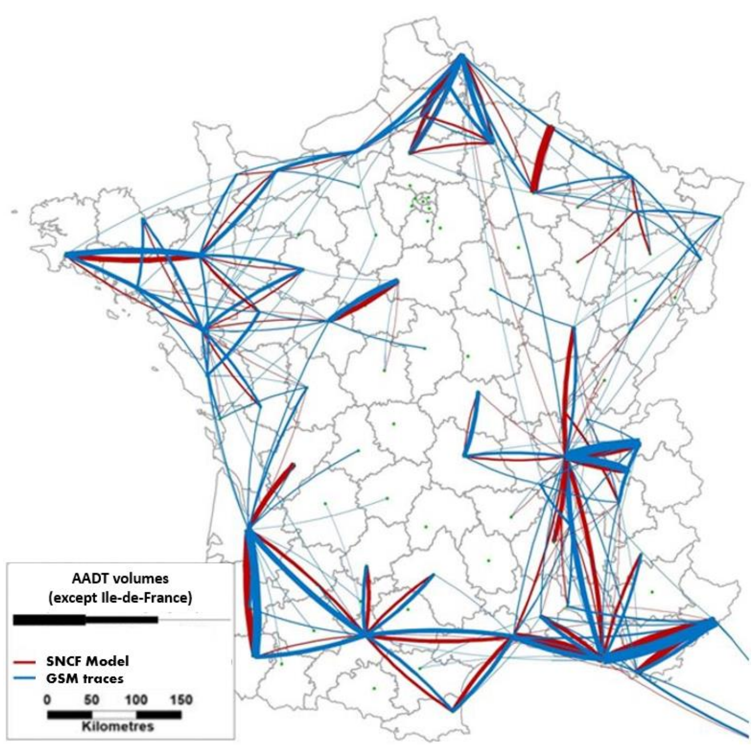
The first map displays only the flows to and from Paris (*département* 75). The two data sources match reasonably well. One could however notice a Paris to Normandy OD where the model has a much higher flow than mobile phone data would suggest.

Figure 6. Comparison of Paris-Province flows between GSM traces and the model



Source: Systra (2020).

Figure 7. Comparison of Province-Province flows between GSM traces and the model



Source: Systra (2020).

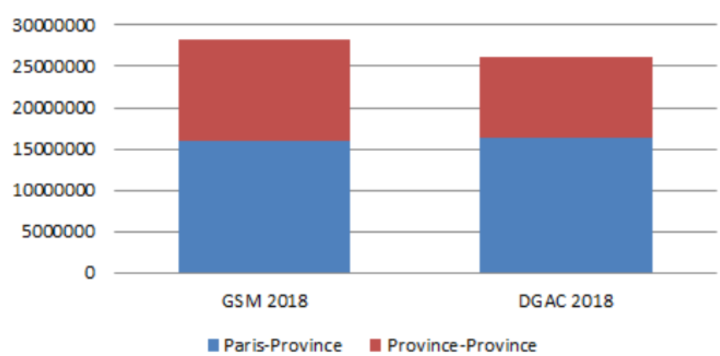
The second map compares all other flows (those neither from nor to Paris). It reveals many OD pairs where the model accounts for no trips, suggesting that GSM data is more complete. Mobile phone tracking data thus provides precious information that is particularly hard to procure: the flow of travellers across all modes. It remains difficult however to assess the validity of the trip volumes obtained from GSM data.

A comparison between mobile phone tracking data and the SNCF Réseau model have highlighted similarities and some differences. This analysis should be taken further to determine whether differences are due to an anomaly in the collection of GSM data or a defect in the collection or processing of surveys and counts in the model. This investigation has yet to take place. To date, GSM data has only been used to make comparisons with the SNCF Réseau model. They have not yet been used to fully update this model, but used to check its consistency, and fill some gaps for the road mode

Comparison with air traffic data

This section seeks to validate the inference of transport mode by the MNO, starting with air travel. When one compares the air travel matrix from GSM data with figures from the Directorate General for Civil Aviation (DGAC), the results in total seem consistent. Figure 8 shows the number of air passengers in 2018 from MNO data and from DGAC. Flows to and from Paris airports are represented in blue; other flows in red.

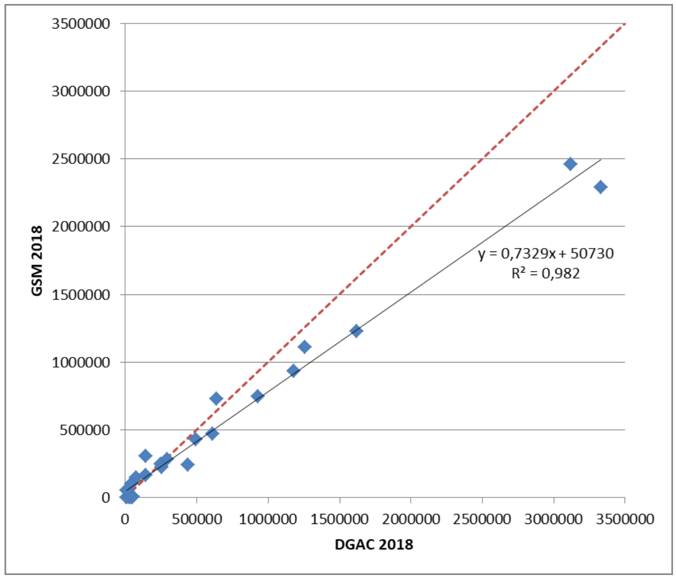
Figure 8. Comparison of the number of travellers 2018 GSM / DGAC



Source: Systra (2020).

The GSM matrix is 7% higher than the figures published by the DGAC with province-province flows which explain the difference. On the other hand, it presents a total of radial flows relatively close to those of the DGAC matrix. Nevertheless, the detailed study of the radial flows shows (on Figure 9) that if the structure of the flows seems globally consistent with the data of the DGAC, this is not the case of the volumes of the strongest relations, underestimated in GSM data (up to about -30%).

Figure 9. Comparison of the main radial air flows 2018 GSM / DGAC



Source: Systra (2020).

So even if the total air flows are correctly reconstituted by the matrices derived from the mobile phone data the volumes per OD are unreliable on major air routes considering the results presented on Figure 9. Foreigners travelling inside the country is one of the sources of bias that could partially explain these differences, as they are very difficult to measure and weight in the mobile network dataset.

Comparison with rail traffic data

This section further looks into the inference of transport mode by the MNO, with a focus on rail travel. For this, the authors used a number of sources but focus in this paper on a single source by Eurostat (2015): the region-to-region trip matrix for rail passengers. At the time when this matrix was elaborated by Eurostat, France was divided into 22 regions, populated by an average of 3 million inhabitants each. The matrix is elaborated by Eurostat using a range of data sources including surveys and counts.

This comparison exercise excludes the flows between neighbouring regions due to their poor scores in some key quality indicators. The modal distinction is indeed less reliable on short distance ODs.

The authors found the MNO data to contain twice as much trip volume as the Eurostat data for an identical scope. Long-distance rail travel increased between 2015 and 2018, with the opening of 550 kilometres of new high-speed lines, but this can only explain a small part of the difference. The reliability of rail trip volumes derived from mobile phone tracking is therefore questionable. The authors consider likely that a number of trips made by road are mistakenly identified as rail trips. The handling of trips whose main mode could not be identified likely makes the matters worse.

Discussion and conclusions

One could draw several lessons from this case study. First, mobile phone tracking data is complex and only a careful approach will prevent its misinterpretation. Transport planners have to set the zoning system and the immobility threshold that best fits their needs. Indeed, the threshold will determine whether a stationary episode is interpreted as a trip end or as an ongoing trip. This paper recommends adopting an immobility threshold of one hour to observe medium-distance trips (10 to 200 km), and of 3 hours to observe long-distance trips over 200 km.

This paper focussed on data validation and did not explore the use of mobile phone tracking data in the longitudinal analysis of passenger mobility, where the authors nevertheless see a great potential. Variations in time has been used notably to control the observed data.

The collection of data over a long period facilitated the analysis, enabling the capture a greater number of devices travelling on each OD pair. Such long sampling not only makes estimations more significant statistically, but also makes it more likely that a given trip volume will to pass the data protection threshold under which this information would be obfuscated.

The inference of transport mode in mobile phone tracking data must be used with caution and requires further research to become more reliable. It remains imprecise for trip distances below 100 kilometres. Consequently, one should avoid disaggregating trips by mode on short-distance OD pairs. Quality indicators suggest that mode inference is most accurate on trip distances between 400 and 900 kilometres. The authors recommend to examine the validity of GSM data by mode for each OD pair, and to account for the uncertainty caused by trips that could not be assigned to a transport mode.

Despite this list of precautions, mobile phone tracking data represents an important potential for the analysis and forecast of passenger mobility, not only at the national level as discussed in this paper, but also at a regional level using the fine zoning system. One could use MNO data, aggregated over a long period, to calculate several factors that modellers find valuable. These include conversion factors between time periods e.g. average day to average working day for each mode and each OD class. One could also use MNO data, when disaggregated by day, in the analysis of seasonality or specific events. Such fields of application remain for the authors to explore.

Systra will build on the experience presented in this paper and engage into further research with the MNO. There is still considerable room for improvement in estimating reliable trip volumes, in the analysis of border crossings and, most importantly, in the inference of transport mode.

References

Axhausen, K. et al. (2002) "Observing the rhythms of daily life: A six-week travel diary", *Transportation*, Vol. 29, Springer Nature, pp. 95–124, https://doi.org/10.1023/A:1014247822322 (accessed on 17 December 2020).

Bonnel, P. et al. (2015) "Passive mobile phone dataset to construct origin-destination matrix: Potentials and limitations", *Transportation Research Procedia*, Vol. 11, Elsevier, pp. 381-398, https://doi.org/10.1016/j.trpro.2015.12.032 (accessed on 17 December 2020).

De Montjoye, Y. et al. (2013) "Unique in the Crowd: The privacy bounds of human mobility", *Scientific Reports*, Vol. 3, Article 1376, Springer Nature, https://doi.org/10.1038/srep01376 (accessed on 17 December 2020).

Eurostat (2015), *Traffic of trains on the rail network – France, 2015* (database), https://ec.europa.eu/eurostat/fr/data/database (accessed 14 March 2019).

Gautier, M. (2020), "Penetration of mobile phones in France 2005-2019", Statista, www.statista.com/statistics/751926/mobile-phone-penetration-france (accessed on 12 October 2020).

O'Dea, S. (2020), "Forecast number of mobile users worldwide from 2020 to 2024", Statista, www.statista.com/statistics/218984/number-of-global-mobile-users-since-2010 (accessed on 12 October 2020).

Rajalakshmi, K. and M. Goyal (2018), "Location-based services: Current state of the art and future prospects", in Janyani V. et al. (eds.) *Optical and Wireless Technologies*, Lecture Notes in Electrical Engineering, Vol. 472, Springer, Singapore, https://doi.org/10.1007/978-981-10-7395-3_69 (accessed on 17 December 2020).

Stopher, P. et al. (2006), "Household travel surveys: Proposed standards and guidelines", in P. Stopher and C. Stecher (eds.), *Travel Survey Methods*, Elsevier, Oxford, pp. 19-74, https://doi.org/10.1108/9780080464015-002 (accessed on 17 December 2020).

Systra (2020), "Les données de téléphonie au secours de l'analyse de la mobilité", presentation given at the 47th ATEC ITS France conference held 22-23 January 2020, agenda available at: https://congres.atec-its-france.com/edition-2020/.

Use of Mobile Telecommunication Data in Transport Modelling

Transport planners see an opportunity in mobile phone data to better map trip destinations and monitor travel demand over time. However, such data require extensive processing to reveal trip details and transport modes. This paper defines quality indicators for reliable trip data collection and examines sensitivity to key parameters. It compares the trip matrices resulting from mobile network data with independent sources. This paper concludes on the strengths and weaknesses of such data in various transport planning tasks.

All resources from the Roundtable on Use of Big Data in Transport Models are available at:
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