

# 'backcasting' for lower transport carbon emissions

**Robin Hickman, Olu Ashiru and David Banister** examine the technological and social changes ahead if we are to meet targets for carbon dioxide emissions in the transport sector



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Transport is the only sector in which carbon dioxide emissions continue to rise; and this is without including international air and shipping emissions – we have a huge problem on our hands

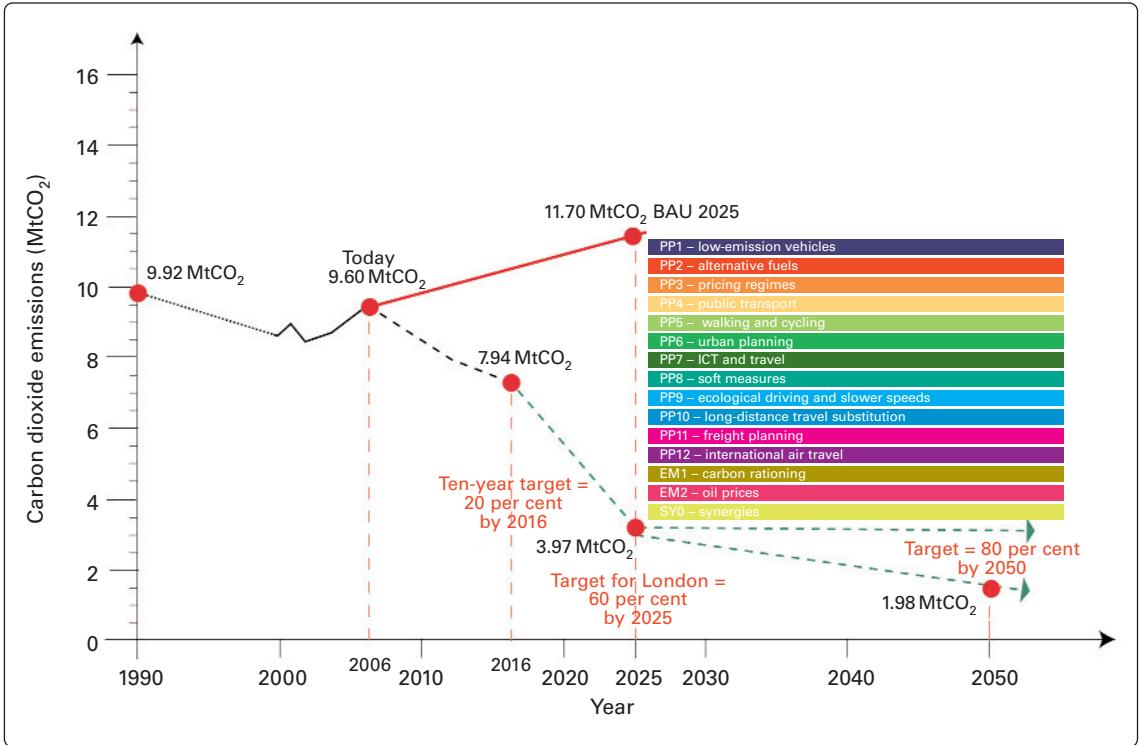
Have you ever wondered how we might travel in our cities in 2025 and even in 2050? A recent study has examined the issues. The VIBAT London project (Visioning and Backcasting for Transport in London<sup>1</sup>) allows London's policy-makers to examine what the city will need to accomplish, both technologically and socially, to reach carbon dioxide (CO<sub>2</sub>) emission reductions of 60 per cent by 2025 and 80 per cent by 2050 in the transport sector. The 'TC-SIM' transport and carbon simulation game developed within the project allows users to simulate changes to different aspects of the transportation sector and to create alternative pathways to reduced CO<sub>2</sub> emissions.

### Backcasting rather than forecasting

The VIBAT project is innovative in developing a backcasting approach to transport planning.<sup>2</sup> Transport planning tends to be based upon forecasting

methodologies: we traditionally examine historic trends and extrapolate them into the future; and then we build a future around that forecast projection. At best we test sensitivities around the 'business as usual' projection. In a world where we wish to radically reduce transport CO<sub>2</sub> emissions, we need a very different approach; one that will allow us to examine potentially radical trend breaks.

The backcasting methodology allows us to envision a sustainable transport future and then 'cast back' from a future year – say 2025 or 2050 – and develop a programme to achieve this different sustainable future. The methodology is useful in that it allows us to focus on the delivery of alternative transport futures. It has a much wider potential application in transport planning (and beyond) – Regional Transport Strategies or Local Transport Plans, for example, would benefit much from a



## Above

There are a wide range of interventions available – the VIBAT London project assesses and quantifies the potential carbon dioxide reduction contribution of over 150 individual transport policy measures

greater forward-looking aspect and a focus on achieving agreed futures.

### Developing the baseline

The first stage of the project was to understand historical CO<sub>2</sub> emissions in the transport sector and to project a ‘business as usual’ (BAU) future. In London, for ground-based transport only (ignoring international travel), this means that emissions, currently at around 9.6 MtCO<sub>2</sub> (million tonnes of carbon dioxide), will rise to around 11.7 MtCO<sub>2</sub> by 2025. London’s Climate Change Action Plan (CCAP)<sup>3</sup> adopts a cross-sectoral 60 per cent CO<sub>2</sub> reduction target on 1990 levels by 2025. This was adopted

cent reduction target by 2025 and 80 per cent by 2050. The gap between BAU projections and headline targets is dramatic, as demonstrated in the graph above. A more robust measurement of CO<sub>2</sub> emissions would also be based on carbon budgets, which would lead us towards a quicker response to reducing emissions. The temptation with end-state targets is to delay the response.

The range of interventions on offer in the transport sector is very wide. An inventory of measures has been developed in the study, covering over 150 individual policy measures. These were then grouped into mutually consistent, and complementary, policy packages (PPs). These include:

- PP1 – low-emission vehicles;
- PP2 – alternative fuels;
- PP3 – pricing regimes;
- PP4 – public transport;
- PP5 – walking and cycling;
- PP6 – strategic and local urban planning;
- PP7 – information and communication technologies (ICT);
- PP8 – smarter-choice ‘soft’ measures;
- PP9 – ecological driving and slower speeds;
- PP10 – long-distance travel substitution;
- PP11 – freight transport; and
- PP12 – international air travel.

## ‘The gap between business as usual projections and headline targets is dramatic’

prior to, and is broadly consistent with, the current UK national target for an 80 per cent reduction in CO<sub>2</sub> emissions on 1990 levels by 2050.

The VIBAT London project assumes that the transport sector delivers its ‘fair share’ of the 60 per

Each policy package can be applied at a variety of levels of intensity – typically a ‘low’, ‘medium’ or ‘high’ level of application. The assumption in terms of background traffic growth is that traffic grows year on year as an extrapolation of recent trends. Relative to the rest of the UK, London is different in that traffic growth has been limited in recent years; it appears to have reached the top of the ‘S-curve’ of traffic growth. In London, there are substantially lower levels of CO<sub>2</sub> emissions in transport than for equivalent populations elsewhere, as car ownership levels are lower and the use of public transport is much higher.

### Simulating carbon efficiency in the transport sector

The TC-SIM game allows us to select different pathways towards carbon efficiency. Different policy approaches can be selected as to efficacy. The level of emissions reduction we want to achieve is selected and the variety of policy measures (both technological and behavioral) are examined to determine the most effective combinations. There are multiple future policy pathways available. The difficulty soon apparent is that very considerable efforts are required across the whole range of policy packages if strategic targets are to be met. This means that there needs to be much greater emphasis on developing the incentives and mechanisms for changed behaviours. This includes

notoriously difficult to engender at the mass-market scale, particularly when car use is involved. High-intensity application of all policy measures is required if we are to achieve the ambitious headline targets. The huge challenge of delivering such a trend break is currently being seriously underestimated. Engagement with the public – both the centre of the problem and the solution – has hardly commenced.

### Lessons learned

The VIBAT London project illustrates some unpalatable issues. Many will prove very difficult to resolve. There is an enormous gap between London’s strategic 60 per cent emission reduction target and BAU trends. This is replicated in cities and countries around the world. London is doing much better than most, but the scale of required change is very challenging.

Reducing transport emissions is a very complex problem; it involves us understanding the sociological factors behind people’s rationales for travel, and will require huge investment and social change. However, the economic arguments from the Stern Review on the Economics of Climate Change<sup>4</sup> show that it is more effective – and cheaper – to act now.

There are a range of policy pathways towards substantial improvements in carbon efficiency in the transport sector. All represent significant breaks against current trends and are likely to be very



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Simulating pathways towards transport carbon efficiency – the decision-making process in transport planning needs to be much more transparent if sustainable futures are to be conceived and ‘owned’ by the public

the successful delivery of low-emission vehicles, and much greater investment in public transport, walking and cycling, urban structure, smarter choices, slower speeds and ecological driving, and carbon efficiency in freight.

Some interventions may prove difficult to implement – pricing regimes and mass-market alternative fuels, for example. The most difficult future area is likely to be in engaging the public in substantial behavioural change. Lifestyle change is

difficult to implement. A number of conclusions can be drawn:

- Current trends mean that the transport sector does not contribute at all to cross-sectoral CO<sub>2</sub> reduction targets. The clear message is to work more effectively across the broader range of policy packages available, at a higher intensity of application relative to current trends.
- A balanced package of measures can, in theory, take us near to the adopted 60 per cent CO<sub>2</sub>



#### Above

Similar modelling work has already begun in Victoria, Canada and (above) Delhi, India – the carbon-efficient travel solution differs markedly by context

reduction target. The very large caveat here is that this assumes a successful level of application across a wide range of policy interventions – and this is not happening at the moment.

- Low-emission vehicles and alternative fuel are likely to remain the most important policy levers as they tackle carbon efficiency in the dominant

developed as a mandatory target for an agreed future year, say 2025. Similar benchmarks can be agreed for light and heavy goods vehicles (fully loaded).

- There is also huge potential in behavioural measures, including pricing regimes, increased use of public transport, walking and cycling, ecological driving and slower speeds, and more efficient freight transport. Urban planning and smarter choice measures, as well as acting in their own right, potentially perform very important roles as supporting measures to other policy packages, enabling higher levels of success in implementation.
- There is little current understanding concerning synergies between policy levers and packages. Much further analysis is required on this issue, among others.
- We will need to become much more innovative as we see that headline targets are not being achieved. For example, we may need to consider greater use of zero- and low-emission vehicle zones, automatic low-speed city driving systems, new forms of car use and ownership (building on the recent growth of city car clubs), new forms of public transport to serve suburban areas, substantial increases in walking and cycling (the latter using 'Vélib'-style city schemes and smart technology to find and use bicycles, including in

**'The huge challenge of delivering the necessary trend break is currently being seriously underestimated. Engagement with the public – both the centre of the problem and the solution – has hardly commenced'**

mode of travel (the private car). The main difficulty here is in achieving any level of success in penetration to the mass-market. The motor industry and government need to develop mechanisms to achieve this, including mandatory targets for manufacturers. The 'sub-100 grammes of CO<sub>2</sub> per kilometre average' car fleet should be

the suburbs), virtual mobility massively scaled up to reduce 'unnecessary' physical travel, and a whole host of ideas we have yet to think through.

The likelihood of making deep CO<sub>2</sub> reductions in the transport sector looks low based on current trends, although major efforts have been made in certain cities. The public needs to radically change their purchasing patterns and behaviour to be more carbon efficient. The means of knowledge dissemination, communication, participation in decision-making and marketing of policy options and futures all need to be considerably strengthened. Tools such as TC-SIM, applied to different contexts, could play an important role in testing different options with a range of different users. The backcasting approach offers a way forward in addressing this future policy (and lifestyle) dilemma.

The huge challenge now is to map out and discuss a wide variety of policy pathways to carbon efficiency in the transport sector, and then – the difficult step – to enable and actually achieve a level of consumer and behavioural change consistent with strategic aspiration.

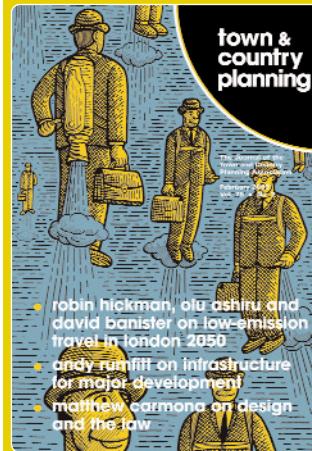
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#### Notes

- 1 The VIBAT London project has been carried out by the Halcrow Group, Oxford University (Transport Studies Unit) and Space Syntax. It has been funded by the UrbanBuzz programme ([www.urbanbuzz.org](http://www.urbanbuzz.org)). More details can be found on the project website, at [www.vibat.org](http://www.vibat.org)
- 2 *Visioning and Backcasting for Transport in London*. Stages 1, 2 and 3 Working Papers and Executive Summary. Halcrow Group, Oxford University Transport Studies Unit and Space Syntax, 2009. [www.vibat.org](http://www.vibat.org)
- 3 *Climate Change Action Plan*. Greater London Authority, 2007
- 4 *The Economics of Climate Change. Stern Review*. HM Treasury. TSO, 2006

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