

Impact case study (REF3b)

Institution: University of Cambridge
Unit of Assessment: UoA16
Title of case study: Sustainable Urban Land Use and Transport Modelling and Policy
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>A series of research projects, between 1994 and 2013, developed innovative land use and transport models to provide an evidence base for urban decision-making. They have impacted the planning of cities around the world, in particular the industrial declining city of Bilbao, Spain, now heralded as an exemplar of renewal; the planning of the developing world city of Santiago, Chile, now an exemplar of modernity; and the expansion of the knowledge-based city of Cambridge, UK, now an exemplar of sustainability. This research continues to contribute to planning policies around the world.</p>
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>The research by Echenique (Professor since 1993) and others, including Jin (University Lecturer since 2008) and Hargreaves (senior Research Associate since 2002) from the Martin Centre in the Department of Architecture, has significantly increased the understanding of how cities work and the interaction between land use and transport planning.</p> <p>The basis of this work is the innovative application of spatial economics to the practical implementation of integrated models of land use and transport infrastructure for use in real world problems at urban and regional scales.</p> <p>Unpicking the research from impact is somewhat challenging here; this is a case of continual interaction, with insight feeding through to practice and experience and feeding back to refine research problems. Pre-period there have been three spin-out companies, Marcial Echenique & Partners Limited (ME&P), Marcial Echenique S.A. (MECSA in Spain) and Transporti e Territorio SRL (TRT in Italy) which have been key to this interaction between research and practice.</p> <p>The special issue of Environment & Planning B edited by Owers and Echenique (1994)¹ is devoted to the work originating with Echenique's group. It includes</p> <ul style="list-style-type: none"> • The model of London and the South East Region (LASER) presented by Williams and developed for the UK Department of Transport by Marcial Echenique & Partners Ltd (ME&P) – a spin-out firm from the University (later bought by WSP Consultants). • Burgos presentation of the Model of the Basque Country developed by Marcial Echenique y Compañía S.A. (MECSA later bought by PROINTEC) of Spain which has been instrumental in the renewal of Bilbao as well as many applications in Spain. • A description by Prof de la Barra of the development of TRANUS, a model which derives from the work of Echenique, developed by Modelistica of Venezuela with successful applications for planning policies in the USA (Oregon, Sacramento, Baltimore, etc.), South America and Europe. • Hunt's illustration of a model for Naples in Italy which led to the creation of the firm Trasporti e Territorio SRL (TRT) in Italy with substantial work in planning (Naples, Vicenza, Bolzano, etc.). • The paper by Simmonds presents another derivation of the same type of model – DELTA, which had practical applications in a number of policy studies in Edinburgh, Merseyside, Bristol, • A paper by Jin illustrates the application of the software MEPLAN (developed by ME&P) in China for the planning of transport. <p>Most of the above authors studied under the supervision of Professor Echenique (beginning in the 1970s) or collaborated with him. Bringing these strands together served not only to illustrate the</p>

applicability of the integrated models, but to examine the difficulties in calibrating models and testing underlying assumptions, particularly with respect to human behaviour.

Echenique's group used their approach to examine the development possibilities for central Chile in 1994².

In the Cambridge Futures Project^{3,4}, this research moved on to consider strategic planning alternatives for the Cambridge sub-region. This notably incorporated input from the public in testing model assumptions – which has been held up as exemplary practice (see section 4). This also included consideration of the impact of congestion charging in the city of Cambridge.

The SOLUTIONS project built on the Cambridge Futures Project, and carried out case studies of three UK city regions to test the sustainability of the planning policy trend over a 30 year period compared against the alternative policies of compaction, planned expansion or dispersal⁵. Non-academic partners allowed use of their policy testing models (developed by Echenique), notably the Departments for Transport and the Communities and Local Government that jointly provided financial support for option testing, and the Cambridgeshire County Council and the Tyne and Wear local authorities. The subsequent ReVISIONS project (2008-12) funded by EPSRC and EEDA explored how spatial planning affects the potential for green technologies. It developed an enhanced version of MEPLAN extended to include buildings, energy, water and waste.

A particular research output was the conclusion that land use allocations and transport configurations will have little impact on reducing carbon dioxide emissions over the next 30 years: the broadly different spatial policies of dispersal or compaction make less than +5% or -5% difference in energy use by transport⁵.

3. References to the research (indicative maximum of six references)

1. Owers, J. and M Echenique, guest eds. (1994) Research into practice: the work of the Martin Centre in Urban and regional modelling in *Environment and Planning B: Planning and Design* **21** (5), September, pages 513-680. **DOI: 10.1068/b210513**
2. Echenique, M., Y. Jin, J.L. Burgos and A. Gil (1994) An integrated land-use/transport strategy for the development of the Central Region of Chile in *Traffic Engineering + Control* **35** (9), September, pages 491-497. **ISSN: 0041-0683**
3. Echenique, M.H. (2005). 'Forecasting the Sustainability of Alternative Plans, the Cambridge Futures experience', in: ed. M. Jenks and H. Dempsey, *Future Forms and Design for Sustainable Cities*, 113-133, Architectural Press, Elsevier. **ISBN: 0 7506 6309X**
4. Hargreaves A.J. and M.H. Echenique (2008). 'Cambridge Futures: forecasting the effect of congestion charging on land use and transport', in: ed. Richardson H.W. and C.C. Bae, *Road Congestion Pricing in Europe; Implications for the United States*, Edward Elgar Publishing, UK & USA. **ISBN 978 1 84720 380 9**
5. Echenique, M., A. Hargreaves, G. Mitchell and A. Namdeo (2012) 'Growing Cities Sustainably: Does Urban Form Really Matter?' in *Journal of American Planning Association* (JAPA) **78** (2), pages 121-137 **DOI 10.1080/01944363.2012.666731**

Research Grants with Echenique as PI

EPSRC GR/S90874/01 Sustainability Of Land Use and Transport In Outer NeighbourhoodS (SOLUTIONS) ,2004-2009 £1.75M Cambridge, UWE, Leeds, UCL, Newcastle. Cambridge coordinated the project, designed, modelled and evaluated the alternative options.

EPSRC EP/F007566/1 Regional Visions of Integrated Sustainable Infrastructure Optimised for NeighbourhoodS (ReVISIONS) 2008-2012 £3.8M Cambridge, Aberystwyth, Exeter, Leeds, Newcastle and Surrey. Cambridge coordinated the project and designed the options and modelling framework for land use, buildings and transport.

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4. Details of the impact (indicative maximum 750 words)

MEPLAN software developed by ME&P from the work of Echenique has been used extensively by the UK Government in LASER (London And South East Region) model for London Crossrail, Thames Gateway, Congestion Charging, and has become the core of the DfT National Transport Model⁴.

Cambridge Futures has had impact on the planning of Cambridge³:

“It paved the way for a more positive planning strategy for Cambridge which provided housing closer to where the jobs were being created, by achieving higher densities on existing brownfield sites, a radical review of the inner boundary of the Green Belt to provide urban extensions, and a New Town to the north west of Cambridge connected to the city by high quality public transport.

Cambridge’s growth strategy has recently been described as ‘smart’ by the Chancellor of the Exchequer, and last week was praised by the Planning Minister for its positive approach to achieving high quality growth that is making a major contribution to the UK’s economy. I have no doubt that Cambridge Futures played a key role in initiating and developing this strategy.”

Director of Joint Planning for Cambridge’s Growth Areas 2007-2011 (writing in 2013)

Prof Echenique was a member of the expert group for the Foresight Land Use Futures exercise of 2010 whose *“key findings and rich evidence base continue to resonate with the change in ministerial priorities”*¹⁰. Cambridge Futures is an exemplar model in the final report⁵ (Box 7.2, pg 246) and underpins a priority recommendation:

“Consider the need for a duty on local planning authorities to consult formally with local residents on options, benefits and trade-offs for new forms of development. This should be based on detailed analysis and evidence, as pioneered, for example, in the Cambridge Futures exercise.” (pg 23)

The impact on Bilbao, and the Basque region more generally, has been continuous over a long period. Decisions were made prior to and during the impact period, infrastructure was built before, during, and is planned for after – but infrastructure built prior to the impact period is still contributing to the transformation of the Basque region to be the most economically vibrant region of Spain today:

*“The model was used in a number of studies for forecasting the impact of alternative policies in the Area and their evaluation. The results of these studies were key to the formulation of the policies implemented over the years and have contributed to the transformation of the area from a declining industrial city (closures of shipbuilding yards, steel production, etc.) in the late 1980s to the successful city of today. Today the Region where Bilbao is the centre has the highest income per capita of Spain (in late 1980s was the 5th)”*¹

Former Technical Director of Metropolitan Area of Bilbao and
Deputy Transport Minister of the Basque Government

The infrastructure for which the model was used¹ include:

- Construction Plan for Bilbao Metropolitan Railway. Lines 1 and 2. Planned in 1990s and completed in 2011 and 2013, respectively. Line 3 of Bilbao Underground. Currently under construction
- Left Bank Highways. Planned and opened in the 1990s. Right Bank Highways. Planned in 1990s and opened in the 2000s.
- Traffic Study for the Central Area of Bilbao. 1990
- New high-speed railway network in the Basque Country. Planned in 2000s under construction.
- Artxanda Tunnels (toll road). Planned in 1990s and opened in 2002.
- Railway plan of Metropolitan Bilbao. Under development.

The model was also used to inform planning policies current in force in Getxo and in Leioa, Municipal Authorities within Greater Bilbao¹.

The process in Chile, and in particular Santiago, has been similar:

“The model was used in a number of studies to forecast the impact of alternative policies in the area and their evaluation. The policies have been implemented... and contributed to the transformation of the area from a developing world region to a developed world region...”

“Chile has multiplied by 5 the per capital income over the past 20 years and [since 2010] is a member of OECD. The work of the teams who work in Chile, based on the theoretical work developed at the University of Cambridge has contributed to make the Country and the Central Region a successful region and world exemplar”².

Ex-minister for Public Works, Chile

The studies in question included² the Macro plan for the central region which made the case for investment in highways, ports, airport, water and sanitation (implemented); and the motorway plan for Santiago (implemented). A key feature was that the model provided confidence to the private sector to invest:

“It is of particular note that the infrastructure has been substantially developed by the private sector under the principle that the user pays for it. The consequence is that the level of taxations has remained low encouraging the development of the productive sector of the economy.”²

Finally, Echenique’s results on urban form, particularly the failure of compaction to generate a reduction in energy use are informing policy and professional debate, including discussion in Parliament and the professional press^{6,7,8} including the highly influential Atlantic Cities⁹. It has also sparked an enormous debate¹¹ in the US about the role of planning research in challenging widely held planning assumptions – or indeed beliefs.

5. Sources to corroborate the impact (indicative maximum of 10 references)

1. Letter from former Technical Director of Metropolitan Area of Bilbao and Deputy Transport Minister of the Basque Government
2. Letter from ex Minister for Public Works of Chile
3. Letter from Director of Joint Planning for Cambridge’s Growth Areas 2007-2011
4. Email from Former Head of Modelling DfT, (now Deputy Director, Strategy and Analysis at High Speed Two)
5. Government Office for Science (2010) *Land use Futures: Making the most of Land in the 21st Century*. Foresight Final Project Report, Government Office for Science, Feb 2010, http://www.bis.gov.uk/assets/foresight/docs/land-use/luf_report/8507-bis-land_use_futures-web.pdf
6. Terence Bendixson (2009) The Government’s compact city policy is failing – we need a new wave of suburban development in *Local Transport Today*, Issue 523, 3rd July 2009
7. Sir Peter Hall, (2009) Planners may be wasting their time in *Regeneration & Renewal*, 6 July 2009
8. Anthony Fyson (2009) Challenge to land-use planning in shaping sustainable urban expansion frameworks in *Planning magazine*, 10 July 2009
9. <http://www.theatlanticcities.com/design/2012/07/new-research-finds-urban-form-plays-little-role-sustainability/2680/>
10. BIS assessment of impact of Foresight impact (Land Use Futures), <http://www.bis.gov.uk/assets/foresight/docs/land-use/12-1128-land-use-futures-one-year-review.pdf>
11. Cox, Wendell *Separation of church and urban planning* in *New Geography* (6.12.2012) <http://www.newgeography.com/content/003291-separation-church-and-urban-planning>