Looking over the Horizon
Visioning and Backcasting for UK Transport Policy

Department for Transport – New Horizons Research Programme 2004/05

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Methodological Issues

1. Introduction

This background note is focused on methodological issues and lessons learnt during the backcasting process in the VIBAT project. Those interested in more details of the research carried out during the New Horizons Research Project 2004/05 should refer to the three extended working papers and presentations produced during the research (September 2004 – October 2005) www.bartlett.ucl.ac.uk/research/planning/vibat/index.htm, and to a sister document on the policy related issues.

The VIBAT project (Visioning and Backcasting of UK Transport Policy) has examined the possibility of reducing transport CO_2 emissions by 60 per cent in 2030. It has examined a range of policy measures (i.e. pricing, regulation and technological), and assessed how they can be effectively combined to achieve this level of CO_2 emissions reduction. The intention has been to assess whether such an ambitious target is feasible, to identify the main problems, and to comment on the main decision points over the time horizon.

There have been three main stages in this innovative research project. The first was to set targets for 2030 and to forecast the business as usual situation for all forms of transport in the UK over that period, so that the scale of change can be assessed in terms of achieving the emissions reductions. The second was the description of the transport system in 2030 that will meet the reduction target. This has taken the form of two alternative visions of the future that will push both the technological and the behavioural options, separately and in combination. The third stage was the backcasting process, where alternative policy packages were assembled to lead to the image of the future, together with their sequencing in terms of when implementation should take place.

The benefits of scenario building are that innovative packages of policy measures can be developed to address ambitious CO_2 emissions reduction targets. This allows trend-breaking analysis, by highlighting the policy and planning choices to be made, by identifying the key stakeholders that should be included in the process, and by making an assessment of the main

decision points that have to be made (the step changes). It also provides a longer-term background against which more detailed analysis can take place.

The two main objectives for the VIBAT project are:

1. To test the visioning and backcasting methodologies as a means to assess challenging new environmental targets for UK transport policy – this is the *methodological* objective;
2. To produce a set of images of the future that represent different alternative visions for the year 2030, and to determine alternative policy packages that are necessary to introduce to achieve these images, together with the policy paths that highlight when change has to take place – this is the *policy* objective.

This background note gives a brief outline of the process used within the VIBAT project and has been designed to reflect on the usefulness of the visioning and backcasting approach to policy scenario building.

2. Futures Studies and the Backcasting Approach

It is important to look at the longer-term future, particularly when dealing with policies relating to sustainable transport, as many interventions require long lead times, as impacts take time to be effective, and as different policies combined to work in the same direction can be more effective. To help us understand these longer-term futures, a number of empirical research techniques are available. Futures studies have been increasingly used in the last few recent decades to illustrate what might happen toif society responds positively to thein adapting to challenging future trends and targets. The most effective studies are used to define a broader conceptual framework within which the possible futures can be discussed, and to contribute to policy formulation.

The traditional forecasting approach is still dominant in many research studies looking over the shorter-term, but there are strong concerns as to the usefulness of forecasting in the study of highly complex, long-term sustainability problems. Based on extrapolating existing trends, forecasting is unlikely to generate creative and radical solutions to current policy challenges. Scenario building approaches offer one alternative approach to looking over the longer term, and they can be considered as being complementary to the current range of transport models. This study has taken and adapted one particular scenario building approach to UK transport policy over a 30 year time horizon.

The backcasting study approach has been used widely in Scandinavian research over the last 20 years and also in a number of pan-European projects, such as the well-known OECD project on Environmentally Sustainable Transport (EST) (see www.oecd.org), and the EU-POSSUM project (Banister et al, 2000), which was the first to assess European transport policies as to their consistency and feasibility, using a qualitative scenario-based approach based on backcasting.

The term backcasting was actually first introduced by Robinson (1982) to analyse future energy options in terms of how desirable futures could be attained. The major distinguishing characteristic is: “a concern, not with what futures are likely to happen, but with how desirable

futures can be attained. It is thus explicitly normative, involving working backwards from a particular desirable end-point to the present in order to determine the physical suitability of that future and what policy measures would be required to reach that point." (Robinson, 1990). The major differences between forecasting and backcasting studies are shown in Table 1.

Table 1: *Comparing Forecasting and Backcasting*

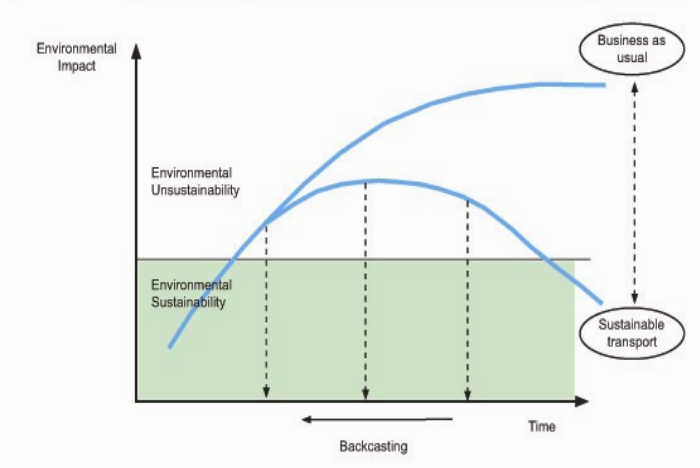
Measure	Forecasting	Backcasting
Philosophy	Justification as the context Causality determinism	Discovery as the context Causality and intentions
Perspective	Dominant trends Likely futures Possible marginal adjustments Focus on adapting to trends	Societal problem in need of a solution Desirable futures Scope of human choice Strategic decisions Retain freedom of action
Approach	Extrapolate trends into future Sensitivity analysis	Define interesting futures Analyse consequences and conditions for these futures to materialise
Method and technique	Various econometric models Mathematical algorithms	Partial and conditional extrapolations Normative models, system dynamic models, Delphi methods, expert judgement

(Based on Geurs and Van Wee, 2000, 2004; and adapted from Dreborg, 1996)

For further details on the technical research, and methodological issues, readers are referred to Geurs and Van Wee (2004), Dreborg (1996), Banister, Hickman and Stead (2006), and Akerman and Hoyer (2006).

Figure 1 shows the main features of the backcasting process. Instead of starting with the present situation and prevailing trends, the backcasting approach designs images of the future representing desirable solutions to societal problems. Possible paths back to the present are then developed - 'casting back' from the future - in 25, 20, 15, 10 and 5 years time. The term 'scenario' covers both the images of the future and the trajectory leading back to the present.

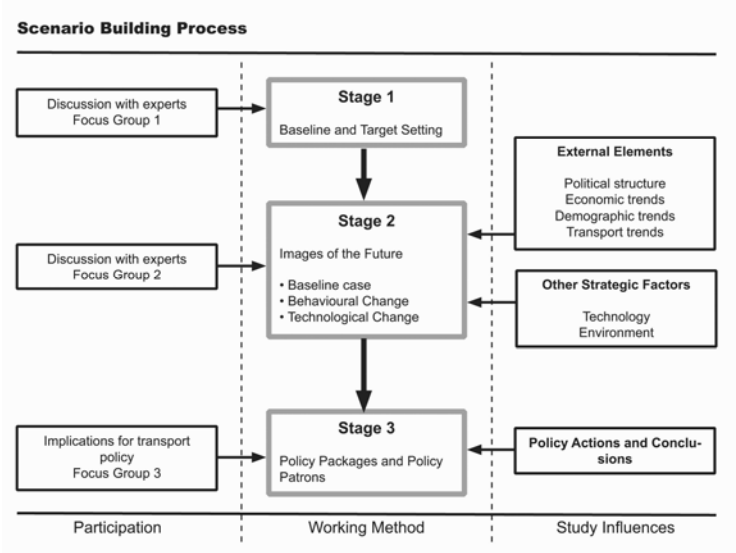
Figure 1: *The Backcasting Conceptual Framework*



3. The VIBAT Study Approach

The scenario building process used in the VIBAT project has three separate stages (see Figure 2). The commentary below describes the process, provides a critique of the methodology and also makes suggestions for modifications.

Figure 2*: The Structure of the VIBAT Scenario Building Approach*



Stage 1 – Baseline and Target Setting: this stage of the study reviews the background research and trends, including the main drivers of change over the period 2000-2030. It also establishes a quantitative baseline against which the scenarios can be constructed (the business as usual future). It includes forecasts of the amount of travel, together with energy consumption and emissions estimates.

Although this stage in the process seems relatively easy to carry out, the time and effort involved in establishing an accurate quantitative baseline was considerable. Much of the available data on transport and CO_2 emissions is from varied and incompatible sources - and the research team still have some concerns over the assumptions embedded in many of the forecasts (e.g. on GDP growth and oil prices) and in the inconsistencies between the different sources of data (DfT, Defra and DTI). Considerable guidance and help was needed from DfT and NETCEN to establish the baseline. Much further research is required to develop a consistent baseline to 2030. A spreadsheet was constructed to interpolate between the time points on the baseline data used, and this allowed robustness and sensitivity analysis to be carried out at later stages in the project. The spreadsheet approach was not envisaged in the proposal for the study, but it has provided a valuable tool for testing later packages of measures for their contribution to carbon reduction.

This stage ended with a workshop that provided valuable feedback on the baseline and the levels of reduction in travel required to meet the 60% CO_2 reduction target. It was agreed that a combination of known technologies and behavioural change was required, as it was agreed that

technology alone could not be relied uponwe couldn't rely for example on technology to deliver a lower carbon future. It was also agreed that one target wshould allow for growth in travel, close to the business as usual projections, but the other wshould effectively mean that no additional travel would take place (similar to 2000 levels). The workshop was extremely helpful in reducing the range of options and projections to be used, but not so helpful in responding to the uncertainties about the forecasts. It also familiarised the participants with the visioning and backcasting approaches available.

Stage 2 – Images of the Future: two images of the future were constructed to reflect the different possibilities in terms of achieving the 60% CO_2 reduction target. One focused more on market forces with higher GDP growth and lower oil prices ($60 a barrel in 2003 prices), suggesting more travel and greater input from technological innovation. The other focused more on a social welfare and environmental perspective, with lower GDP growth and higher oil prices ($80 and $100 a barrel in 2003 prices), suggesting less travel and a greater reliance on behavioural change.

The intention was to establish two visions that were both feasible and were sufficiently different to each other to warrant description as alternative policy approaches. They were not intended to be prescriptive but to illustrate different potential futures. Again this process took time, as there was considerable input from the workshop 1 participants in suggesting a large number of existing scenarios that could be used. These were all reviewed, but none of them were suitable. It should be noted that the backcasting approach goes further than most scenario building, as it also examines policy packages and paths (Stage 3 of the process), as well as the alternative futures. This is the structured backcasting element that explores the means to get from where you are to where you want to go – most scenarios do not explicitly include this important element in the process. Using more than two or three images of the future can mean that the policy packaging process can become overly complicated.

The two images presented explored the background socio-economic and technological trends, and developed a systematic process for construction through the framework of the external elements. A summary description of the images was provided to cover impacts on society at large and on transport policy (including headline indicators and descriptions of technological and behavioural change). This image building process worked well and there were again useful inputs as a result of workshop 2 in terms of strengthening and amending the images.

The workshop proved extremely fruitful, as participants were able to give clear advice on the individual elements of the images, and the time and costs implications (e.g. on the availability of the new technologies and alternative fuels). This expert input is critically important as the visioning process requires a synoptic view that cuts across many disciplines – the experts from those disciplines need to be engaged. An additional element here was the enhancement of the spreadsheet so that the forecasts for the business as usual could also encompass the two images of the future – the 'New Market Economy' and the 'Smart Social Policy'. This again

allowed the effects of different combinations of technological and behavioural change to be tested at different times to 2030.

Stage 3 – Policy Packages: this Stage proved to be the most complex and time-consuming part of the project, but in terms of the backcasting the most interesting. A comprehensive review of the full range of *policy measures* was carried out. This identified some 122 individual measures, and the experts were again helpful in identifying sources. Apart from the measures, information was gathered on their effectiveness in reducing emissions, and the itemtime scale necessary for their implementation. These policy measures were then assembled into *packages* that were mutually supporting. The difficulty here was in the packaging, and the potential number of packages. Originally the measures were grouped into 15 packages, but these were reduced to 11 (including two that were seen as being more like supporting mechanisms – oil prices – or enabling mechanisms – carbon rationing). Most of the packages had variants that were more suited to one image of the future than the other.

These packages were then *clustered* together to see whether the targets set in each of the images could be reached. In this study an additivity assumption was used, namely that the savings from each package were supportive of others. This assumption gives an optimistic view of target achievement, and suggestions were made at workshop 3 that it would be useful to explore non-additive effects, synergies and rebound effects in implementation. The final stage was then to establish the sequencing of implementation so that the targets set for 2030 in each image would be achieved – these are the *policy paths*.

As can be seen from the description above, stage 3 (the core of the backcasting process) brings together four elements. In retrospect, it might have been helpful to separate out the policy paths as an additional stage 4 with its own Workshop. Much of the discussion at the final workshop concentrated on the implementation issues and the necessity for immediate action.

The packaging process was very fruitful as measures could be combined and efforts made to ensure their impact was made more effective. To achieve substantial reduction in emissions requires combinations of mutually supporting policies - often involving a variety of stakeholders. Individual policies will certainly not take us far down the lower carbon route. Combinations (together with the supporting soft measures such as awareness raising) can help control for rebound effects, where individual reductions in emissions are in turn increased as people travel further, thus negating some of the benefits. Many of the packages are extremely inter-related - even the technological options, such as low emission vehicles, require supporting behavioural change such as adapted consumer buying preferences becoming more positive towards low carbon vehicles.

In addition, potential carbon savings were calculated from the spreadsheet through the estimationed of the reductions in travel. These figures proved to be enormously useful in working out how the targets set could be achieved, in illustrating likely levels of change, and they also give an indication of the importance of each package and their variants. Again, this spreadsheet was

not originally envisaged as having a role here, but it has proved critical in providing some quantitative input to an essentially qualitative process. Much further work is however required to test the assumptions used in the VIBAT analysis.

4. Backcasting as a Way Forward

In summary, five points are highlighted as the main conclusions on the methodological issues (Objective 1 of the VIBAT project):

1. The visioning and backcasting approach has been very successful in describing possible futures and in outlining the means by which change can take place to achieving the challenging targets set.
2. The process of visioning and backcasting is time consuming and requires expert inputs from a range of disciplines and policy areas. The expert workshops have provided a very useful and necessary "sounding board", but - at certain times - did not give the level of detail required to test the impacts and risks involved with some technologies and behavioural changes. This limitation may result from a lack of information provided or knowledge. In addition to having expert workshops, direct one to one interviews with key individuals may help.
3. Although visioning and backcasting is essentially a qualitative approach to scenario building, this project has demonstrated that a database approach is compatible, both in terms of establishing a baseline and in identifying the levels of travel (and emissions) for the images of the future. The innovative use of simple calculations for potential carbon savings for each package needs further development. This could provide a useful tool in testing different combinations of policy options.
4. The opening up of the debate for alternative challenging futures has generated considerable interest, and this again is a positive message from the visioning and backcasting approach. The workshops, presentations made and articles written have generated much discussion ofabout the possibilities available, and all of these dissemination and communication activities have very usefully brought together experts from many different backgrounds. This is a critical part of the work - a lower carbon future requires innovative thinking across many disciplines - multi-disciplinary analysis is required.
5. For policy makers, an additional stage 4 may need to be added to describe more fully the policy paths and the means by which implementation can take place. This would extend the timeline to include those who were the main stakeholders responsible for implementation, and the means by which progress towards targets can be monitored and achieved. This is likely to be the most difficult part of the transformation to lower carbon-intensive transport. Much further work is required in terms of programming, phasing and implementation pathways.

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