Reducing greenhouse emissions from transport - UK national project

Phase One: Perspectives

SECOND DRAFT

Targets: how far and how fast?

The importance of rates of progress for climate change

One of the key issues in assessing the success or failure of any public policy is how far it achieves its objectives. In the case of climate change, the UK target for carbon emissions of "60% reduction on 1990 levels by 2050" (Ref. 1), is straightforward and easy to understand. There is also the Kyoto target of a 12.5% reduction by 2008-12. The Government forecast (Source 3), based on current policies, is that transport will fail to meet this target, even excluding air travel. In fact, there are no specific interim targets for transport to guide policymaking, only a range of estimates from 2005 to 2020 based on current policy aspirations.

However, the rate of progress towards the target for 2050 is, in the case of greenhouse gas emissions, just as important as the end date itself. In other policy areas it may be acceptable to seek to achieve a certain end state at a fixed date in the future. When addressing climate change, the crucial policy goal is not to achieve a specific reduction by the end of a policy programme, it is to release as little carbon as possible between now and the programme's end date. It is this which actually influences the level of greenhouse gas in the atmosphere in 2050. Carbon dioxide produced today will still be contributing towards the greenhouse effect well beyond 2100. Thus it is essential to start making significant progress as soon as possible. The analysis in this section gives an idea of just how important this might be.

The significance of the rate of progress is one of the reasons behind the idea of setting annual targets, and can be illustrated by looking at the total carbon emissions between now and the target date (2005 to 2050).

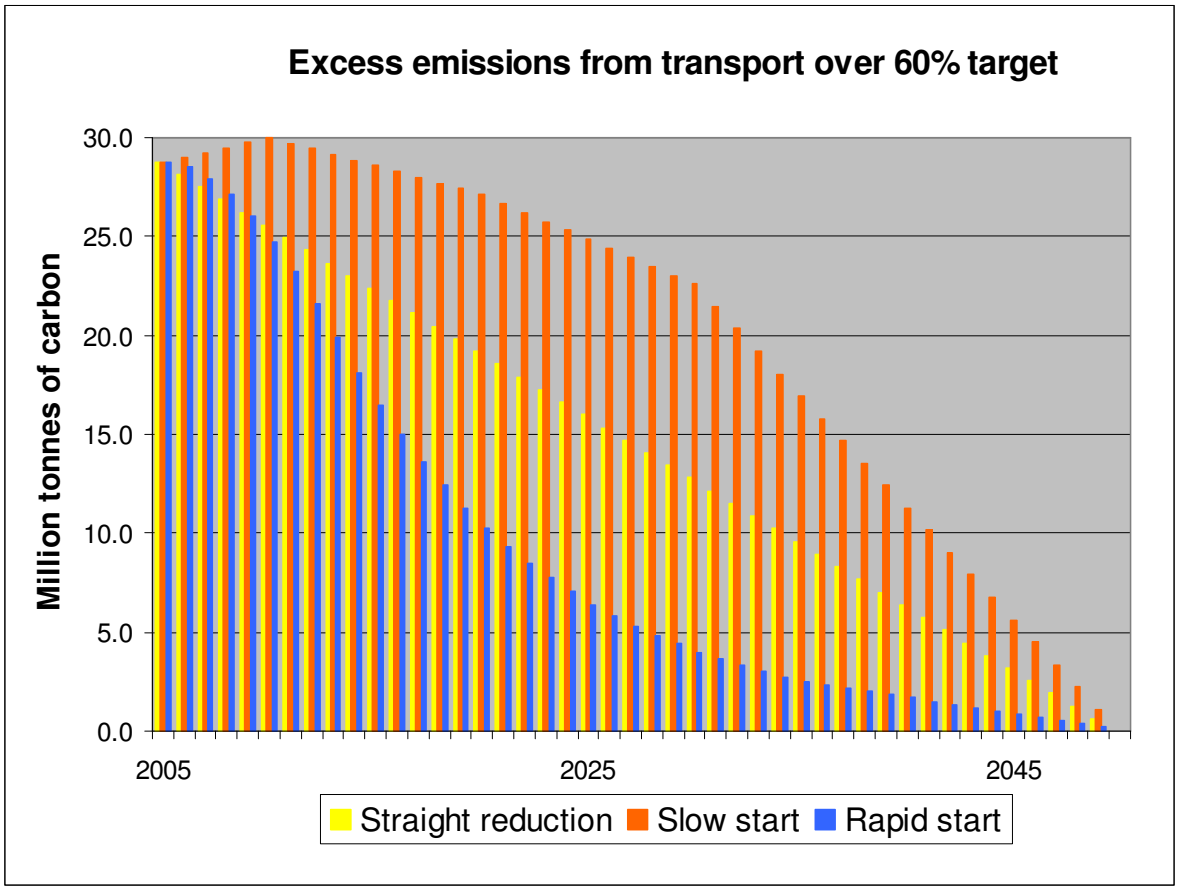
In Figure 1, all the assumed policy programmes deliver the end date target of a 60% reduction. However, each one causes a very different amount of carbon to be released over the whole time period.

The "slow start" series is calculated using the emission data and forecasts from the UK's climate change programme (Source 3) for 2020 and 2030 (Source 3, Ref. 2). These are then extrapolated so that they reach the 2050 target.

The "straight line" is simply that – reductions occur at the same level every year. This is really used for reference purposes.

The "rapid start" is based on a series of policy changes which combine technological improvement with demand management – broadly those being developed for this project.

Figure 1



Detailed spreadsheets which have been used to produce these charts are available (References below) and the sources and assumptions for all the charts are also set out in that section. The three scenarios above were chosen to illustrate likely outcomes for different policies relevant to this study, but the analysis can be applied to other established scenarios for the UK and elsewhere.

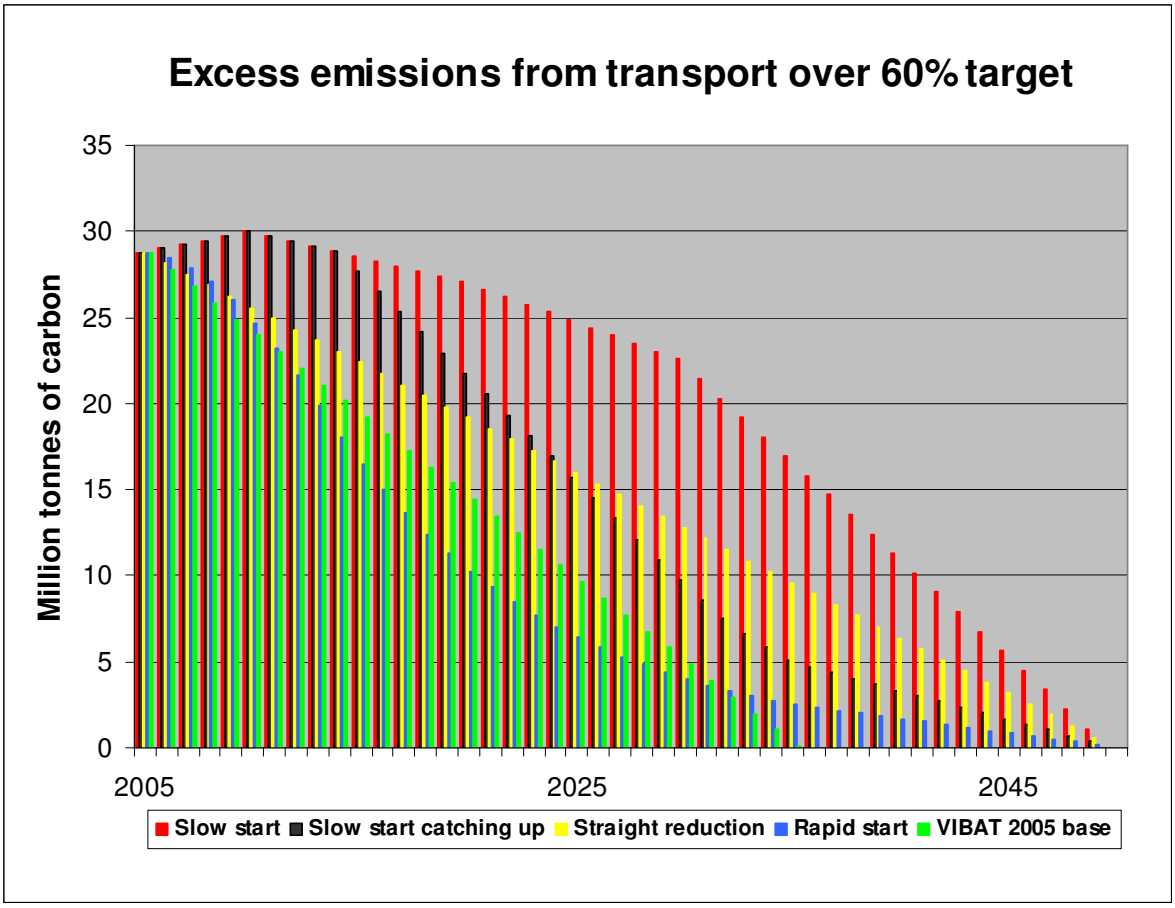
Results from other reduction scenarios: VIBAT

The first example set out here is the research published in January 2006 entitled "Visioning and Backcasting for UK Transport Policy" (**VIBAT**), sponsored by the Department for Transport, and undertaken by University College and Halcrow (Ref. 2). This looked at combinations of strategic transport and land use policies which might achieve the 60% emissions reduction target by 2030 rather than 2050. VIBAT used a straight line achievement rate and this has been added to the chart below for comparative purposes. VIBAT assumed a 1990 start date so this was adjusted to 2005, with an end date of 2035, to allow a more realistic comparison. The original VIBAT total, assuming policies had begun to take effect earlier than 2005, is included in the Table.

In addition, another profile has been created. For this, the DEFRA estimates used for Figure 1 have been adjusted from 2015 onwards to achieve significantly greater reductions. The aim was to create a profile, using DEFRA for the early years, that would emit the same total amount between now and 2050 as that achieved by the

straight line rate of progress. This was done to give an idea of how great the challenge might be if the start is too slow. This is set out in Figure 2.

Figure 2



Three important points emerge from this analysis.

The first is that it is not really practicable for a slow start to achieve the same overall emissions as the "rapid start" without unrealistically high annual rates of reduction. Even in the case where the "straight line" total reduction is achieved, extremely rapid progress would have to be made between 2015 and 2035, given the slow start.

The message here is that delay is the equivalent of not achieving the proper target. Including these two new scenarios illustrates the value of looking at the annual profiles of carbon emissions as well as distant targets.

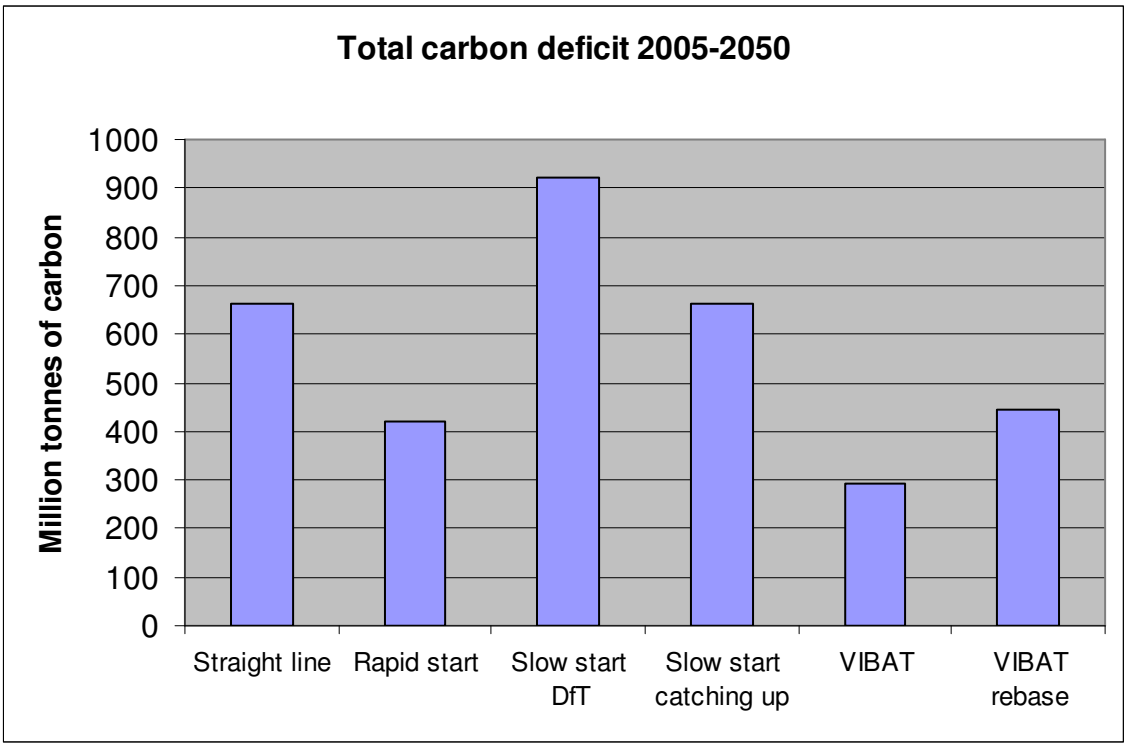
Secondly, it is clear that the rapid start scenario slows down its rate of reduction in the latter half of the 50 year period and moves more gradually towards the target. This can be viewed in two ways. The first is that it is a reasonable representation of technological change not going too much beyond what we know is possible today. The second is that there is bound to be further improvement and thus that progress should continue, effectively moving beyond the 60% target by 2050. Again, this would be an advantage – in terms of climate change any improvement over target is worthwhile.

The third key point, which the inclusion of VIBAT illustrates, is the value of achieving the same target (60% reduction) significantly earlier. This becomes very clear when the total amount of carbon in excess of the desired level over the 50 years is calculated as in Table 1 and Figure 3 below.

Table 1: Total carbon deficit 2005 – 2050
(defined as the carbon emitted in excess of the target level)
million tonnes of carbon equivalent

Straight line reduction	Rapid start	Slow start (Future of Transport)	Slow start catching up	VIBAT	VIBAT rebased to 2005
662	421	921	662	290	446

Figure 3



Overall, the analysis highlights the crucial nature of making early progress. This in turn illustrates the requirement for regular monitoring (probably annually). The key point is that the monitoring must be sufficiently frequent to allow for policy adjustment.

It is also an important motivating factor behind this project's phase two work. This will seek to prepare a UK transport policy package to address climate change which provides the necessary rapid start. This is bound to involve both an acceleration in

the adoption of existing technologies and a faster, and deeper, implementation of policies which affect travel choice. It will seek to go beyond the strategic impacts to indicate what specific policies could achieve the desired reduction profile.

Results from other reduction scenarios: California

While many policy packages do not have detailed targets for each year between now and 2050, the choice of even a few interim targets can create a profile which can be analysed. For all the charts except "rapid start" a simple straight line between targets has been used to create annual profiles and allow comparisons to be made.

The example considered next is the new state law in California, Assembly Bill (AB) 32. This was approved in September 2006 and authorised for action by Governor Schwarzenegger in October (Source 5). Interestingly, it included specific co-operation with the UK. The targets are to return to 2000 carbon emission levels by 2010, to 1990 levels by 2020 (about 15% reduction on today) and to achieve an 80% reduction on 1990 levels by 2050. The profile assumed by this report draws a straight line between the above targets and is **not** part of the legislation.

The targets themselves are to be achieved by means of regulation, in the first instance specifying both vehicle efficiency standards and fuel carbon content (Refs. 3 & 4).

The latter is a flexible standard – it does not specify whether biofuels are to be used, or whether other means such as electric or hybrid power sources reduce the effective carbon emissions per unit of power. All sources will have to complete a full "well to wheel" inventory so that all the emissions from producing and transporting fuel are included. They draw attention to the fact that biofuels from corn which are made out of state probably do not save any emissions compared to current petroleum. Locally produced biofuel using waste products would show significant savings.

The State legislation specifically excludes the use of taxes. Thus the Californian approach is very much technology led in the early stages rather than changing patterns of travel. However, the whole policy is underpinned by the enforceable caps on carbon emissions. For example, manufacturers may have to stop selling vehicles which produce a lot of carbon if they have not sold a large enough number of those which produce a below average amount. The Californian Air Resources Board is currently working on a more detailed action plan to implement AB32.

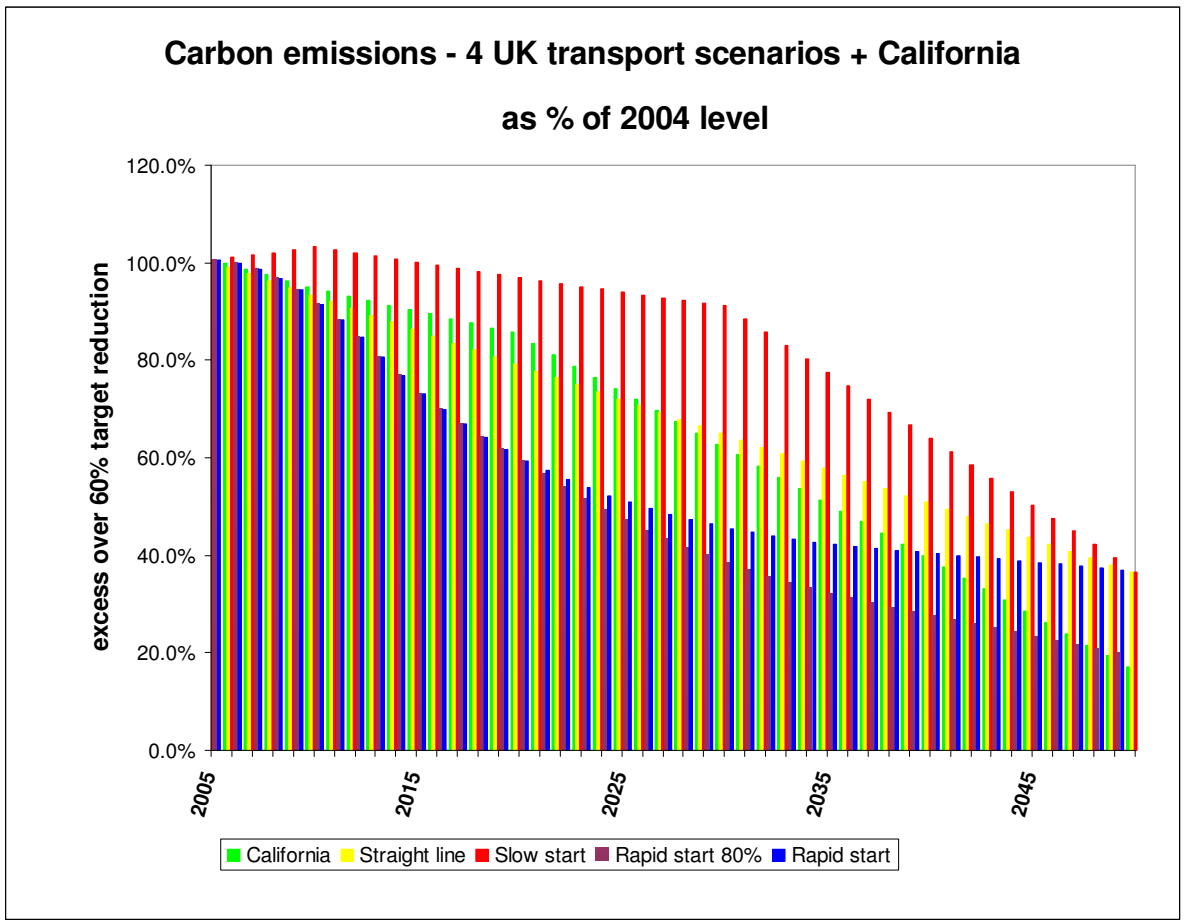
The cap makes it substantially different from policies which reduce a vehicle's carbon emissions per kilometre without setting a total emissions target. This appears to be the national US Government position, as in the most recent State of the Union speech.

Beyond technology, there is some discussion over behavioural change coming on stream, particularly in relation to transferring freight from road to rail, better land use planning, and smart growth. The latter would include UK policies such as accessibility and company travel planning.

California and UK profiles

In order to allow comparison with the rate of achievement of UK scenarios, the Californian profile, as expressed in the targets for 2010, 2020 and 2050, is shown in Figure 4 below in percentage terms, with a base year of 2005.

Figure 4



The Californian profile outperforms the current profile predicted for the UK, mainly due to the tough early targets for 2010 and 2020. Progress then accelerates slightly to 2050. The 2050 target is also tougher than the UK target and this helps to reduce the total emissions over the whole period. Its overall achievement is close to the rapid start scenario which this project favours.

Conclusions

1 In relation to climate change it is the total amount of greenhouse gas emitted from now until the target date which should guide short as well as longer term policies.

2 This highlights the need for more frequent interim targets and annual monitoring, and this is very relevant in the context of the proposed UK Climate Change Bill.

3 Other studies, one from the UK, and the other based on California's new legislation, suggest that transport in the UK could make a much more significant contribution to tackling climate change than currently planned.

4 The importance of making an early start to carbon reductions suggests that the achievement of a rapid start is the preferred approach to the formulation of transport policy which addresses climate change. This will be reflected in the policy development undertaken during Phase 2 of this project.

Sources and References

Sources and assumptions for the tables and charts

S1 Carbon deficit for the UK is defined as amount produced in excess of the long term target level of 16.5 million tonnes of carbon equivalent (60% reduction on 1990 levels)

S2 Totals are for all surface transport (no international air travel or deep sea shipping)

S3 Greenhouse gas emissions from UK transport are from "Climate Change - The UK Programme 2006" DEFRA
http://www.defra.gov.uk/ENVIRONMENT/climatechange/uk/ukccp/pdf/ukccp06-all.pdf

S4 UK Department for Transport assumptions on traffic growth and vehicle efficiency are also used
http://www.dft.gov.uk/foi/responses/2005/mar/trafficgrowthforecasts/futureoftransportassumptions
http://www.dft.gov.uk/foi/responses/2005/mar/trafficgrowthforecasts/futureoftransporttrafficsummary

S5 Californian estimates are sourced from baseline assumptions for State Bill AB32, in the Climate Action Team Report, March 2006
http://www.climatechange.ca.gov/climate_action_team/reports/2006-04-03_FINAL_CAT_REPORT.PDF
http://gov.ca.gov/index.php?/press-release/4111/

S6 Except for "rapid start" scenarios, intermediate years are calculated using straight line assumptions between given target years

S7 Californian transport estimates for all years are produced by using a fixed proportion of 41.2% of total emissions (current figure)

References

R1 Future of Transport White Paper, CM6234, October 2004
http://www.dft.gov.uk/pgr/strategy/whitepapers/fot/

R2 VIBAT Report, 2006
http://www.ucl.ac.uk/~ucft696/vibat2.html

R3 California expert briefing on the low carbon fuels standard
http://gov.ca.gov/index.php?/speech/5249/

R4 State of California Executive Order on low carbon fuels, 18th January 2007
http://gov.ca.gov/executive-order/5172/

MTRU working spreadsheets will be published early in 2007 on:
http://www.transportclimate.org/