

STAG Technical Database Section 2

Analysis of Problems and Opportunities

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Transport Scotland

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2. Analysis of Problems and Opportunities

The view that there are problems with the transport system is the root of any transport appraisal. In this Guidance, a problem is something that results in a shortfall in meeting objectives. The definition of objectives and the identification of problems are naturally iterative exercises, one informed by the other.

2.1 Introduction

The identification of problems and opportunities within the transport and land-use system under consideration must form the basis of the development of a STAG transport study.

The process of defining objectives, described in Section 3, and the identification of problems and opportunities, the subject of this section, are parallel and iterative processes. An initial assessment of problems and opportunities should inform Objective Setting, which in turn may highlight the need for further investigation of problems and opportunities.

It is essential that consideration is given to existing and future problems and opportunities that may potentially arise. Similarly, those perceived by stakeholders should also form a thorough part of this assessment during Pre-Appraisal.

The identification of opportunities is often given insufficient attention during a STAG study and it should be recognised that this is an equally important task to be completed during the Pre-Appraisal process. As such, opportunity analysis should be given appropriate and explicit attention during Pre-Appraisal.

The problem identification stage should not be limited to just the identification of problems that can be quantified through the analysis of data or the use of a transport model. It should also consider "perceived problems", that is problems that are experienced but cannot be easily encapsulated through data analysis. Consultation with stakeholders and the public can provide a valuable input into the problem identification process.

The problem identification process should look beyond their immediate manifestation on the transport system and should explore their root causes and consequences.

Existing or new data can assist in the identification of problems and guidance is given on which data may be helpful and how it can be used. Transport models are also a potential source for analysis of existing and potential problems, but models must be treated with caution. Their contribution is limited to the modes and interactions that are modelled and this may not cover the full set of problems pertinent to a study.

Each model is underpinned by a set of implicit and explicit assumptions that will influence any assessment of problems. Such assumptions will need to be understood and considered.

When considering problems it will also be important for the practitioner to consider issues and constraints that face the study. 'Issues' are uncertainties that the study may not be in a position to resolve, but must work within the context of. 'Constraints' are the bounds within which a study is being undertaken.

The Scottish Government and/or Transport Scotland requires a textual statement of the problems, issues and constraints along with the appraisal to accompany each submission.

2.2 Terminology

In this section, problems are effectively the genesis of an option and are measurable through shortfalls in meeting the objectives. For example, rapid traffic growth in recent years would be a problem if it were acting against an objective to improve local air quality or were causing congestion that was seen to be suppressing economic growth. In contrast, if traffic growth could be accommodated on the network it need not be a (local) problem.

Problems with the transport system can be experienced by its users as well as third parties who are impacted upon by the use of the system.

It is important to recognise that perceptions of problems with the transport system by users, operators, the public at large and politicians can be equally as important as problems that can be quantified through analysis of data. Such problems are called perceived problems in the text although this should not be taken to have any pejorative meaning; just because a problem is perceived and cannot be easily quantified does not mean that it has no basis and should not be addressed. Indeed, the analyst should strive to capture the perceived problems as thoroughly as possible. There will be, however, cases where perception of a problem is misplaced; the onus is then on the practitioner to explore such problems and explain the real root cause of any shortfall in meeting objectives.

Constraints and uncertainties are matters that a study will have to consider when developing an option, but are largely outwith the immediate influence of the study.

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2.3 Data Analysis

For a full understanding of the study area and the transport system under consideration, it is essential to establish the levels of service offered by the current transport networks and the current demands for travel by those living in the area and its hinterland. The surveys necessary to collect this information often consume a substantial part of the resources allocated to the study. Best use should be made of information collected previously and care should be taken to minimise the effort required to assemble new information.

The nature and extent of data analysis within a STAG study is clearly correlated with its duration and the resources available. In a similar way to the development of objectives, the effort put into analysis of data must be commensurate with the scale of the Pre-Appraisal analysis undertaken for the study area and potential impacts of the options to be considered.

It is possible for a small-scale option (in terms of cost) to have wide ramifications and in such cases an extensive problem identification exercise may be warranted. In some cases, however, there may be no need for any data analysis at all. At the other extreme a substantial exercise is likely to be appropriate for a transport corridor study or major public transport or road option.

However, practitioners must ensure that the analysis of data provides evidence of problems and/or opportunities. The analysis of data should provide a significant contribution to the basis of a STAG study and simply providing contextual information must be avoided.

An appropriate evidence base is crucial when moving to the Objective Setting phase of Pre-Appraisal and the setting of SMART Transport Planning Objectives as the STAG study progresses. This is reflected by the iterative nature of the Analysis of Problems and Opportunities, and Objective Setting.

2.3.1 Roads

Examples of road and traffic data that can be analysed to support an assessment of transport problems include:

- Traffic counts – from either manual classified counts (MCCs) or automatic traffic counts (ATCs), which are regularly collected by the appropriate road authority. These can be used for establishing the volume of road traffic, its composition and the extent and duration of peak periods. Count data can be used to establish growth trends and peak spreading effects. Advice on the conduct of traffic counts and their reliability is given in the Design Manual for Roads and Bridges (DMRB Volume 12).
- Journey time surveys – can be used to identify the impact of congestion on travel times, identify highly congested junctions and quantify delays. If journey time surveys have been repeated periodically over a number of years they can show how travel times and/or journey speeds have changed. Advice on undertaking journey time surveys is given in DMRB Volume 12;
- Roadside interviews (RSIs) – routinely collected for model development, RSIs collect much rich data that, other than its use in modelling, is often not analysed or presented in detail. Information available from RSIs includes journey purpose and car occupancy, both usually segmented by time of day. RSIs can also be used to collect data on parking and trip chaining amongst other issues. Advice on conducting RSIs is given in DMRB Volume 12;
- Accident data – there is a statutory obligation to collect data on personal injury accidents classified by severity. Accident data can be used to assess the number

and severity of accidents; time trends can be identified and, if combined with a GIS, can easily be used to identify accident clusters or blackspots. The Scottish Government's Road Accidents Statistical publication includes details of all injury accidents reported by the police authorities in Scotland (see Section 17.2);

- Parking surveys – parking surveys can include a simple inventory, that is an assessment of the number of parking spaces in an area, appropriately segmented (long stay, short stay, PNR, public etc). More detailed surveys can include assessing occupancy of spaces, the duration of the study, the turnover of spaces and pricing structure;

2.3.2 Public Transport

Much data on the use of public transport and the characteristics of public transport users is routinely collected by public transport operators as well as the public sector. Despite much data being regarded as commercially confidential by operators, there is still a significant number of data sources readily available to the practitioner. Even in situations where public transport data is regarded as commercially confidential, it is often possible to make use of such data by anonymising the data, combining it with other sources or indexing data rather than using it in the form in which it is provided.

Practitioners should not be deterred by issues of commercial confidentiality. Often public transport operators will perceive a direct or indirect benefit from supporting a project or study and they will be willing to consider how their data can be used to inform the process, while at the same time ensuring their commercial interests are protected.

For identifying problems related to the use and operation of buses and coaches, the following are examples of potential data sources:

- *Counts* - local authorities often have cause to undertake bus passenger counts. These can be undertaken at bus stops where boarders and alighters are counted or can be passenger counts undertaken as buses cross screenlines. Such counts can either be taken on-bus (with the operators' permission) or off-bus by experienced surveyors. Count programmes may be undertaken to support a model development exercise or can be undertaken on a regular basis across a screenline with the object of monitoring temporal trends. A large study may warrant bespoke bus passenger counts to support the problem identification stage;
- *Origin-destination (O-D) surveys* – like roadside interviews, these are almost always undertaken as part of a model development exercise. Also like RSIs, bus O-D surveys contain much rich data on the passengers' profile such as their journey purpose, ticket type, access mode, and age and gender;
- *Level of service data* – in the deregulated era it can be difficult to keep track of changes to bus routes and the level of service on each route. Current timetable data should be available from operators. Local authorities have a statutory responsibility to provide information on bus services in their area, although the time required to process such data into a useful format should not be underestimated. Data on current fares is readily available from operators, but unless the mix of ticket types sold is known it is often difficult to identify the average fare paid. Often fares may appear to be increasing but the average fare paid may be static or decreasing due to greater availability or take-up of discount fares.
- *Concessionary fares surveys* – Transport Scotland which operates the National Concessionary Travel Scheme of Older and Disabled Persons and the Scotland Wide- Concessionary Travel Scheme for Young People, collect data to enable operator reimbursement; in addition, local authorities often routinely collect data

to enable revenue allocation. Such surveys can often be a source of data for wider bus use and patronage trends;

- *Satisfaction surveys* – while an operator's own market research is likely to remain confidential, local authorities and other bodies are in a position to conduct their own bus passenger satisfaction surveys;
- *Tendered bus services* – data collected to support the tendering of social bus services can shed light on the changing pattern of bus service provision.

For data on rail services and passengers, the position regarding the availability of passenger counts and origin destination surveys is very similar to that for bus. Information on rail services is available from the published national passenger timetable and fares information is published in the National Fares Manual. The same sources can be used to look at changes over time. Again, calculating an average fare paid by rail passengers is difficult due to the wide availability of discount tickets and limited period offers.

Additional sources of data on the rail industry include:

- *Reliability and punctuality performance* – train operating companies are obliged to monitor and publish the reliability and punctuality of their services against standards established as part of their franchise agreements; and
- *Customer satisfaction surveys* – including the National Passenger Survey undertaken by Passenger Focus and surveys undertaken by individual train operating companies.

2.3.3 Air Transport

The principal source of data on air travel is the Civil Aviation Authority (CAA). They have three data sources that may be relevant:

- The annual report, UK Airport Annual Statement of Movements, Passengers and Cargo;
- The annual report, UK Airlines Operating, Traffic and Financial Statistics; and
- A rolling annual survey of passengers at the UK's principal airports (including Glasgow, Edinburgh, Inverness and Aberdeen).

The first two sources provide data on the number of passengers using airports, the routes they use, cargo and mail handled and aircraft movements. Data for the most recent years can be downloaded from the CAA's website. Published reports for recent and earlier years are available for purchase.

The CAA's passenger survey contains much rich data on the characteristics of air passengers including their ultimate origin/destination and surface access mode. Reports are produced periodically on the characteristics of passengers at the surveyed Scottish airports. The database is available for purchase from the CAA's agents. Specific cross-tabs on the data can be commissioned.

Timetables for scheduled air services are readily available from airlines and airports. The Official Airline Guide (OAG) summarises all scheduled air services and can be a useful source for examining how service patterns have developed over time. Data on charter/inclusive tour services and freight-only services is usually available from operators and airports.

Further high-level data is available in Scottish Transport Statistics.

2.3.4 Ferries

Aggregate data on the use of ferries is published in Scottish Transport Statistics. Ferry operators should be contacted if any more detailed data is required. Ferry timetable information is available from the operators.

2.3.5 Freight

Data on the volume of road freight traffic is routinely collected as part of Manual Classified Counts and at some Automatic Traffic Count sites. Weight in Motion sites can provide data on vehicle loadings. Origin-destination data collected at RSIs, in the main, provides data on the O-D of goods traffic although occasionally they will also include questions on the commodities being carried by HGVs.

Two government surveys, the Continuous Survey of Road Goods Traffic (CSRGT) and the Continuous International Road Haulage Survey (CIRHS) provide useful data on the total freight transported by road to and from each UK county or region, the commodities carried, the types of vehicle used and the length of haul.

To obtain data on rail freight movement is much more difficult and practitioners should approach the operators, Network Rail, and rail enthusiast publications.

Aggregate data on freight carried by air is available from the CAA sources but this provides no information on the commodities carried.

2.3.6 Walking and Cycling

Transport Scotland recognize that there is generally little baseline data available for walking and cycling schemes. Aggregate data on walking and cycling are published in Scottish Transport Statistics. Data on the frequency of walking and cycling in general and for travel to work in particular are available from the Scottish Household Survey and the Census. Some Local Authorities may also collect survey data on the use of their walking and cycling networks and facilities.

2.3.7 Other Data Sources

Practitioners should not feel restricted to conventional data sources relating to the supply and use of the transport system when seeking to identify transport problems. Other data routinely collected by local authorities, Government departments and agencies and other public bodies may be helpful. Examples include, but are not limited to:

- *Land-use data* – data on new house completions or retail floor area can be used to illustrate rapid growth in transport demand, similarly data on vacant properties can indicate decline. Trends in an area's attractiveness can be informed by retail and office rents. Similarly house price data can inform a view of trends in the residential sector. Uncompleted planning permissions can give an indication of potential future problems, as could data on land zoned for different development;
- *Surveys of development plans* – development plans should contain a positive and sustainable vision of an area's future, with structure plans providing a long term vision, looking forward at least 10 years, supporting and encouraging sustainable patterns of travel. Local plans often contain detailed analysis of environmental, social and community issues and problems, including integrated transport issues;
- *Scottish Household Survey* – this is a continuous survey that commenced in 1999. About 15,500 different households across Scotland are interviewed each year. The survey collects transport-related data, as well as data for a number of

other topic areas. The questions cover household car ownership and use; the accessibility of bus services; the frequency of driving, cycling and walking; travel to work and to school; and other transport topics, including Travel Diary information. Further information about the survey is available from the Scottish Government website.

- *The Census* – The National Census is undertaken every ten years. The Census provides data on household structures, car ownership and journey to work characteristics amongst other things. Information from the 2001 Census results for Scotland may be found at www.gro-scotland.gov.uk.

2.3.8 Use of Transport Models

Transport models can be a valuable aid in assessing existing and potential future problems. Transport models can usually be easily interrogated to produce summaries of network-wide conditions as well as modelled flows and delays on particular links or at particular junctions. If the models include public transport as a mode or modes, then data can be produced on route or corridor flows (and potentially overcrowding) as well as network-wide summary data. Transport models can also be used to provide data on the gross volume of trips made in the modelled area, and in some cases mode split and journey purposes. Plotting desire lines can be helpful. Output from transport models can also be used to derive other measures that may help quantify problems. Examples include, but are not limited to, emissions of pollutants or accessibility indices.

Practitioners should, however, be cautious when using transport models:

- The availability of a transport model can result in a practitioner devoting much attention to extracting data which in reality may reveal little if problems lie elsewhere. Scoping the exercise of extraction of data from a model will be important before starting the exercise.
- The analysis of problems that can be undertaken using a transport model is limited to the time periods and modes included in the model. There may be significant problems in other time periods or with non-modelled modes. The analysis of problems should not be limited to what can be extracted from a model; and
- Transport models are only as good as the input demand and supply data. Analysts should carefully consider a model's calibration and validation before embarking on any significant work. A poor model can lead to mis-identification of problems.

Transport models can be used to identify potential future, as well as existing, problems. However, each and every forecast is:

- Underpinned by a set of explicit (or sometimes implicit) assumptions and exogenous forecasts of key variables (e.g. traffic growth); and
- Limited to the modes modelled and the interactions (assignment, mode split etc.) considered.

When a transport model is being used to identify future problems this must be accompanied by a clear statement of the assumptions that underpin the forecasts.

The Scottish Government's Transport Model for Scotland (TMfS) offers practitioners a potentially rich source of information on existing and potential future problems in their area.

In large-scale studies, model development often forms part of the process prior to testing and then appraisal. The problem identification stage will usually precede any model development and application.

Naturally, practitioners should not feel that the absence of a transport model means that they cannot make assessments of what potential future problems may be. A structured approach should be taken to scoping the future conditions relevant to the study in both the transport field and beyond. Appropriate techniques include professional level consultation, opinion gathering techniques, and quantified projections, but in the last case it is important to make clear what assumptions have been made.

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2.4 Identifying Problems and Opportunities

It is important to recognise that actual and perceived problems or opportunities within the transport system must be the rationale for a STAG study.

Perceptions of problems or opportunities with the transport system as identified by users, operators, the public at large and politicians can be as equally important as problems that can be quantified through data analysis.

The analysis of problems should look beyond the immediate manifestation of problems on the transport system. The analysis should, instead, explore the root causes and consequences of problems. At this phase of the Pre-Appraisal process, opportunities for improvements to the transport system and the way it is used should be thoroughly explored.

Practitioners should ensure that an appropriate analysis of data has been undertaken to provide an evidence base.

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2.5 Issues and Constraints

In parallel to problem and opportunity analysis, relevant Issues and Constraints should also be considered within the context of a STAG led study. It is important that the identification of problems and opportunities is considered within the wider context.

'Issues' are uncertainties that the study may not be in a position to resolve, but must work within the context of. Where there are uncertainties, there is a responsibility to develop an option that is either robust under different possible out-turns or, alternatively, is flexible enough to be adapted in response to changed circumstances.

Examples of Issues include:

- Uncertainty at the time of the study whether a major road or rail link will be built that will affect the study area;
- The impact of a major new land-use development has yet to become clear; and
- A study for a neighbouring area may lead to a proposal that results in significant changes to through traffic passing across a study area.

Practitioners should account for, or if possible neutralise, such Issues through liaison with neighbouring authorities, government departments and agencies, and transport operators.

Constraints represent the bounds within which a study is being undertaken. These may include but are not limited to:

- The statutory powers of an authority to promote change;
- The funding levels that can realistically be obtained;
- Scottish, UK or EU legislation; and
- Scottish or UK fiscal policy.

Similarly, constraints on the shape of a particular option could be affected by:

- Sensitive areas of ecological or landscape or heritage importance;
- Built-up areas;
- Rivers or railway lines which are expensive to bridge;
- Rough terrain making infrastructure works expensive; and
- Unusual existing patterns of development such as industry and commerce spread over wide areas outside the traditional urban centre.

An early appreciation of these issues will assist in identifying an option which is more readily acceptable than one which ignores them. While it is proper for a study to highlight how a change in the constraints it faces may contribute to the development or success of a transport option, no option should be developed that is dependent upon a change to the constraints upon a study, unless the promoting organisation is in a position to change those constraints.

2.6 Participation and Consultation

It should be recognised that people will naturally have more reliable views about current problems, potential opportunities, Issues and Constraints than those predicted to occur in the future. Problem, Issue, Constraint and opportunity identification through consultation is therefore of most use in the base year or current year.

People are more likely to be concerned with issues that directly affect them, their immediate environments and lifestyles. Some may also be well informed on the more strategic Issues and could contribute a useful perspective on these. It is important not to underestimate the level of detailed knowledge people may have and it must be recognised that perceived problems, opportunities, Issues and Constraints can also feed into this stage of the Pre-Appraisal process.

In order to fully understand and confirm the issue under appraisal, there may be value in consulting with members of the public alongside key stakeholders. The scale and focus of this consultation must be proportionate to the appraisal itself and draw from other consultations where appropriate.

At more 'representative' levels, politicians, business groups, service providers and a range of interest groups will have more strategic perspectives. It is important that they are kept informed of the views and opinions of the wider public throughout the process.

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2.7 Reporting

It is expected that the thorough analysis of existing and future problems and opportunities will have comprised an integral part of the methodology adopted to develop the study and, therefore, clear evidence of existing and future problems and opportunities should be presented in the STAG Report.

A textual statement of the assessment of problems and opportunities together with identification of any Issues and Constraints should be presented in the STAG Report. The statement should summarise the sources of data and any consultation activities undertaken. It should highlight the key problems, Issues, Constraints and opportunities are and, where appropriate, also provide details of associated severity/magnitude of such problems, Issues, Constraints and opportunities. Tables and figures may be useful but are not essential. The use of GIS and mapping software can help illustrate problems succinctly.

The summary should be comprehensive in its identification of problems, issues and constraints facing a study, but it should also be concise. If necessary, supporting technical appendices should be prepared to present the detail of analysis or surveys but these are only likely to be necessary for the largest appraisals such as those for a transport corridor study or for a major road or public transport option.

Practitioners should avoid simply providing background information for the study area. The geographic scope of the study should be presented with clear evidence of the problems and/or opportunities together with the methods of analysis used.

A geographical display of problems, issues, constraints and opportunities can be very useful, in that it provides:

- Those involved with the study, including the public, with a display of current problems, Issues, Constraints and opportunities on the transport system in a comprehensible, rather than abstract, form;
- The practitioner with a means of "calibrating" the methods used for forecasting future problems, by comparing the numerical analyses in the base year with people's perceptions and adjusting the numerical analyses appropriately; and
- A direct stimulus to the development of solutions and the transport option as a whole.