

INFORMATION NOTE



ASAM14 MODEL DEVELOPMENT

ASAM14 AUDIT RESPONSE

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1. RESPONSE TO ASAM14 AUDIT

1.1 Introduction

- 1.1.1 The Aberdeen Sub Area Model (ASAM14) is a strategic transport model covering the North East of Scotland, which is calibrated to represent traffic and travel conditions in 2014.
- 1.1.2 Nestrans issued a brief in 2016 which set out their requirements for an interim upgrade of ASAM in advance of the AWPR completion, scheduled for 2018. This interim update acknowledges that there should be a balance between the cost of collecting data and the value that it will bring to the modelling process. Systra's approach to the model update reflects the relatively short shelf life that the Base model will have and the model development, results, documentation, the audit and our response to the audit should be interpreted in that context.
- 1.1.3 The model update was undertaken by SYSTRA and completed in early 2018. ASAM14 is documented within a Model Development Report which describes the model objectives, components, functionality, input data, assumptions and calibration and validation statistics.
- 1.1.4 ASAM14 was subject to a model audit undertaken by AECOM during 2018, which is reported within the Audit Report *Aberdeen Sub Area Model 14 Audit Report, AECOM, 7/6/19*. The audit process provides commentary regarding the model development approach and identifies any concerns or limitations associated with the model build, level of calibration achieved and potential implications for subsequent model use.
- 1.1.5 This note provides a response to the key issues identified during the model audit that should inform future model use in the context of the interim update, including:
- Data Availability & Coverage;
 - Quality of Calibration & Validation; and
 - Model Application.
- 1.1.6 The note also discusses new data sources that are due to become available which may assist in applying the ASAM14 model.

1.2 Value of New Data

- 1.2.1 Collecting transport data is expensive, potentially inconveniencing travellers, and for many elements can result in low sample sizes and poor value. At the time of the model build, the AWPR was being constructed, with roadworks and diversions potentially disrupting travel patterns and creating unreliable data. Most significantly, the majority of data collected would have a very short shelf life, as the completion of the AWPR would significantly change travel patterns.
- 1.2.2 For example, the cost of undertaking nine RSI's for modelling another region of Scotland was approximately £100k. The data collected did not provide sufficient coverage or responses to directly use within traffic matrices, particularly for goods vehicles, where only around 250 records were provided. As stated in the brief, there is a balance to be struck between cost and value of collecting data and in this case there wasn't sufficient value in undertaking significant data collection for a limited shelf life model.

- 1.2.3 The project brief and Model Development Report state that ASAM14 is aimed at a limited update, with a more extensive update planned following the completion of the AWPR. Data collection for this more extensive (Post-AWPR) update (ASAM19) is now underway with a cost estimated at between £100k-£200k, with a shelf life of a number of years.

New ASAM19 Data Collection

- 1.2.4 The ASAM19 data collection programme will provide users with considerable data that could be used to compare/review ASAM14 outputs prior to the completion of the new ASAM19 model, including:

- Over 200 traffic counts – for reviewing post AWPR traffic levels;
- Mobile Phone Data – for reviewing travel patterns;
- ANPR – for reviewing specific routing patterns; and
- Rail & Bus data – for reviewing passenger occupancy levels;

1.3 Data Availability, Coverage and Use

- 1.3.1 A key outcome from the model audit concerns the limited availability and use of observed data. This concern is particularly relevant to the development of travel demand matrices, where synthesising of travel patterns has been employed as an alternative approach. The auditor findings subsequently advise that due to this limitation, potential users should consider delaying/ not using ASAM14 for some applications. This is discussed in more detail below.

Commuter Travel

- 1.3.2 ASAM14 comprises AM Peak, PM Peak and Inter Peak time periods, a number of travel purposes and user classes, and the approach to matrix development and calibration does differ between these elements, with varying degrees of data available. For example, Commuter travel patterns are compared during calibration using 2011 Census travel to work movements. The detailed and extensive nature of the Census provides significant sample sizes to understand both road and public transport trip movements, and therefore provide confidence for use in calibrating travel demand.

- 1.3.3 With generally over 40% of travel in the peak time periods consisting of commuters, this is the largest segment of travel demand within the modelling and these matrices have been developed using the most suitable available data for calibration. These are important factors not to lose sight of, therefore, when judging the model's fitness for purpose for a specific application a more nuanced view may be required than implied by certain audit recommendations if viewed in complete isolation.

Business, Leisure and Retail Travel

- 1.3.4 The main data set available to understand specific travel movements associated with 'business' and 'other' (i.e. leisure, retail, health etc) movements is the Scottish Household Survey (SHS) travel diary. Although the SHS forms a very detailed survey the number of records, produced when broken down for the North East of Scotland and relevant travel modes and purposes is relatively low – particularly for public transport.

- 1.3.5 Within ASAM14, SHS data is also used to calibrate the synthesised matrices output from the demand model, focussing on trip length/cost distributions for business and other



movements. It is also used to draw broad comparisons at sector level to review and adjust travel movements.

- 1.3.6 Although the ASAM14 trip distribution profiles appear intuitive, we agree that a larger sample would provide greater confidence in understanding the underlying model travel patterns, particularly at the more detailed zonal/sector level.
- 1.3.7 Users should also note however, that for some specific activities (i.e. Student trips to Aberdeen and Robert Gordon University, and Aberdeen Airport passengers) the ASAM14 modelling has used specific travel pattern data to calibrate specific 'other' and 'business' travel purpose movements. Further calibration has also been undertaken at the trip end level relating to student college trip destinations (using education employment figures) and more broadly against the overall level of traffic and public transport trips generated. Parking destinations are also calibrated in detail, within Aberdeen City Centre and at Park and Ride sites and rail station car parks.
- 1.3.8 Users should note that the matrix synthesising approach adopted within ASAM14 has been employed within many other Scottish strategic models, particularly for representing shorter distance intra-sector trips (such as TMfS, SEStran Regional Model and earlier versions of ASAM). This is mainly due to the expense and difficulty of collecting this type of movement data (traditionally through Roadside Interviews), where ultimately some form of matrix synthesising / infilling with estimates is necessary to create a detailed travel pattern across a wide area. This approach was influenced further by the brief with respect to the timing of the AWPR opening and the considerations for data collection. Despite such limitations, these models have been applied successfully to inform the types of transport appraisal also relevant to ASAM14.

Goods Vehicle Movements

- 1.3.9 The audit findings note concern regarding the lack of observed data used to form goods vehicle matrices, and subsequent use of ASAM14 cordon matrices within microsimulation modelling and traffic flow outputs to inform local air quality modelling.
- 1.3.10 LGV and HGV Goods vehicle matrices were developed using matrix synthesising - through a distance/cost based gravity model, which used housing and employment data to calculate goods vehicle activity levels for each zone. Although the matrix pattern is predominately estimated, origins and destination trip ends do reflect local data.
- 1.3.11 The ASAM14 goods matrix (longer distance) pattern was also constructed by extracting a proportion of goods movements (approximately 5% LGV and 20% HGV) from TMfS and TELMoS where TMfS patterns reflect underlying RSI data, and TELMoS reflects patterns of commodities which is the most suitable tool available. This combination of data sources therefore reduces the reliance on estimation, particularly for longer distance movements which would be more impacted by the AWPR.
- 1.3.12 The road model was also calibrated using traffic volumes by user class, with separate calibration of HGV and LGV traffic levels. This approach used goods vehicle flows for each route/location to determine the final calibrated flows. This detailed calibration of link flows ensures that the key model outputs used for informing detailed analysis such as air quality assessments are appropriately robust – i.e. total vehicle volumes and composition of traffic volumes.

- 1.3.13 The majority of Microsimulation models will be developed using specific data (such as ANPR) to develop travel demand matrices. Matrices from strategic models are then almost always applied to indicated changes in travel levels and patterns over time (for example to demonstrate the impact of the AWPR or growth associated with the delivery of Development Plans). With appropriate methods for applying incremental growth to a calibrated microsimulation model and adequate checks in place, this is a reasonable approach for the use of ASAM14 cordon matrices.
- 1.3.14 Goods vehicle patterns are inherently uncertain, with movements varying from day-to-day and often made up of several 'legs' or delivery 'drops'. Even with an extensive data collection exercise, or 'Big Data', movements would remain relatively uncertain. There is more certainty regarding trip generation and traffic volume data, which is easier and more cost effective to access. The ASAM14 modelling uses these available data sources, and therefore was considered to provide a reasonable approach to determining goods vehicle travel patterns considering the full context of the ASAM14 development.
- 1.3.15 The above are important factors and a more balanced and detailed view when judging the model's fitness for purpose for a specific application may be required than implied by the audit recommendations.

1.4 Quality of calibration & Validation

- 1.4.1 To judge whether ASAM14 should be used for certain applications, the audit puts in place a number of 'performance requirements' which must be met. These stipulate that model calibration **must** meet WebTAG guidance recommended levels of validation across the relevant study area, otherwise the model will be unsuitable for use.
- 1.4.2 The audit therefore indicates that ASAM14 is unsuitable for use in Outline Business Case preparation, Development Plans, City Centre SUMP, Parking Constraint, Routing Strategies, and potentially regional transport projects. The audit suggests that lower than WebTAG accuracy is only acceptable for Strategic Business Case and Cumulative Transport Appraisal of Development Plans.
- 1.4.3 This interpretation of WebTAG recommended levels of calibration/validation as stringent pass and fail thresholds for model use, has therefore a significant impact in determining the outcome of the audit process.
- 1.4.4 The audit findings are viewed as relatively uncompromising in nature, and we would recommend that a more nuanced view is taken by the model users in the full context of the model development. With this in mind, more emphasis should be placed on the opportunity for model users to review the available calibration statistics and make an informed choice on model use, taking into consideration all aspects of a particular study.

1.5 Model Use for specific Applications

- 1.5.1 The model audit findings appear to 'rule-out' ASAM14 model use for a number of applications, due to the reasoning discussed above. A number of applications have now been undertaken using ASAM14, including some demonstration testing of the AWPR and City Centre SUMP.
- 1.5.2 Users should take some comfort from these demonstration testing where the model outputs provided intuitive responses during scheme testing, particularly for the AWPR,

where the model provides traffic forecasts that take into consideration the new route. Several model applications have made use of these Post-AWPR traffic forecasts to inform specific appraisals.

1.5.3 ASAM14 has also been used extensively to undertake a Cumulative Transport Appraisal of the Strategic Development Plan. This included developing detailed forecasts of travel patterns and appraising a number of transport interventions aimed at mitigating impacts. A significant level of model outputs were produced across all transport modes, and analysis results are now published for review.

1.5.4 ASAM14 has also been used to inform the appraisal of a new grade separated intersection on the A90 at Laurencekirk. The model was reviewed, with some refinements identified and made to junction capacities and speed flow curves to reflect local journey time and traffic flow data. These are not unexpected changes when reviewing local calibration prior to application. The model was subsequently and successfully applied to undertake an economic appraisal and inform a local micro simulation model (using cordon matrices).

Alternative Risk

1.5.5 With the audit concluding the unsuitability for use for several applications, potential users may be pulled towards developing/using more limited or ad hoc approaches to form an evidence base. The ASAM14 modelling provides a well-documented process which provides transparent information on each of the modelling elements, input data and assumptions – all of which has been subject to an independent audit.

1.5.6 In many cases the risk of using an alternative approach may well present more risk than through use of ASAM14 acknowledging that, as with all models, it should be reviewed prior to application.

Advice to Users

1.5.7 Systra's advice to Model Users is simply – 'Read, Review and Refine' to determine suitability for specific model application. Where the model reporting and audit advice is available for users, network coverage and matrices can be interrogated, and further local data can be reviewed to understand issues relevant to the study area. If deemed necessary, refinements can be made to ensure adequate suitability for the intended purpose.

1.5.8 The SYSTRA team is available to help and discuss potential model applications.



APPROVAL

Version	Name		Position	Date	Modifications
0.4	Author	Jeff Davidson	Project Manager	07/01/2020	Final Note
	Checked by	Malcolm Neil	Project Director	07/01/2020	
	Approved by	Boris Johansson	Director	07/01/2020	

