Institution: **University College London**

Unit of Assessment: **16 – Architecture, Built Environment and Planning**

Title of case study: ***Supporting policy-making on sustainable urban transport***

1. Summary of the impact   Research on sustainable transport conducted by Hickman et al at UCL has contributed significantly to a major shift in UK and international transport policy during the last decade. Whereas such policy previously included little, if any, consideration of climate change, the desire to reduce transport CO_2 emissions is now often its primary objective. Findings from and methods developed through the research have been used at city, regional, national and international to support and implement revised strategies and investment programmes promoting sustainable transport. As such, they contributed to increased use of public transport, walking and cycling, and reduced dependence on car usage. The methods have also been widely used by international consultancies and other researchers.

2. Underpinning research   The Bartlett School of Planning (BSP) has a long history of research in transport planning, typically as part of the planning of cities and urban areas. A key strand of this is work on sustainable transport led by Dr Robin Hickman (researcher/visiting lecturer at BSP from 2004, and Senior Lecturer since 2011), in association with Professor David Banister (who worked at UCL up to 2006, subsequently Oxford University), and in partnership with engineering, planning and urban design consultancies such as CH2M Hill/Halcrow and Space Syntax Ltd.   Impacts on the development of sustainable urban transport systems are underpinned particularly by research from 2004 onwards involving the development and modification of approaches in scenario analysis and their application to sustainable transport strategy and investment programme development. This has included the development of innovative approaches in scenario development, visioning, backcasting, scenario quantification and modelling, multi-criteria appraisal (MCA) against scenarios, and participatory involvement in scenarios. Much of this was highly original research, developed to challenge the projected increase in transport CO_2 emissions and develop alternative policy and investment approaches. Simulation modelling/games (i.e. transport and carbon simulations and integrated transport and simulation decision support tools) were also designed to help take the decision-making process to a wider group of stakeholders, including politicians, civil society, the public, and technical specialists at the city authority level. These approaches were developed by Hickman, Banister and wider team members during work with the UK Department for Transport, Transport for London and other city authorities.   Between 2004 and 2012, the UCL team developed both qualitative and quantitative scenario approaches allowing, for example, quantification of the likely impact of policy measures – both in combination and as synergetic strategies – over the long term (up to 2030 and 2050) and in participation with local stakeholders. These constituted novel and little-used approaches to transport planning. The work was conducted at the BSP by Hickman and Banister, the first for the UK Department for Transport's *Horizons Programme* (*Visioning and Backcasting for Transport: VIBAT-UK*, 2004–06) (Banister as principal investigator and Hickman as lead researcher). The key insight of this was the requirement for behavioural, as well as technological, responses to low transport CO_2 emissions **[a]**. In other words, it identified a need for much greater use of walking, cycling, public transport and urban planning, as well as low emission vehicles, to significantly reduce transport CO_2 emissions. The second major study (*VIBAT-London*, 2007–09) was carried out by Hickman (principal investigator) with Banister and others as part of the UrbanBuzz programme, led by UCL and developed in association with Halcrow, Space Syntax, Transport for London and the Greater London Authority. Here, the research focus was on the potential for low-carbon transport pathways to be developed and implemented in London, and the likelihood of meeting the Mayoral CO_2 emission reduction target in transport. The study considered the range of policy measures available in London, modelled levels of application and investment, and explored strategies and strategic choices available to decision-makers. A simulation modelling game (TC-

SIM) was developed to illustrate the strategic choices available and the trade-offs against CO_2 reduction, political and financial deliverability. The research recommendations included: reducing average vehicle emissions to below 95 gCO_2/km by 2025; increasing the use of biofuels to around 10% of the fleet; radically increasing the use of urban densities and mixed uses around public transport interchanges (including in suburban locations); increasing the geographical scope of the congestion charge across London (and charging against emissions); increasing levels of investment in public transport, walking and cycling; and considering international flying emissions in the Mayor of London's target **[b]**.

A series of related studies conducted since 2009 have allowed the UCL team to test the application of the strategy development work in both UK and international contexts. These have involved the development – and in many cases modelling – of wide-ranging and integrated strategies, including different levels of application of a range of policy measures such as those mentioned above. The studies have supported the development of context-specific low carbon transport strategies and pathways tailored to meet particular problems and opportunities. Specific applications have included the use of scenarios and multi-criteria appraisal in Oxfordshire (for Oxfordshire County Council) and Swindon (for Swindon Borough Council and the DfT). Here the research was used to provide an evidence base to help develop the Local Transport Plan. The work was also discussed with local stakeholders, politicians and the public **[c]**.

Elsewhere, the same research has been applied for Transport Canada in Victoria, in Auckland for the University of Auckland and Auckland Council, and also in an Asian context via projects in Delhi (for Asian Development Bank) and Jinan, China (University of Oxford, Future of Cities Programme) **[d]**. In each, a low-carbon transport strategy and investment programme was developed and policy measures suggested for investment by the city authority. Further simulation modelling games were developed for Swindon and Auckland, this time with MCA application against low CO_2 transport strategies. A major essay on urban transport and carbon emission reduction **[e]** encompasses much of the research project, including the development and application of scenario methodologies and the testing of these in London and Oxfordshire.

3. References to the research

[a] Hickman, R. & Banister, D. (2007) Looking over the horizon: transport and reduced CO2 emissions in the UK by 2030. *Transport Policy*, 14: 377–387. [http://doi.org/bc65rh]

[b] Hickman, R., Ashiru, O. & Banister, D. (2010) 'Transport and climate change: Simulating the options for carbon reduction in London', *Transport Policy*, 17: 110–125. [http://doi.org/dmt6z2]

[c] Hickman, R., Saxena, S., Banister, D. & Ashiru, O. (2012) 'Examining transport futures with scenario analysis and MCA', *Transportation Research, Part A*, 46: 560–575. [http://doi.org/fztqwj]

[d] Hickman, R., Fremer, P., Breithaupt, M. & Saxena, S. (2011) *Changing Course in Sustainable Urban Transport. An Illustrated Guide*, Manila: Asian Development Bank. [http://bit.ly/1anNziR]

[e] Hickman, R., Hall, P. & Banister, D. (2013) 'Planning more for sustainable mobility', *Journal of Transport Geography,* [http://dx.doi.org/10.1016/j.jtrangeo.2013.07.004; Available on request]

4. Details of the impact
Transport CO_2 emissions have risen in all city contexts and there has been a strong imperative to examine how these can be reduced and to develop strategies to tackle the problem. Efforts to mitigate the impacts of climate change rely heavily on a changed approach in the transport sector (typically 20-40% of CO_2 emissions at the city level). The research described above has led directly and indirectly to significant changes in policy determining how the transport sector responds to the challenge of climate change, in multiple jurisdictions in the UK and internationally.

(i) Informing changes in UK city-wide, regional and national policy and investment:
Prior to 2006 there was little, if any, consideration of climate change in UK transport planning. Since then, the need to reduce transport CO_2 emissions has featured prominently in all strategy development, usually as one of the primary objectives for the strategy. This major shift in emphasis has been informed, in part, by findings from the VIBAT studies, which were the first to consider this issue at the national level. Those findings have been disseminated at a huge range of seminars, conferences, workshops and publications, including over 50 presentations by Hickman **[1]**. In

2006, Hickman and Banister held a lunchtime seminar on the *VIBAT-UK* study for transport experts at the UK Department for Transport (DfT). Written and oral submissions were also made to the Environmental Audit Select Committee (EAC) at the House of Commons, and the final EAC report cited the *VIBAT* work substantively, and requested that the DfT become more progressive on this topic. Since then, there have been significant changes in national, regional and city-based transport strategies, investment programmes, local masterplanning and urban planning strategies, at all scales of transport planning, and in multiple contexts. These have included much increased funding in public transport, walking and cycling (through dedicated transport funds in London and the Local Transport Plan mechanism in the UK); an increased use of urban planning as an instrument within transport planning; and revised street design approaches. In addition, a Local Sustainable Transport Fund of over £100 million has been provided by the DfT.

The BSP research was carried out largely with city authorities, using a participatory approach that brought in local officers and politicians to help develop transport strategies and investment programmes over the long term (up to 2026 and beyond). Accordingly, it has fed into spatial and transport strategies and revised investment programmes devised by city and regional authorities. Notable examples since 2008 include the use of the research to inform the London's Mayoral Transport Strategy (Transport for London, or TfL, and GLA, 2009, 2011) **[2, 3]**, which now includes reducing transport CO_2 emissions as a major objective; and in Local Transport Plans and Delivering a Sustainable Transport System (DaSTS) studies for the Oxfordshire (2011) **[4]** and Swindon (2010) LTPs, where investment programmes have been developed to help reduce transport CO_2 emissions. These will be implemented over the next 10–20 years and aim to significantly change travel behaviours and reduce CO_2 transport emissions.

The research has also facilitated a shift in policy approach at the national level towards low carbon transport, including a new emphasis on the need to consider alternative futures over the long-term. Thus, for example, the 2011 White Paper Cutting Carbon, Creating Growth: Making Sustainable Local Transport Happen by DfT **[5]** considers climate change as a major objective, takes a longer-term approach to strategy development over 20 years and includes consideration of the range of measures considered in the *VIBAT* studies.

(ii) Emerging changes in travel behaviour:
This improved awareness of the role of transport in reducing CO_2 emissions, and the changing strategy and investment programmes, has begun to translate into changes in transport funding patterns and, subsequently, in travel behaviour. More specifically, investment has been made in public transport, walking and cycling, and the use of urban planning to help support transport investments. This has been one of several important factors responsible for changes in travel behaviours, including less car usage and greater use of public transport, walking and cycling. Some studies of recent trends suggest that car usage is beginning to peak in certain urban areas in the UK (particularly London), and that public transport, walking and cycling are increasing in popularity (e.g. LeVine and Jones, *On the Move*, 2012). Although by no means the only factors, the changed policy and investment approach at the urban level – supported by the use of the *VIBAT* studies to demonstrate realistic investment policies for city authorities – has contributed to this.

(iii) Influence on international policy:
The *VIBAT* studies have similarly influenced strategy and policy development in international contexts. Research by Hickman et al **[d]** has had a particularly significant impact on the development of policy in Asia. Here, the sustainable urban transport concept, closely linked with the need to reduce transport CO_2 emissions, is now the dominant policy approach and forms a central element of transport planning and major project investment by the Asian Development Bank. This has led to significant investment in public transport, walking and cycling, as alternatives to the private car, although of course there is a long way to go before sustainable travel behaviours are achieved internationally. The sustainable mobility approach is being further developed in related work by Hickman et al on multimodal interchange design in China (forthcoming in 2014).

(iv) Take-up of BSP methodologies in governmental and consultancy and academic work:
Key methodologies developed through the *VIBAT* research include scenario analysis and backcasting; methods to quantify policy impacts and assess the likelihood of policy targets being met (such as the UK CO_2 emission reduction target and London Mayoral CO_2 emission reduction

target in London); simulation gaming and participatory scenario development. Since 2008, these approaches have been used in many other governmental, consultancy and academic studies (beyond the work of Hickman and Banister), including in work conducted by national and international policy-making organisations. The quantification of scenarios, for example, which was rarely used in the transport sector before the *VIBAT-UK* study, is now well used in almost all studies in mitigation in transport, providing a much clearer evidence base for policy makers. The UCL approaches have also been applied in the EU Logman and EU OPTIC projects, which applied very similar scenario development methodologies in to freight (rather than passenger) transport. Similarly, scenario analysis and backcasting (developed and applied in the transport sector in the *VIBAT* studies) have been used as part of the 2008–10 FP7 EU Freightvision project on long-term futures for freight transport in Europe **[6]**.

They have also been used at the UK governmental level, for example in publications seeking to quantify the impact of policy measures against targets. Important examples include the 2008 *Delivering a Sustainable Transport Strategy* and *Carbon Pathways Analysis* (both by DfT), and the 2009 documents on *Low Carbon Transport: A Greener Future. A Carbon Reduction Strategy for Transport* (DfT) and *An Analysis of Urban Transport* (Cabinet Office), the latter an important document feeding into the development of national transport strategy and funding levels for local authorities, including in Local Transport Plans **[7]**. All of these, in fact, used BSP approaches to quantify the likely impact of scenarios and strategies; BSP research also informed their new focus on reducing transport CO_2 emissions and using urban planning to reduce car dependency.

The approach have also underpinned UK consultancy studies, such as those by Halcrow/CH2M (jointly with the BSP) **[8]**, WS Atkins, and Arup in the Guildford Transport Strategy, which made direct use of the VIBAT approaches in scenario development, visioning and scenario quantification. This has improved awareness of robust and practical approaches to reducing transport CO_2 emissions. The BSP methods have also been used in international studies such as those by AEA Technology in the *EU Transport GHG: Routes to 2050 Project* (2010) and in various Asian Development Bank projects. These include their global regional modelling of low carbon transport pathways in the ASEAN region, considering policy approaches that can be taken in Indonesia, Malaysia, Philippines, Singapore, Cambodia and Thailand (2011–14); and studies on sustainable mobility and investments in sustainable transport projects **[8]**.

5. Sources to corroborate the impact

[1] List of multiple public presentations on transport and climate change by Dr Robin Hickman [Available on request, or publications available at personal BSP website at http://bit.ly/HIGfrJ]

[2] Mayor of London's Transport Strategy by GLA/TfL, 2010 [http://bit.ly/1eCHzuy – this lists reducing transport CO_2 emissions as a major objective, p. 22, and details the strategy, including technological and behavioural measures as detailed in the *VIBAT-London* study, pp. 237–250]

[3] Statement from Director of Planning, Transport for London, detailing the joint work of the *VIBAT* team with TfL officers and subsequent use of evidence base in TfL/GLA strategy development. [The Director of Planning at TfL may be contacted for corroboration]

[4] Statement from Head of Smarter Choices, Transport, Oxfordshire County Council (OCC), detailing joint work of *VIBAT* team with OCC and subsequent use of evidence base in Oxfordshire Local Transport Plan [OCC Head of Smarter Choices may be contacted for corroboration]

[5] DfT White Paper on *Cutting Carbon, Creating Growth*, 2011 [http://bit.ly/1aOahaf – this indicates the new importance of reducing transport CO_2 emissions as a transport policy objective]

[6] Use of scenario analysis, visioning, quantification of scenarios, as developed in *the VIBAT* studiesm for FP7 EU *Freightvision*, 2010 [http://www.freightvision.eu/ and http://bit.ly/17isuGz]

[7] References to research in *Analysis of Urban Transport* [http://bit.ly/HR1kjs, PDF, pp. 19, 114]

[8] Statement from the Director of UK Transport Planning, Halcrow/C2HM Hill, corroborating the use, influence and impacts of the research on the importance of transport and climate change as a central element of transport planning in the UK [Available on request]

[9] Statement from Senior Transport and Climate Change Specialist of the Asian Development Bank, corroborating their use of Hickman's research in major projects [Available on request]