

Project Appraisal Guidelines

Unit 5.1 Data Collection

February 2011

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1 Introduction

Overview

- 1.1. This PAG Unit provides details on the data available for use in the development of transport models. The Unit also includes some guidance on the collection of additional data for individual schemes which is not readily available.
- 1.2. Any model is only as good as the data on which it is built and it is important that the modeller understands the quality of data that is being used. It is also fair to say that data collection can be a costly exercise in terms of both time and money.
- 1.3. This means that no traffic survey should be planned unless it is clear why the information is needed, that there are no alternative sources for this information, and that the cost, timing and location of the survey are reasonable. A review of current data available, and planned data collection, both nationally and locally, should be undertaken to ensure that the requirement for data cannot be met from an existing source. This review should include consideration of any existing transport models which may be able to provide a basis for, or supplement, the proposed modelling approach.
- 1.4. Where large-scale traffic surveys are planned, discussions should be held with the NRA at an early stage to ensure that the data gathered will be suitable for use in any subsequent model development or appraisal.

Model Composition

- 1.5. *PAG Unit 5.2: Construction of Transport Models* describes the range of transport models available for use in different schemes and the model building process. The basic component parts of a transport model are network data and traffic demand as illustrated in Figure 5.1.1.

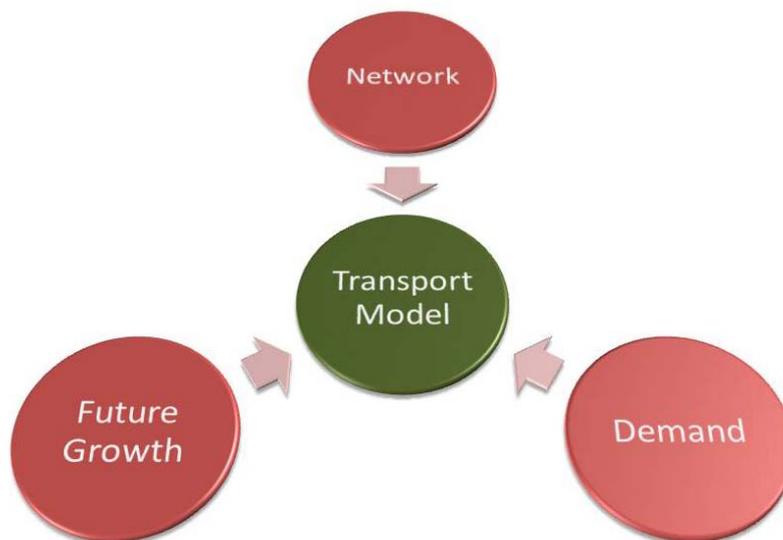


Figure 5.1.1 – Structure of a Transport Model

2. Network Data

Road Links

- 2.1. A transport model network is represented by a series of links (sections of road), and nodes (junctions). Each link in the network will have an associated capacity based on the number of lanes available to traffic and usually a speed flow curve. This defines how the speed of vehicles on the road alters as the number of vehicles change. Clearly, as the number of vehicles increases, the speed decreases.
- 2.2. The way in which junctions are handled is dependent on the modelling software that is chosen for the study. Some consider junctions as simple nodes with no associated delay; others incorporate more complex junction modelling which takes account of the type of junction (e.g. roundabout or signals) and the effect on the capacity of the network.
- 2.3. The road network does not need to include all roads in the study area, only those which carry a significant volume of traffic. But it should incorporate sufficient detail to reflect route choice within the area and may therefore incorporate minor roads which are used as rat-runs.
- 2.4. If an existing model is not available then a network will need to be built based on a combination of available data, and information gleaned from aerial photos or site visits.

Public Transport Network

- 2.5. A public transport network consisting of lines (public transport routes), stations and stops is required for the development of a Variable Demand model.

Zoning System

- 2.6. The development of an appropriate zoning system does not require data per se, but does require knowledge of the administrative boundaries (e.g. county, district, parish, townland). This is because zones should be designed so as to be capable of being aggregated to match these boundaries. This assists when making comparisons with other sources of data (e.g. population statistics) and also so that adjacent or regional / national models have some degree of commonality.

Available Data

- 2.7. The National Traffic Model (NTM) was developed by the National Roads Authority in 2008 and is currently maintained as a central analysis tool for the assessment of the future needs of the network at a strategic level. The modelled network includes all National Primary, Secondary and Regional Roads, plus other local roads of significance. The model is constructed to represent a 2006 Base Year. Network information is thus available on existing and proposed road links throughout the country.

- 2.8. The main source of network information for the NTM was derived using NAVTEQ data. NAVTEQ data provides detailed information on all existing roads throughout the country at all levels of complexity, with information on road type, speeds and distances. The NAVTEQ information also provides geographical data for all roads which allows the data to be input directly to network files of compatible models.
- 2.9. Detailed network information may be available from other models which cover a study area. Such models may include Local Area Models (LAM) cordoned from the NTM, models produced or maintained on behalf of other authorities, or individual models developed for scheme appraisal.
- 2.10. Mapping outputs are available from Ordnance Survey Ireland (OSI) and the Central Statistics Office (CSO) to support zone boundary definition. The latter provides mapping of District Electoral Divisions (DEDs) around the country. DEDs form the basis of the zone system used in the NTM.
- 2.11. Aerial mapping or photography can be useful in the presentation of micro-simulation model outputs and to understand the demand that might arise from prescribed zones.

3. Transport Demand

- 3.1. Transport demand is applied to the road network in the form of static routes for simple junction or network models, or as an origin-destination trip matrix with flexible routing in assignment models. The demand is applied for a specific time period.
- 3.2. The demand can be applied in the form of passenger car units which encompass all classes of vehicle, or as distinct user classes.
- 3.3. If a variable demand model is required the assignment process will also likely require public transport demand. This would need to cover all available public transport options within the study area, whether that is bus, rail or light rail.

Turning Counts

- 3.4. Turning count surveys are designed to provide the turning movements at a junction. Their complexity reflects the nature of the junction that is being surveyed. Turning movements at simple junctions can be counted by a small number of enumerators on site who directly record each movement e.g. Arm A to Arm B etc in a given time period (typically 15 minute intervals) and according to a specified vehicle classification, or by video surveys with post-production analysis.
- 3.5. More complex or large-scale junctions may require video surveys or number plate matching techniques in order to obtain an accurate result. In the latter case, registration plate numbers are recorded at all arms into and out of the junction. Proprietary software can then match the numbers to provide a matrix of movements through the junction. With this type of approach it is often only possible to provide a maximum of two classifications, cars and goods vehicles.

- 3.6. All results obtained should be divided into maximum periods of 15 minutes and should allow classification into passenger car units.

Queue Length Surveys

- 3.7. This type of survey is typically undertaken to calibrate a junction model or a micro simulation model. They are also sometimes undertaken to provide a proper estimate of traffic conditions at a junction which is operating in excess of its capacity. In this instance, a standard turning count would effectively measure throughput or capacity (i.e. how much traffic can get through the give way line or stop line) rather than demand. So the addition of the queued vehicles in each time period provides a more accurate picture.
- 3.8. Whilst these surveys are simple in principle, they can be difficult to undertake with any degree of consistency. It can be very difficult for an enumerator on site to distinguish between slow moving and queuing traffic. It is also often the case that the queue will grow quickly as capacity is exceeded, in busy situations, and it can be hard for the enumerator to determine where the end of the queue is. This difficulty is of course compounded when queues tail back through upstream junctions. Nevertheless, queue information must be collected to permit validation of junction models.

Link Counts

- 3.9. Link or passing counts are the simplest form of survey and can be undertaken manually or automatically. In the manual method, an enumerator records each vehicle passing their location by direction and according to the agreed classification.
- 3.10. Automatic link or traffic counts (ATC) can be temporary or permanent. Where the requirement is to collect a few weeks of data, pneumatic tubes are laid across the road, either singly or in pairs. A counter at the side of the road then records when a vehicle passes over the tube by detecting the pulse of air. Where a pair of tubes are used, at a known distance apart, this type of survey can also record speeds.
- 3.11. A permanent ATC involves cutting loops in the road which are then connected back to roadside cabinet containing the traffic counting equipment. Depending on the nature of the loop arrangement, and the capability of the traffic counter, these installations can record vehicle number, type (either a simple length classification or a more complex profile) and speed. This type of survey is usually undertaken to assist in long term monitoring of traffic growth. Either type of ATC can provide useful supplementary information to a turning count or roadside interview (which are usually undertaken on one day only) as they can indicate whether that survey day was typical or not.

Journey Time and Speed Surveys

- 3.12. Much of the economic benefits of road improvement schemes typically come from time savings. It is therefore important that models accurately reflect the speed observed in reality. Knowledge of the prevailing journey speeds on links is also

important when trying to code model networks such that subsequent assignments reflect drivers' route choices accurately.

- 3.13. As mentioned earlier, ATC surveys can provide speed measurements as can other techniques such as radar. But these are 'spot' speeds and do not reflect the variation in speed that may be experienced when traversing a network i.e. the journey time. This can be obtained either using number plate matching techniques as described earlier (each number plate is time stamped) or by moving car methods. The latter is more common and simply involves a survey team driving along a route at the prevailing speed of traffic. A number of timing points, usually significant junctions in the network, are chosen in advance and the time from the start to each point is recorded.

Origin Destination Surveys

- 3.14. Origin Destination or OD surveys involve obtaining detailed information about individual trips. Such surveys can take a number of forms including:
- Registration Plate matching;
 - Roadside Interview surveys (RSI);
 - Public Transport surveys; and
 - Household surveys.
- 3.15. Registration Plate surveys involve the collection of registration plate details of passing vehicles at a number of pre-determined locations at specific time periods. This allows an origin-destination matrix of movements to be created.
- 3.16. RSI surveys involve stopping drivers at the side of the road and questioning them about their trip hence the term roadside interview. They provide the best sort of data for building assignment models but can be costly and difficult to implement safely in certain situations e.g. high-speed roads. As the survey involves stopping vehicles at the roadside, the location and layout of the survey site is extremely important and Garda permission and assistance will need to be sought.
- 3.17. Public Transport surveys provide information on trips undertaken by public transport and are used chiefly in the development of Variable Demand models. They can be undertaken through interviews and/or counts on board vehicles and at stops/stations. They can also be arranged for self completion by passengers.
- 3.18. Household surveys are similar to RSI surveys except the trip maker is asked to record their own trip information. The availability of Census journey to work information has largely eliminated the need for such surveys.
- 3.19. The purpose of the Origin-Destination surveys is to obtain a sample of the population in the study area who are travelling along relevant routes / corridors and obtain detailed information about the nature of their trip. This should include questions about:

- Trip origin;
 - Trip destination;
 - Trip purpose;
 - Number of people in the vehicle; and
 - Vehicle type.
- 3.20. Origin-Destination surveys undertaken must use DEDs or sub-divisions of DEDs for coding geographical zones.
- 3.21. Other procedures for collecting origin destination data may also be acceptable providing they can be shown to collect robust information using adequate sample sizes. These should be discussed with the NRA Strategic Planning Unit.

Stated Preference Surveys

- 3.22. Stated Preference surveys provide information on the intentions of trip makers when presented with a number of choices to make. Stated Preference Surveys are normally undertaken in order to inform behavioural models such as willingness-to-pay, most relevant in the planning of tolling schemes.

Available Data

- 3.23. The NTM was developed using Census Journey to Work information, supported by a comprehensive programme of Roadside Interview Surveys, Automatic Traffic Counts and Journey Time Surveys across the network. Model demand is represented by 874 zones which are based on aggregations of District Electoral Divisions (DEDs).
- 3.24. The Census database of journey to work trips (POWCAR) reports all journeys to work by DED for the relevant census year. This information can be extracted for input to traffic models, thereby giving good Origin-Destination information without the necessity for widespread Roadside Interview Surveys. The POWCAR information also provides travel mode and time of departure, thereby allowing journeys by car during the AM Peak to be isolated.
- 3.25. The NRA operates a network of Automatic Traffic Counters (ATC) on national roads throughout the country. A permanent ATC provides hourly directional flows, Heavy Commercial Vehicle (HCV) percentages and AADT estimates. The automatic traffic count data is accessible via the NRA website at: <http://www.nra.ie>.

4. Reporting

- 4.1. While the choice of model may be influenced by existing data which is available for use, no significant additional data collection should commence until the Traffic Modelling Plan has been approved by the NRA Strategic Planning Unit (SPU). The content of the Traffic Modelling Plan is described in *PAG Unit 5.2: Construction of Transport Models* and in *PAG Unit 5.6: Reporting*.