

Post Opening Project Evaluation Meta-analysis of Major Projects

Executive Summary • May 2011





Overview

The Highways Agency (HA) is responsible for operating, maintaining and improving the strategic road network in England on behalf of the Secretary of State for Transport. The network is made up of England's motorways and all-purpose trunk roads (the major A roads).

The role of Post Opening Project Evaluation (POPE) programme is to check whether investments in major schemes (individually valued over £10m) are delivering the outcomes that were expected prior to approving their construction. The main socio-economic safety and environmental impacts of each scheme are described in detail in individual scheme evaluation reports (undertaken one and five years after opening) and are available on our website. These impacts are compared to those expected in order to draw conclusions about the robustness of the decision making process.

Every two years we undertake a review of the whole programme to identify emerging trends – these are published in the 'meta report'. The purpose of this overall analysis is to:

- Demonstrate whether or not schemes deliver good value for money and meet user needs;
- Assess the extent to which we are meeting commitments made at Public Inquiry; and
- Looking for opportunities to improve the accuracy of the tools and methods we use to predict scheme impacts prior to planning permission.

Key Findings and Issues from 2011 Meta Report

This document summarises the main findings and conclusions from the 2011 meta report which covered five topic areas, as shown in Figure 1. The main report is available on the HA website and the daughter documents are also available upon request.



Figure 1 - structure of the 2011 meta report

These are based upon post opening analysis of 57 new schemes (28 bypasses; 18 road widening schemes; and 11 junction improvements) opening to traffic between 2002 and 2009.

Overall the results show that we are meeting in excess of 80% of our scheme specific objectives relating to

- Traffic
- Road safety
- Environment
- Accessibility/quality of life objectives

The remainder of this summary sets out further detail on the impacts of our schemes and the extent to which they have met our expectations.

Traffic Impacts and Modelling

As part of Major Scheme appraisal, it is usual for detailed modelling techniques to be used to predict how many vehicles will use the new or improved road, the changes on other roads, as well as impacts on journey times. These predictions are fundamental in the justification of these schemes as they directly affect the predictions of economy and safety benefits, as well as the environmental impacts of schemes. These predictions also explain the impacts of traffic changes on key roads and on communities

Q. To what extent do Major Schemes affect travel times?

Major schemes improve journey times for road users: on average they save each driver three minutes during the peak period. Despite these savings being small, our resident surveys suggest that these are valued by users of our network.

Bypass schemes generally save the most journey time, giving a 35% reduction in journey time. Widening schemes and junction schemes generally give 18% and 19% reductions in journey time respectively.

For all schemes in the programme, journey times vary less across the day after scheme opening.

Q. Do these effects change over time?

Journey time savings are generally slightly reduced at five year after (FYA) opening compared to one year after (OYA). However, if the scheme hadn't been built, journey times would also have been expected to continue deteriorating

A small number of widening and junction improvement schemes showed improved journey time savings at FYA compared with OYA.

There is no observable change in journey time 'variability' for schemes evaluated at both the one year and five year after stage.

Q. How do major schemes influence re-routing of traffic (re-assignment) from less suitable routes?

Our analysis shows that major schemes (particularly bypasses) do assist in removing traffic from local roads and attracting it on to core HA roads. This in turn offers significant quality of life benefits to residents of these communities.

More than half of the bypass schemes have succeeded in removing 80% or more of the traffic along the former route. These benefits are still present five years after opening.

Bypass schemes more commonly have an impact on local and strategic reassignment than widening or junction schemes.

On average bypass schemes have reduced heavy goods vehicles (HGVs) on the former route by 94%.

Q. Do schemes generate new traffic in their own right?

Our analysis has provided very little evidence that major schemes generate new traffic in their own right. For a majority of the schemes, observed traffic growth could be explained through expected background growth; re-assignment; and other factors such as other schemes on the road network or land use changes. Only three were deemed to have generated extra traffic that couldn't be explained through local and strategic re-assignment or new developments (independent of the scheme).

Q. Are HA traffic models accurately estimating traffic volumes?

The majority of schemes have accurate traffic flow forecasts; but there is variability in accuracy between schemes.

In order to derive estimates of future traffic levels resulting from a major highway investment, a suite of computer models is used. Current traffic forecasting guidance considers a forecast/modelled estimate to be accurate if it is within +/-15% of observed traffic levels. Figure 2 illustrates the proportion of schemes where traffic flow forecasts for the main route affected was within +/- 15%.

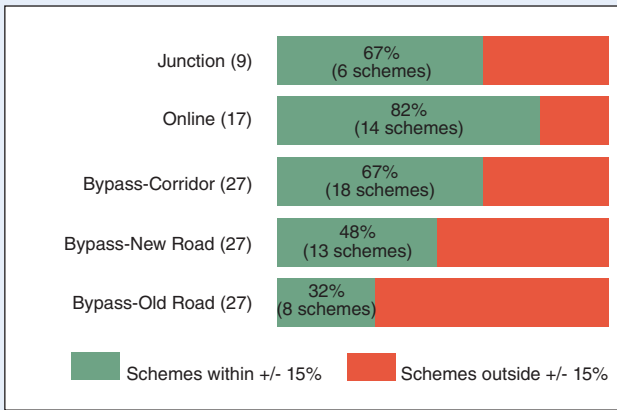


Figure 2 – Proportion of schemes where post opening traffic flows were within +/- 15% of pre-opening forecast.

Our analysis shows:

- Post opening traffic volumes are accurately predicted (within +/- 15%) for the majority (73%) of schemes evaluated.
- There is no systematic bias to the over or under prediction of traffic flows;
- Traffic forecasts for widening schemes are the most accurate with a small level of variation in accuracy between schemes;
- Overall accuracy of total corridor traffic forecasts for bypasses is good, with 67% of schemes within +/- 15% of forecast. However, 32% of old road and 48% of new road traffic flows are within +/- 15% of forecasts;
- On average for bypass schemes, traffic flows are around 5% higher than expected on the new road, and 4% lower than expected on the old bypassed road.

Q. How accurately are we forecasting journey time savings?

Savings between peak hours are close to those expected prior to opening; whilst peak hour savings are typically lower than forecast.

Observed journey time savings are less than predicted. On average, they were only marginally smaller in the inter-peak, but 1 to 2 minutes less in peak periods (**Figure 3**).

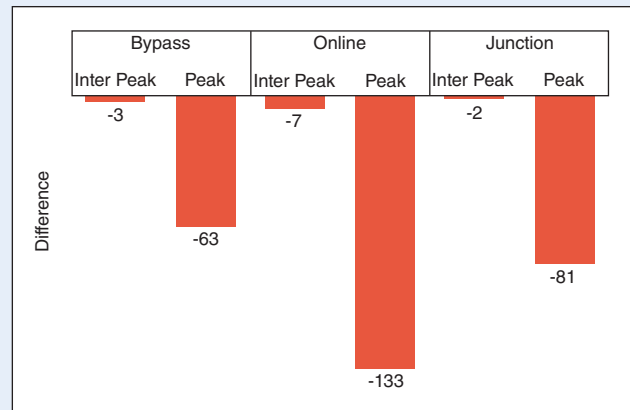


Figure 3 – Average difference (seconds) between observed and forecast journey time saving

Q. What are the reasons for differences between forecast and actual journey time savings?

The following appear to be the main causes of discrepancy between forecast and out-turn savings:

- Traffic flows have been higher or lower than forecast;
- Do-minimum (without scheme) journey times were poorly forecast;
- Speed limit enforcements actually in place are different to those assumed in the forecasts; and
- Other errors in the data entered into forecasting models.

Q. What is important for making accurate traffic volume forecasts?

Based on analysis of traffic forecasts for all the schemes considered, the following have been most important for ensuring accurate traffic flow predictions:

- External effects, such as major land use changes or other schemes on the transport network, are fully taken account of in the forecasting and match the actual scenario emerging;
- The traffic forecasting model covers a sufficiently large geographical area and is detailed enough to capture all significant local and strategic traffic re-assignment effects;
- The do-minimum traffic forecasts are in line with traffic trends observed before opening;

- The growth forecast assumptions used in the traffic modelling are in line with observed growth and local (as opposed to national) estimates of growth have been used appropriately;
- The traffic model has accurately forecast the amount of traffic switching from old road to new road (of particular relevance to bypass schemes).

Q. Is the accuracy of traffic forecasting improving?

The schemes appraised after the year 2000 are more accurate than those appraised earlier. Accuracy is improving in response to changes in traffic forecasting and appraisal guidance and techniques.

Safety

Accurate predictions regarding accident and casualty savings are important as they not only provide an important part of the justification for many schemes, but also form a significant element of the overall monetary benefit of schemes.

Q. What contribution do Major Schemes make towards reducing the number of accidents on our roads?

Major schemes make a positive contribution to improving safety. On average, a major scheme saves 8.6 personal injury accidents (PIA) a year. The scale of impact varies by scheme type.

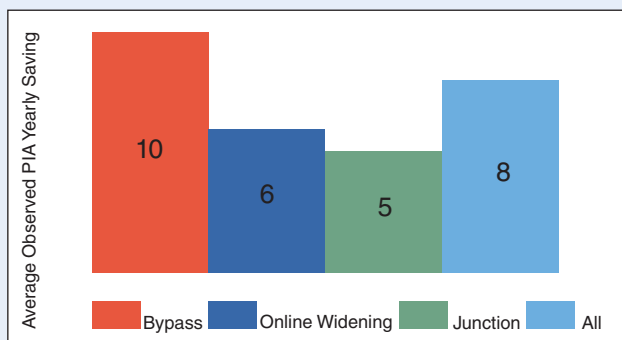


Figure 4 – Observed Average annual PIA saving by scheme type

The observed PIA savings are statistically significant for more than 50% of schemes.

Bypasses are very effective at reducing accident rates (PIAs per million vehicle km travelled), with an observed reduction of 69%. Residents perceive this improvement in safety.

Overall, the proportion of slight accidents to fatal and serious accidents remains unchanged after scheme implementation.

The annual accident saving observed five years after opening is greater than that observed in the opening year.

Motorway widening schemes appear not to provide any accident saving. However, this is based on OYA studies only and requires further consideration in future meta reports.

Accident savings can be observed over an area beyond that defined by the scheme extent. This confirms the importance of using a model of suitable geographical size and complexity to adequately predict scheme impacts.

Q. How accurate are accident saving predictions for major schemes?

Total accident savings across the programme have been accurately predicted. However, there is a very broad range of accuracy between schemes.

The average outturn annual accident saving was 8.6, compared with a forecast of 9, indicating a slight bias towards over-estimation of accident benefits in scheme forecasts.

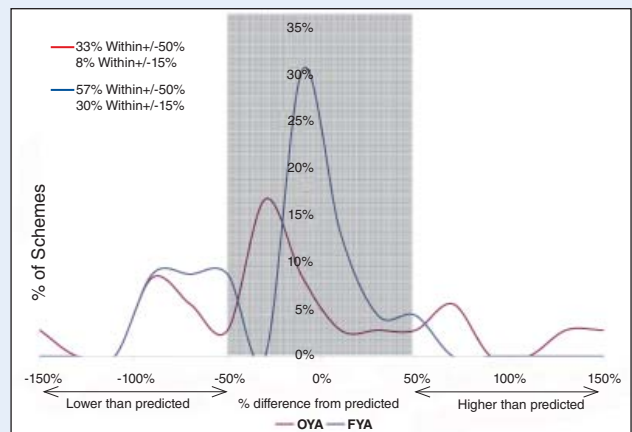


Figure 5 - Accuracy of accident saving forecasts (One and Five Years after opening)

Q. How useful is OYA accident data?

At the one year after scheme opening, safety benefits are lower than forecast. This contrasts with the five year after stage, where average accident savings for all major schemes are in line with expectations. This indicates that HA guidance on analysis of accident data, using a minimum of three years of data, is robust.

Q. What are the reasons for the differences between predicted and outturn accident savings?

Accident saving predictions are more accurate for online widening schemes than for bypass schemes. This trend reflects that observed in our traffic results where forecasting for bypasses was also less accurate than for other scheme types.

Apparent inaccuracies in forecasting are mainly attributable to OYA scheme evaluations being too soon after opening to make conclusions about scheme safety benefits. Further causes of discrepancy are:

- Incorrect application of default and observed accident rates in scheme appraisal;
- Differences in base year (before period) assumptions in appraisal and POPE studies caused by a delay to opening; and
- Differences in assumed and actual speed enforcement regimes.

Economic Impacts

Prior to being given permission by the Secretary of State for Transport to begin construction, all major schemes are subjected to an in depth economic appraisal to ensure they represent value for money to the tax payer. Our evaluations include a post opening value for money assessment of major schemes by monetising the key elements of major schemes, namely:

- Accident savings;
- Journey time savings;
- Scheme investment costs; and
- Indirect taxation benefits (for more recent schemes).

POPE evaluations do not include a re-assessment of maintenance cost savings following scheme opening.

Q. Do major schemes represent good value for money?

The majority of schemes (76%) evaluated to date deliver more than £2 of benefit per £1 invested.

The average gross benefits per scheme from journey time and accident savings range from £119m (for schemes evaluated over 30 years) to £161m (for schemes evaluated over 60 years) compared to an average investment cost of £39m (2002 prices).

For 10 of the 13 schemes where taxation impacts were evaluated, the change in revenue generated from fuel taxes was nominal.

The average net benefit of major schemes ranges from £58m (for schemes evaluated over 30 years) to £79m (for schemes evaluated over 60 years) (2002 prices).

Q. How accurate is HA forecasting of economic benefits and costs?

The accuracy of our economic benefit forecasting is variable across schemes.

Overall, there is a slight bias towards journey time benefits being lower than predicted. Similarly, there is a wide divergence in the level of accuracy of safety benefits. This is consistent with uncertainties in forecasting the number of accidents saved by a given scheme.

Only 50% of schemes had an out-turn cost within 30% of forecast, and overall we have had a tendency to underestimate overall costs. This is an issue we have identified elsewhere and we have changed our procedure to improve cost estimating.

None of the schemes where these new methods were applied have been evaluated yet.

Overall, average benefit to cost ratio (BCR) is relatively accurate. Although at a individual scheme level, BCRs are generally slightly below those expected, 39 schemes achieved BCRs greater than two.

Q. What are the main reasons for inaccuracies in economic forecasts?

Benefit accuracy is dependent upon a combination of the accuracy of traffic flow, journey time and accident saving predictions. Cost prediction accuracy also has implications for the ratio of benefits to costs (BCR).

BCR forecasts tend to be more accurate where traffic forecasts are most accurate. The relationship between traffic flow forecasting accuracy and monetised journey time benefits is stronger than that between traffic forecasting accuracy and monetised safety benefits.

Environment

Q. What have been the observed impacts of Major Schemes on the environment?

Major schemes have a broad range of positive and adverse impacts on the physical environment. In general terms, they have been found to make a positive contribution to achieving physical fitness; local air quality: noise and journey ambiance objectives. Cultural heritage impacts were as expected in 91% of schemes.

Where adverse impacts have occurred on the environment, these are most likely to be biodiversity and landscape impacts. These impacts have, however, been in line with expectations, indicating that mitigation measures adopted are generally effective.

A majority of schemes have resulted in a rise in carbon emissions.

Q. How accurate are impact forecasts for the environmental sub-objectives?

For 87% of the schemes evaluated, out-turn impacts are generally as expected, although this is variable between different sub-objectives.

Noise and water are least likely to have impacts as expected although we found that for water, 20% of schemes evaluated performed better than expected. An equal number of schemes were better or worse than expected for noise.

Traffic flows and reassignment are not always accurately predicted and consequently this impacts on the accuracy of noise, air quality and greenhouse gas assessments. The accuracy of the prediction of the proportion traffic flow consisting of HGVs is particularly important to air quality and greenhouse gas assessments.

Overall the current POPE air quality methodology remains valid, such that where the observed traffic is within 10% of the predicted traffic and the difference in the number of average daily HDVs is less than 200, then the air quality can be considered to be as reported in the ES. However, the verification study indicates that in some situations there appears to be a difference between calculated air quality and that which is measured.

The availability of post opening biodiversity monitoring data has improved since the last meta analysis in 2009 allowing for greater confidence in our post opening evaluation results.



Overall, the results of the Mammal Verification project indicate that crossing facilities provided to maintain connections between habitats are effective.

The POPE analysis has helped identify a number of emerging issues that require further verification in future evaluation reports and meta reporting, these relate to:

- Translocation of fauna and flora;
- Recycling of soils and height of mounds;
- Treatment of excavation material;
- The effect of lighting and sign and gantry proposals that may have changed since the initial ES was prepared; and
- The effect of de-trunking on long term landscape maintenance

Impacts on Accessibility and Integration

Q. What are the observed impacts of major projects on accessibility sub-objectives?

On balance, major schemes make a positive contribution to achieving national objectives on accessibility.

41 schemes had specific objectives to improve accessibility for communities in the vicinity of the scheme. Of the 91 quoted scheme objectives, 87% of these had been achieved, with it being too early to tell for the remainder.

None of the schemes evaluated had overall adverse impacts.

Other key issues relating to the impact of major schemes on accessibility are summarised as follows:

- Schemes are most likely to have a beneficial impact on severance. This is particularly true of bypass schemes where 96% had an

overall beneficial impact - largely attributable to the removal of barriers to cyclist, pedestrian and equestrian activity;

- Bypass schemes are also most likely to impact positively on access to the public transport system. Bypasses create better conditions for users to access bus stops and for the vehicles themselves to stop without disruption to the main flow of traffic;
- The overall evaluation assessment partly masks more localised impacts, such as severed Public Rights of Way, movement of bus stops, and the realignment of pedestrian routes that have either been increased in length or severed.

Q. What are the observed impacts of major projects on integration sub-objectives?

Major Schemes make a valuable contribution towards delivering land use policies and wider government objectives.

19 schemes were expected to assist in the delivery of regeneration and economic growth goals, as illustrated in Table 1.

Scheme Objective	Number of Schemes where objective achieved	Number of schemes where objectives not yet conclusively achieved
Improve highway access to regeneration/assisted areas	2	3
Assist in coping with future traffic growth	9	-
Promote regeneration and development	3	1
Encourage economic growth	4	-
Assist compliance with existing development proposals	1	-

Table 1 – Summary of Schemes with Local Development/Economic Growth Objectives

Q. How accurate are forecast impacts on accessibility and integration?

For a majority of schemes, accessibility and integration benefits are as expected.

However, reducing evaluation to just an overall score does not reflect:

- Site specific issues such as congestion at certain locations along the scheme extent or residual speeding or rat running problems;
- Adverse perception of land use impacts – for example the adverse traffic impacts of new development facilitated by a new major scheme;
- Quality of life and community impacts as perceived by the communities affected.

Q. What have we learnt from our surveys of residents affected by 11 new bypasses?

The community and quality life effects of bypasses are generally valued positively by local communities. However, other responses illustrate that they can leave a range of residual problems that need to be addressed including: rat running; speeding and parking issues.

Where asked, a majority (57%) of respondents perceived the bypass as making their town/village a better place to live.

Where asked, residents perceived that they now walk and cycle more often and 79%

of residents were satisfied with provisions made for pedestrians.

Residents also widely perceived benefits with respect to community spirit, noise and air quality.

What Next?

The key findings presented here are examined in more detail in the main report. The main report also identifies issues we need to consider further in order to improve the accuracy and reliability of our appraisal and evaluation methods. These issues broadly fall into the following themes:

- Traffic modelling;
- Appraisal reporting;
- Data availability and monitoring;
- Safety modelling;
- Economic forecasting;
- POPE methodology;
- Stakeholder Engagement; and
- Scheme Objectives.

The nature of the issues raised is varied and therefore we will be working to develop an 'action plan' to help to ensure that we use the lessons learnt from POPE to improve the way we do things in the future and thus continue to ensure that we offer best value for money to the road user and taxpayer.





Want to find out more?

The main meta report is available on our website, along with other information about POPE:

www.highways.gov.uk/evaluation

or contact us on:

08457 50 40 30

Lines open 24 hours a day, 365 days a year.

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