21. The potential of large-scale Smarter Choice Programmes

21.1 Qualitative overview

The large-scale Smarter Choice Programmes in the three Sustainable Travel Towns were successful in achieving travel behaviour change, and in particular, reducing the car driver trips and mileage travelled by residents, whilst encouraging substantial increases in the use of other modes. The reduction in car driver trips, and consequent effects on traffic volume, will have had favourable effects on traffic congestion, carbon and other environmental emissions, and the increase in walking and cycling will have had favourable effects on health and fitness. There are indications of some improvement in quality of life and consumer satisfaction.

The scale of both the initiatives and the outcomes were less than a full implementation of the 'high intensity' scenario envisaged in the 2004 smarter choices report[1]. The focus of the programmes was almost entirely on within-town trips (and without similar exercises being carried out in neighbouring towns), and thus it is unsurprising that there was a greater effect on the numbers of shorter car driver trips than on longer ones. As noted, this does not imply that the effect on traffic levels was mainly from the shorter trips, and the effect on the medium-length trips made a proportionately larger contribution to traffic reduction.

Although the Smarter Choice Programmes in the three towns were, in many respects, similar, there were some differences, and these give interesting results. In particular, where there was a focus on encouraging a particular mode of travel (as measured by staff resources, or funding allocated, or both) and where promotional measures were accompanied by improvements in the quality of the 'offer' (e.g. better bus services, or new cycle infrastructure) this yielded comparatively greater success. This was evident in Darlington in relation to cycling, and in Peterborough in relation to bus travel. This highlights the importance of considering Smarter Choice Programmes in a holistic way, encompassing service improvements as well as marketing. Through evaluating the programmes in the three towns, we have reached the view that the common tendency to see smart measures in isolation, independent from infrastructure or service improvements, is unhelpful. Instead, infrastructure and service enhancement, marketing, information and publicity should all

[1] The 2004 smarter choices report considered two scenarios: a 'low intensity' and a 'high intensity' scenario. The high intensity scenario was based on an expansion of activity, commitment and resources for smarter choice measures to a substantially higher level, consistent with practical and realistic experience, the judgments of local practitioners, and feasible levels of expenditure. It assumed that implementation was in a supportive policy context, in which smarter choice measures were accompanied by policies such as reallocation of road capacity and other measures to improve public transport service levels, parking control, traffic calming, pedestrianisation, cycle networks, congestion charging or other traffic restraint, other use of transport prices and fares, speed regulation, or stronger legal enforcement levels. Such measures, if well designed, could also have further beneficial effects on travel choices in their own right (Cairns et al., 2004, pp334, 364, 374).

follow together from an assessment of a target market (such as pupil travel to school, or employee travel to work, or residents' travel to the town centre).

The smarter choice measures used were broadly 'carrots' rather than 'sticks', and involved no price increases or specific restrictions. There were therefore no campaigns against them from negatively affected stakeholders, or public opposition, and no spontaneous reports of negative side effects. Therefore, the only significant cost to be compared with the benefits is the money expenditure itself. The question to be addressed is whether the positive impacts were big enough to give good value for the money spent.

21.2 Measurement of value for money

The standard Department for Transport (DfT) procedures for calculating benefit-cost ratios and value for money of transport expenditures, for example, for road and public transport investments, require estimating two trajectories, for periods of up to 60 years into the future: travel patterns and transport conditions which would result from the expenditure; and those if the expenditure had not been made. The benefits and, hence, value for money are estimated from the difference between these trajectories. Such estimates are invariably made using models that, in principle, are able to project forward into the future and also take account of the direct and indirect consequences for all the included modes, and on a wider and more detailed network than is ever covered by observed traffic counts. A full calculation of this kind was outside the scope of the project.

A partial calculation can, however, be made by comparing the difference in travel patterns observed 'before' and 'after', i.e. in 2004 and 2008. This is not quite the same as the difference between 'with' and 'without'.

21.2.1 Congestion benefits

In the 2004 smarter choices report, an estimate for the money value of the congestion benefits already achieved in implementation of separate initiatives was made using standard DfT parameters. We first apply the same procedure to the current study, updating the values to allow both for changes in inflation and context, and also for the specific results in the three towns.

Cairns et al. (2004) compared the estimated expenditure per vehicle kilometre removed from the road network to DfT's estimate of the marginal congestion cost per vehicle kilometre. The expenditure varied substantially by measure, but a balanced programme of all the measures was estimated to cost an average of 1.5p per car kilometre removed at 2003 prices, and the congestion cost saving according to DfT figures at the time was 15p per average vehicle kilometre removed, giving a congestion benefit-cost ratio of about 10, being higher than this for low-cost measures in congested urban areas, and lower for higher-cost measures in uncongested rural areas (though there was limited evidence on the latter case).

Simply updating for inflation, but not for changes in the level of congestion, the cost of measures, or values of time, these calculations would be equivalent to about 1.8p expenditure per kilometre removed at November 2009 price levels, with congestion benefits of 18p per vehicle kilometre. This does not change the ratio.

The Sustainable Travel Town programme expenditure was in the order of 3.6p per vehicle kilometre removed (2006 prices), or 4p at November 2009 prices. Details of the derivation of this figure are given in the annex to this chapter. However, the method of calculation can be summarised as follows. We know that the effect in 2004 is zero by definition. From the household surveys, we can calculate how many car driver kilometres (equivalent to vehicle kilometres) have been removed by 2008, across the whole population in all three towns. In order to calculate the full reduction in vehicle kilometres, we also need to interpolate between 2004 and 2008 to get the intervening years, and to allow for a residual continuing effect after the end of the intervention. Both calculations need an assumption about whether effects are permanent, only last for one year, or something in between. We used the same assumption as in the 2004 report, namely that there is quite a rapid decay of effect of 40% per year[2]. This then gives a total estimate of vehicle kilometres saved, which is compared with the total expenditure, and gives the result of 3.6p per vehicle kilometre (with no discounting of capital costs). This answer is influenced by the assumption on decay rate, with a likely range from about 2p to about 4p. The 40% figure, we judge, is probably higher than is likely to be the case, especially in the context of widespread implementation supported by other policies, when there is little reason to suppose that choices quickly revert to a norm based mainly on extrapolation of policies that are more favourable to car use. Therefore we consider this cost is on the high side, and the resulting ratio of benefits to cost is conservative. A tentative shift to a decay rate of 33% would give a cost per car kilometre of 3.3p (2006 prices)[3]. The question of the longevity of impacts remains an important issue for research, for smarter choices as indeed for all other transport interventions, especially those whose timescales for assumed benefits may be very much longer[4].

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[2] The 2004 choice of decay factor was informed by research carried out by the authors and others about the longer term dynamics of travel choice (with an earlier review of the evidence contained in Goodwin et al. 2004). This suggested that population turnover and 'life-events' such as moving home tend to build up within a population over a 5-10 year period, which is consistent with the time scale of evolution from shorter term to long term elasticities. Thus even if the behaviour changes brought about were permanent for the individuals concerned, they would be subject to erosion as the individuals changed and moved. In addition, past smarter choice initiatives have taken place in a context where the dominant trend has been for increasing car use, not reducing, and this might cause people to 'relapse' into their earlier behaviour if not reminded. A 40% decay rate would be broadly consistent with the combined effect of such arguments. However the former effect would be less if similar measures were implemented over the whole country (since people would take their experience with them when moving) and the latter effect would not be relevant if the dominant trend were itself changed. This would be the rationale for adopting a slower decay rate in the context of an expansion of smarter choice measures.

[3] In calculating these figures, we take the household survey results at face value, and do not adjust for any change in vehicle kilometres as a result of wider national factors. We estimate that if such adjustment were made, the cost per vehicle kilometre removed would be 4.2p (2006 prices) with a 40% decay rate; or 3.8p (2006 prices) with a 33% decay rate. The assumed decay rate is predicated on the assumption that other factors are generally leading to increased car use. If that pressure reduces, it would be expected to be associated with a lower decay rate, so the effect of both together would not necessarily be to increase the cost.

[4] For example, it is quite common to assume that the forecast benefit achieved from road improvements at the most distant future forecast year is then continued every year for the remainder of the 60-year appraisal period, i.e. with no decay at all. This would give very much higher estimated benefits.

The figure for cost per vehicle kilometre removed is higher than the 2004 figure. This is likely to be for two reasons: first, because of the inclusion of a significant element of capital expenditure, which is not annualised; and second because of the different balance of cheaper and more expensive measures. The towns generally adopted a slightly more expensive 'package' than that modelled in the 2004 smarter choices report.

Thus, allowing for the extra cost, the average congestion benefit would be about 18p per 4p of expenditure, giving a congestion-only benefit-cost ratio of 4.5, still using the national average figure for congestion.

A full calculation would then need to take into account the higher than average cost of congestion in urban areas, partly offset by a lower than average value for the greater impacts on off-peak travel which occurred in the three towns. It would also be necessary to up-rate the cost of congestion, as a result of traffic growth since the congestion calculation was made in the early 2000s, and to include any increase in the value of time (for both personal and commercial traffic) above the rate of inflation. The net result of these factors would probably be to increase the ratio above the factor of 4.5 given above, though this would require more detailed modelling to estimate precisely.

According to procedures still adopted in early 2009, a substantial reduction in BCR would be produced by treating the reduction in tax receipts from motorists as an increased public expenditure cost attributed to the measures. No allowance was made for this in the 2004 figures, and it is not sensible retrospectively to include this adjustment since, during 2009, DfT decided that this is not an appropriate way to define the BCR, and will not be used in future.

Thus we conclude that the factor of 4.5 for the BCR, when *only considering the benefits arising from congestion relief*, is a conservative estimate.

21.2.2 Other categories of benefit

One of the major changes in DfT approaches to estimating benefit-cost ratios since 2004 has been a more formal inclusion of the money values of a wider range of other impacts, including health and carbon. DfT guidance is given in a series of case studies of 'non-traditional' types of projects in Webtag[5], in the context of encouraging the wider application of appraisal using broadly consistent approaches to those used for road schemes. The case studies are based on ex-post analysis of real cases, but their significance is probably more for the nature and scale of the effects than the specific schemes themselves. Specifically, benefits are estimated and given money values for health impacts, journey ambience, congestion, accidents, absenteeism, and environmental impacts.

This approach was applied by DfT to the calculation of benefits of smarter choice measures in the context of an impact assessment of carbon reduction[6]. The results of this assessment

[5] http://www.dft.gov.uk/webtag/documents/expert/unit3.14.php#05 April 2009
[6] DfT (2009) Impact assessment of the carbon reduction strategy for transport, Low Carbon Transport, A Greener Future http://www.dft.gov.uk/pgr/sustainable/carbonreduction/ia.pdf

are not comparable with the calculations here due to the assumptions and methods used, and in particular due to the new data which has become available from this evaluation subsequent to the DfT calculation. However, we note that for smarter choices, the proportion, by value, of congestion benefits in the total benefits was 49%, with the 51% including carbon, health and other factors. If the same proportions applied in the three towns (which is qualitatively consistent with the observed results), then the BCR would be broadly doubled.

21.2.3 Overall value for money

With a value of benefits to cost in the order of 4.5 for congestion benefits only, on the narrowest assumptions, and the net effect of other considerations being upwards, we are therefore confident that the Sustainable Travel Town programme has produced very good value for money for the public spending on the measures. Our provisional view is that the inclusion of other benefits (carbon, health etc.) might be expected to broadly double the BCR in this instance. We note that this is not an 'upper limit' for the value for money of Smarter Choice Programmes, and that it should in principle be possible to achieve further increases in the BCR through intensive application at a regional scale (as opposed to an individual town scale), and through greater focus on measures designed to influence medium-length journeys. We return to these points in the next section. We also hypothesise that as the scale and intensity of implementation of Smarter Choice Programmes grows, it is likely that the behaviour change 'decay rate' will reduce, due to changing social and behavioural norms.

21.3 Achievement of potential

The estimated outturn costs of the programme were £10 per person per year (roundly £11 at November 2009 prices). In the four-year appraisal period, this produced a reduction of 5-7% in car driver distance travelled by residents for those journeys under 50km that were in-scope. As noted above, this represented very good value for money. The next question is whether or not this represented the maximum potential for change.

In considering this question, it is instructive to compare the results in the three towns with the estimate of full potential made by the 2004 smarter choices study. For urban areas, this proposed a 14% reduction in urban traffic, or 18% reduction in urban car traffic, to be produced by a 10-year programme with an annual cost of roundly £17 per head in 2003 prices (£20 at November 2009 prices)[7].

It is clear that the three Sustainable Travel Towns achieved less than this, but the rate of expenditure and the duration were also less. Thus they achieved about 30-40% of the previously estimated full potential reduction in car driver kilometres, in about 40% of the

[7] The reduction in car driver mileage, 17.6% for urban areas in a high intensity scenario, is not given in the 2004 smarter choices report, which reported potential changes in 'all traffic' (i.e. car + goods vehicles /bus). It has been extracted from the original spreadsheet model for this report. Similarly the figure of £17 per head is not stated in this form in the 2004 report, but is implied in the calculations of costs, expenditure and effects.

time period which the 2004 study estimated would be required, with a rate of expenditure per head slightly over half as great, and without the supporting effect of simultaneous programmes in neighbouring towns.

Therefore, allowing for the differences in scale, circumstances, duration and budget, our judgement is that the exercise has produced results that are broadly proportionate to the 2004 estimate of full potential. At the same time, the measures implemented have by no means exhausted the full potential.

Thus, whilst acknowledging the achievements in the three towns, it is necessary to consider how Smarter Choice Programmes might be developed in future to achieve greater effects.

Journey distance: Concerning journeys of different distances, examination of aggregated baseline household survey data suggests that 37% of car driver distance in the three towns was on journeys of 10-50km, and 40% on journeys of over 50km. These medium-length and longer trips must have had origins, or destinations, or both, which were outside the Sustainable Travel Towns; and for the longer journeys, the majority of the distance driven would have taken place outside the urban area where the measures were focussed. Even so, a substantial proportion of the reduction in car driver distance recorded in the household surveys was from these journeys. This suggests that a rebalancing of measures to focus more on medium and longer car journeys, and wider implementation in neighbouring areas, would still have further potential.

Journey purpose: Commuting was by far the dominant trip purpose in these medium and longer trip distance categories, accounting for nearly half (46%) of car driver distance. Medium-length and longer commuter trips thus offer a large potential 'prize' in terms of car mileage savings, given suitable smarter choice interventions designed to influence them. Interventions targeting these trips might be expected to include a greater attention to workplace travel plans; a coordinated regional approach; a stronger emphasis on car sharing, express buses, rail travel, teleconferencing and telework; and use of regulatory or financial policy levers to incentivise business engagement in travel planning.

21.4 Induced traffic and 'locking in'

Any measures that reduce traffic congestion have the potential to enable traffic to move faster, and therefore can induce more traffic, which will reduce the benefits. In principle, this would apply as much to smarter choices as to, say, increasing road capacity, and, for that reason, it is common to suggest that there should be complementary measures designed to 'lock in' the benefits, for example by reallocation of road capacity, changes in prices and charges, or changes in the regulation and management of traffic.

In the event, a characteristic of the way in which the policies were developed in the towns was that rather little action was taken to reduce or reallocate road capacity to match the reductions in car driver mileage by residents. Therefore, in the absence of such measures, or a similar policy focus in neighbouring areas, it seems likely that a proportion of the benefit could have been eroded by induced traffic. Therefore seeking evidence on this point is of interest.

The problem of assessment is that, at the scale considered here, the amount of induced traffic that would be expected from the measures is very small. This may be seen by examination of the DfT's 2008 National Road Transport Forecasts, which involved a series of modelled relationships between traffic growth, congestion delay and modelled traffic speed.

Between 2003 and 2010, for 'other urban areas' (i.e. excluding London and the large cities), the DfT forecast was for a 4% increase in traffic volume, giving a 2% increase in congestion delay, and by inference approximately a 0.3% drop in traffic speed. This suggests that the observed decrease in traffic of approximately 2% in the three towns should logically have led to a fall in congestion delay of say 1%, and an increase in speed of about 0.2%, which is equivalent to around 0.2 seconds per kilometre travelled at 30 kph. The induced traffic from such a change using average elasticities would only have been of the order of 0.2% or less[8]. Such changes can certainly be large enough to calculate appreciable costs and benefits in a fine-grained model, but are not observable in survey or traffic count evidence: this is a common result in attempts to verify ex-post impacts from other transport interventions such as expanding road capacity.

As discussed in Chapter 17, in practice the apparent discrepancies between the household survey data and the changes in traffic observed on street were primarily not due to induced traffic, but due to other factors, as follows:

(a) To some extent, rather than freeing up road capacity, reductions in car driver mileage by existing residents provided the capacity to absorb population growth (in Peterborough) and employment growth (in Darlington) without increasing congestion. Hence, in a sense we may say that these towns consumed the benefits of the smarter choice interventions by enabling growth without causing a deterioration in quality of life or road network efficiency[9].

(b) The three towns were not 'closed systems' – in other words, traffic in the towns was caused by trips by non-residents as well as residents. Since most traffic count sites were on major roads, where through traffic (or trips by non-residents) may have been representing as much as half, or more, of total traffic volume, then, in crudest terms, it would be expected that a 5-7% reduction in mileage as a car driver by residents would result in an observable reduction in car traffic of only 2.5-3.5%.

(c) Residents appear to have preferentially reduced their car use for trips into the inner/central area, as opposed to trips to outer town locations, possibly because trips into the inner area were better served by buses, and parking was more likely to be constrained or

[8] This is a second-order effect since the 2% observed fall in traffic would include both reduced and induced traffic together. This does not affect the order of magnitude.

[9] This is one of the more important cases where benefit defined as the difference between 'with' and 'without' would be greater than the difference between 'before' and 'after', and we will be underestimating the benefit by not allowing for it.

charged-for. This is consistent with the observation from the household surveys that behaviour change appears to have been larger for shopping and personal business trips than for some other journey purposes, since destinations for these trips might perhaps be expected to be concentrated in inner/central areas, or to be more transferable to these locations. This is also likely to be part of the reason why the proportional reduction in car driver mode share was greatest for shorter trips, and the initiatives therefore had a lesser effect on car driver distance than on the number of car driver trips. This effect was particularly marked in Worcester.

However, although these appear to be the dominant factors explaining the discrepancies observed, it is still probable that induced traffic occurred – particularly, perhaps, with extra car use by people living outside the towns, or by freight, service vehicles and business travel.

In brief, then, it has been our strong hypothesis that, in the absence of locking in, or a supportive impact from other policies, there is the danger that induced travel will undermine (some of) the benefits of Smarter Choice Programmes. Given the relatively good correspondence between the household survey results and the count data (when factors such as population and employment growth are taken into account) we conclude that the amount of induced traffic is likely to have been relatively small. However, the results do not add further clear evidence to assess the issue, or, indeed, to examine the important issue of whether the behaviour changes recorded would have been considerably greater had greater locking in occurred.

21.5 Long term sustainability

The issue of timescale is important. Our original report envisaged a 10-year programme of activity. It seems clear that some initiatives – such as workplace travel planning – may take a relatively long time to deliver results, and that smarter choices work generally requires significant start-up time in terms of getting staff in place, with an appropriate strategy and training. Hence, assessing the effects of conducting this type of programme over a longer period could clearly be important. A related issue is the longevity of behavioural change.

As already highlighted, experience in the towns has been different, partly depending on the way that initial activities have been reinforced over time. Hence, monitoring progress in the three towns in the future may be important to understand how any reductions in traffic and carbon emissions, and improvements in health, can be sustained and enhanced over a longer period.

21.6 Quality of the evidence and analysis

In a separate recent review of the methodology used for evaluation of the effects of smarter choice interventions, a number of critical comments have been made about the quality of the evidence. In November 2009, the DfT published two reports[10] [11] on this question, which came to a general view that many of the specific studies they examined were unclear, not well specified, or failed to take into account issues of policy interest.

The reports did not systematically re-examine the actual content of the evidence, being more concerned with coverage and methodology, and therefore did not come to any different view from Cairns et al. (2004) about the quantitative scale of the effects, nor even conclude that there was an inherent likelihood for the estimated effects to be biased in one direction or the other. They did make substantial recommendations about how the quality of the evidence could be improved.

We have paid considerable attention to some features of concern to the authors. Clearly, any estimation of benefits will only be as good as the underlying data, and in the case of our estimation of the ratio of benefits to costs, this means that particular scrutiny of the vehicle kilometre reductions determined from the household travel survey is appropriate. One particular concern, mentioned over the years by other commentators as well as by ISR (2009) and AECOM (2009), was the transparency and processes of collecting and weighting survey data, and the sensitivity of results to weighting. At an early stage, we sought to carry out all the major analyses in parallel using both weighted and unweighted data. In most cases we found that the results were robust whether weighted or unweighted data were used, though there were a few exceptions and, in these cases, we have noted them specifically.

We also paid considerable attention to issues to which those reports gave less attention, especially the features of traffic count data and how to synthesise the results of disparate data sources.

The results inevitably have caveats, and we have sought to spell these out in the interests of transparency and accuracy. The underlying problem is that there is policy and research interest in a level of detail of impacts that would make the research effort more costly than the expenditure on the measures themselves, which would be difficult to defend.

The biggest shortfall in data, in our view, remains the absence of longitudinal panel data which could identify details of behavioural change that are simply unobservable in cross-section surveys, though we do acknowledge that this criticism applies equally, or more so, to very much bigger programmes of travel research relating, for example, to most programmes of road building, pricing, public transport investment, subsidy, and regulation. For example, the Highways Agency programme of ex-post monitoring of their schemes does not include longitudinal data on road users to identify who has changed their travel patterns.

[10] Independent Social Research (2009) *Impacts of Better Use Interventions: Review of the Evaluation Evidence Base*. DfT, London. Available online at:
http://www.dft.gov.uk/pgr/evaluation/evaluationguidance/existingnetworks/betteruse.pdf

[11] AECOM (2009) *Evaluation of Better Use Interventions: Evaluation Framework Report*. DfT, London Available online at:
http://www.dft.gov.uk/pgr/evaluation/evaluationguidance/existingnetworks/frameworkreport.pdf

With these caveats, we judge that the current research offers as robust an evaluation of the available evidence as is realistically possible. As always, the data sets contain information that would reward further examination.

21.7. Conclusions

We conclude that the Sustainable Travel Town programme was successful in reducing travel by car, and increasing the use of other modes, and that the programme offered very high value for money. The trends in the towns were different from those in other medium-sized urban areas, with respect to car, bus, walking and cycling trips per person and also with respect to changes in traffic.

Over the last year, the development of various important policy initiatives has had to proceed in advance of the results reported here, but with specific recognition of their importance. In particular, we note advice given by the Commission for Integrated Transport and the Committee on Climate Change, and an Impact Assessment carried out by the DfT, in which more or less conservative assumptions were made about the potential contribution to carbon reduction that could be made by smarter choices, all noting that the results of the Sustainable Travel Town initiative would be important to give more confidence in these assumptions.

Not all outstanding questions can be resolved by the Sustainable Travel Town programme on its own, especially those which depend on testing the effect of simultaneous application of measures not in a single town, but in a cluster of towns and the surrounding areas in a region. Similarly, the Sustainable Travel Town initiative does not add any new information on rural potential to that already available in the 2004 report.

On the other hand, considerable new information has been added regarding the relative effect on journeys of different lengths, which has been one of the issues of discussion. The results clearly indicate that, for Smarter Choice Programmes as presently being implemented, the proportionate effects on numbers of car trips are likely to be greater for shorter journeys, but that, even so, the biggest contributions to reduced traffic volume and carbon emissions are likely to be from changes to medium and longer distance journeys. They leave open the question of how the *principles* of the Smarter Choice Programmes in the three towns might be applied to medium and longer distance journeys, and this is now an important topic for examination and experimentation.

We judge that the experience in the three Sustainable Travel Towns (and elsewhere) is now sufficient to justify widespread development and delivery of town-based Smarter Choice Programmes. All such development will produce new information, which should be monitored and analysed, but we do not have the view that such research need now be a necessary precursor to practical application. There would also be great merit in piloting of new initiatives, to apply the principles of travel behaviour change to medium and long-distance journeys and to travel in rural areas, and to focus more intensively on travel for work.

21.8 References

Goodwin P, Cairns S, Dargay J, Hanly M, Parkhurst G, Stokes G and Vythoulkas P (2004) *Changing travel behaviour.* In: ESRC Transport Studies Unit Final Conference, September 2004, UK. http://eprints.ucl.ac.uk/1245/1/2004_23.pdf

Annex

A21.1 Estimation of cost per vehicle kilometre saved

Our approach to estimation of the cost per vehicle kilometre saved is described below. This approach should be treated as provisional, and likely to be subject to future refinement following discussions with the DfT. There is a particular issue of specifying an appropriate decay rate for behaviour change; and at this stage we have not made any adjustments to present values, for either costs or benefits, and have treated capital investment in the same way as revenue, with no discounting. Subject to these caveats, we consider that the approach adopted is likely to give a headline figure that is of broadly the right order.

1. For each town, the per capita saving in car driver km between the baseline and ex-post surveys (using the weighted dataset, for trips up to 50km only) was factored up to generate an annual town-wide figure. These three figures were summed to give the car driver km reduction in 2008 across the whole Sustainable Travel Towns programme (Table 21.1).

Table 21.1: Calculation of car driver km saved in 2008

	Darlington	Peterborough	Worcester	all towns
2004 population	85,459	140,540	92,678	
2007 population index, compared to 2004	100.2	106.1	101.1	
2004: distance as a car driver (km per person per day)	9.6	9.9	11.4	
2008: distance as a car driver (km per person per day)	8.9	9.0	11.1	
car driver km saved per day in 2008, all residents	-58,058	-147,853	-31,330	
car driver km saved per year in 2008 (compared to 2004), all residents	**-21,191,281**	**-53,966,342**	**-11,435,496**	**-86,593,118**

Note: Figures are for trips less than 50km; weighted dataset.

2. We then examined the expenditure in the period between the baseline and ex-post surveys, including both revenue and capital, and estimated the proportion spent in each of the four years between the two surveys. Spending before the baseline survey, and after the ex-post survey, was not counted. Capital costs were not discounted. As outlined in Chapter 3, in considering the spending in the towns, we have included investment in infrastructure and services funded from other budgets where it might reasonably be supposed that this would be likely to be supportive of behavioural change, as well as that directly allocated to the smarter choices work.

3. We assumed that the behaviour change 'effect' in year X as a result of expenditure in year X was proportional to that expenditure: that is, one unit of expenditure generated one unit of 'effect'. We assumed that the effect decayed at a rate of 40% per year, so that the effect over time of one unit of expenditure was '1' in year one; '0.6' in year two; '0.36' in year three,

and so on. This enabled us to calculate the total effect in each year, which was the sum of the residual effect from expenditure in all previous years.

4. The total effect in year 4 (2008) was translated from our arbitrary 'effect units' to the estimated car driver km reduction for the Sustainable Travel Town programme, and the ratio between these two numbers was used to derive an estimated car driver km reduction in years 1-3 and 5-30 (Table 21.2).

Table 21.2: Relationship between expenditure and effect for the Sustainable Travel Town programme

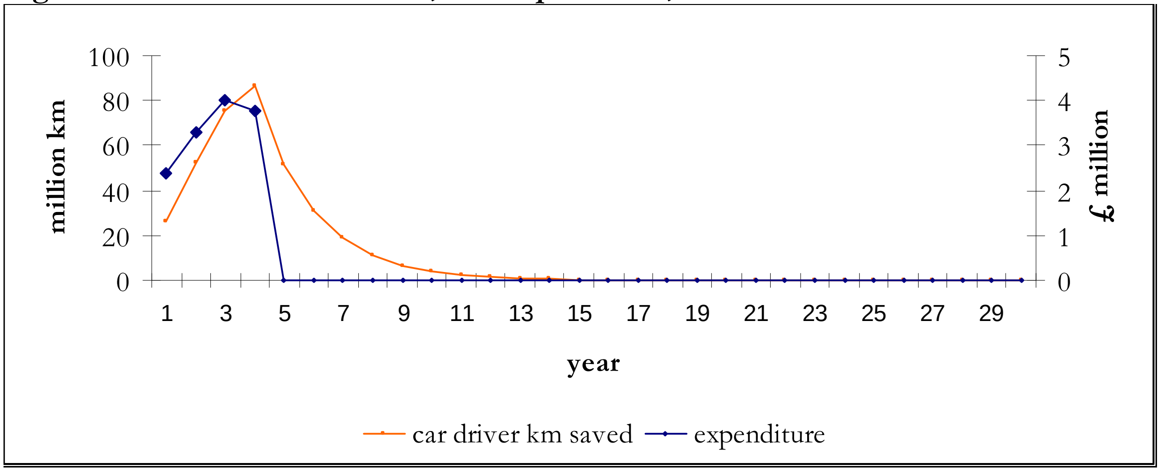
Year	Proportion of spend in this year	Effect of year 1 spend	Effect of year 2 spend	Effect of year 3 spend	Effect of year 4 spend	Total effect (arbitrary units)	Total effect (car driver km)	Total capital + revenue spent in each year
0	0.0					0.0	0	0
1	17.8%	**17.8**				17.8	26,312,634	£2,388,070
2	24.6%	10.7	**24.6**			35.2	52,186,163	£3,303,445
3	29.7%	6.4	14.7	**29.7**		50.8	75,274,872	£3,989,989
4	28.0%	3.8	8.8	17.8	**28.0**	**58.5**	**86,593,118**	£3,759,921
5	0.0	2.3	5.3	10.7	16.8	35.1	51,955,871	£0
6	0.0	1.4	3.2	6.4	10.1	21.0	31,173,523	£0
7	0.0	0.8	1.9	3.8	6.0	12.6	18,704,114	£0
8	0.0	0.5	1.1	2.3	3.6	7.6	11,222,468	£0
9	0.0	0.3	0.7	1.4	2.2	4.5	6,733,481	£0
10	0.0	0.2	0.4	0.8	1.3	2.7	4,040,089	£0
11 to 20	0.0	0.3	0.6	1.2	1.9	4.1	6,023,489	£0
21 to 30	0.0	0.0	0.0	0.0	0.0	0.0	36,422	£0
TOTAL	**100%**					**250.0**	**370,256,243**	**£13,441,425**

Notes: Expenditure figures are estimated for periods Autumn 2004-Autumn 2005; Autumn 2005-Autumn 2006; Autumn 2006-Autumn 2007; and Autumn 2007-Autumn 2008, to match timing of baseline and ex-post household surveys. Neither expenditure nor effect before the baseline survey or after the ex-post survey are included. Assumed decay rate = 40%.

5. The cost per car driver km saved was then the total cost of the programme (capital + revenue) between the baseline and ex-post surveys, divided by the sum of the car driver km savings in each of years 1 to 30. This was 3.6 pence (at roughly 2006 prices).

The assumed decay rate is very high, leading to a rapid diminution of behaviour change. Thus, the total effect in year 8 (2012) is just over a tenth (13%) of the total effect in year 4 (2008). The rapid tailing off of behaviour change may be seen in Figure 21.1.

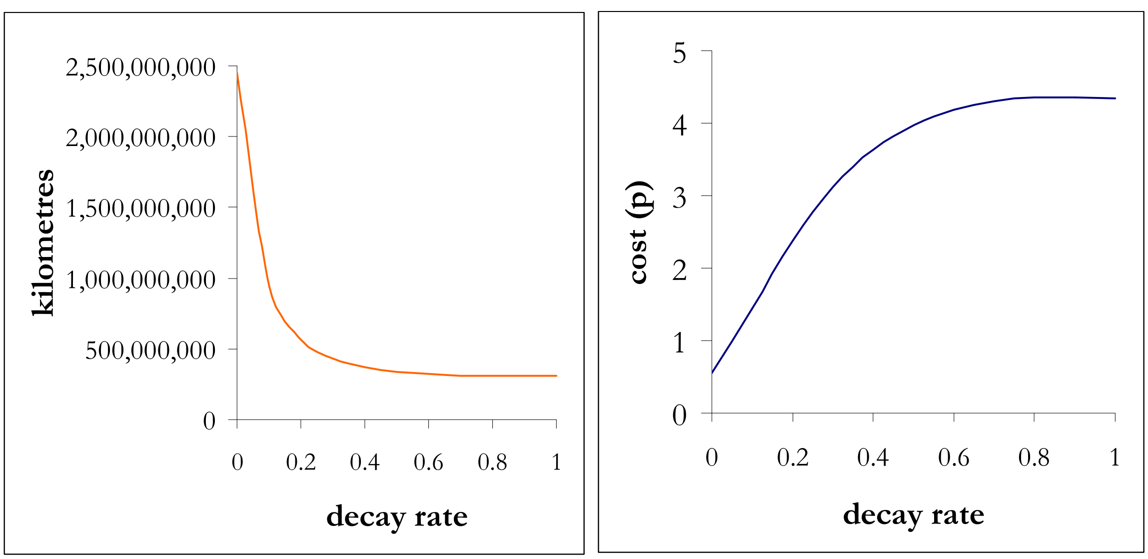
Figure 21.1: car driver km saved, and expenditure, over time



Note: Graph shows relation between expenditure and 'effect' (car driver km saved), for the whole Sustainable Travel Town programme, but only taking account of the expenditure between Autumn 2004 and Autumn 2008. The effect in each year is the sum of the effect as a result of any expenditure in that year, and the residual effect from expenditure in all previous years, using a decay rate of 40%.

It should be emphasised that we have no empirical basis for assuming such a high decay rate. Sensitivity tests suggest that if the decay rate were lower (say, 20%), the cost per car driver km saved would be 2.4p. If the decay rate were higher (say, 60%), the cost per car driver km saved would be 4.2p. Tentatively, if the decay rate were 33%, the cost per car driver km saved would be 3.3p. Figure 21.2 shows the effect of different decay rates on both the total effect (i.e. the cumulative car driver km saved) and the cost per km saved.

Figure 21.2: relation between 'decay rate', total car driver km saved and cost per car driver km saved



Note: Figures for costs and kilometres saved are for a 30-year period.