Visualising Landvaluescape without a Cadastre

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Key words: valuation, GIS, visualisation, landscape.

ABSTRACT

Two technologies are converging: Computer Assisted Mass Assessment (CAMA) within the property valuation field; and Geographic Information Systems (GIS) more generally. Some of the governments using CAMA and GIS claim that there are significant spin-offs, in terms of improved land management. The ability to visualise local economic performance changes over space and time, expressed in the 'landvaluescape', can be an important audit tool.

A study is under way to assess how CAMA/GIS might help assist in a number of property market functions in the UK, where national spatial data sets are undergoing modernisation and integration. Starting with data obtained for this research from the US, a team is creating a model that might be applied to British conditions. A survey of international practice in these fields is also being carried out.

The paper will explain the concept and anticipated benefits, report on the reactions to it so far and describe how the particular conditions of Britain differ from those elsewhere. Issues faced include: policy approaches to price data privacy; levels of aggregation; very variable quality of individual assessments and of other spatial attribute measures; and lack of experience of land valuation in Britain.

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Visualising Landvaluescape without a Cadastre

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1 BACKGROUND

The potential scope for surveyors to contribute to the development of techniques for Land Value Taxation (LVT), including the use of Geographic Information Systems (GIS) to maintain and publicly display land value maps, was presented at FIG XXI (Connellan et al, 1998). Interest in the subject has been further stimulated by the beginning of devolved government in the UK and by the recommendation of the UK Government's Urban Task Force (UTF) to look at overseas experience of forms of LVT (Rogers, 1999).

This approach is particularly important in the British context, because property data are not presently stored within a cadastre and there has been strong support among property[i] tax 'stakeholders' for the idea that Value Maps should form part of the developing National Land Information Service (NLIS), the fledgling national cadastre.

Key to understanding LVT is the visualisation of land value itself and while there are many ways of visualising land value in a mapping context, the most popular is by choropleth mapping, where colours are assigned to the parcels within a cadastre according to their value. In this way, the data are treated as discrete objects. However, other cartographic techniques have been used in the past to map property values, including by the use of a 'field' representation – the data surface.

In this paper, we will report the early conceptualisation of landvaluescape – a data surface visualisation of land values (Vickers 2000a). It is an element of a larger research programme, funded by the Lincoln Institute of Land Policy, which is looking at how to introduce LVT to Britain.

2 A BRIEF SURVEY OF LAND VALUE MAPPING

2.1 What is Land Value?

Real estate values can be said to comprise two main components: land (or location) and improvements (buildings, etc.). Identical buildings in different locations can have widely differing rental and capital values. The difference is accounted for by the land/location element of total value: high value indicates high demand for that particular type of facility (home, office, warehouse, etc.) in that general locality; low value indicates that the market for that facility is poor. This principle has also been expressed as the concept of bid rent (Alonso, 1964).

Whereas the value of bricks, steel beams and other man-made improvements to land do not normally vary much, either over time or geographically within a wide area, land values can vary quite considerably over time **and** space.

2.2 How and why is Land Value Mapped?

There has long been a recognition of the benefits of mapping land and property values. Denmark used land value maps for LVT from 1927 to 1981, largely as a means of facilitating public access to land value assessments. Howes (1980) gives numerous examples of value maps compiled for a variety of purposes including valuation and urban planning which because they were hard to compile and produce, were confined to quite limited geographic areas and usually only prepared for one-off research or development projects. He rarely found examples of value maps which were compiled in support of tax administration, which need to cover the entire area of a tax authority. He concluded:

"*value maps will increasingly play a major part in research into the causes and effects of changes in land and property values"*.

The use of computers to increase the efficiency and speed of producing property tax assessments began in some countries, such as Denmark, early in the 1980s (Müller, 2000). Although Müller specifically states that GIS were not used by Danish tax authorities owing to a dispute between officials about who pays for the map data, this issue was resolved in 2001. However value maps were, somewhat ironically, made redundant by computers: a combination of reducing tax rates, increasing frequency and sophistication of reassessments (annual since 1998) and availability of assessed land values to the public, meant that tax authorities have not felt continued production of value maps to be warranted (Müller, 2001).

Despite this, the benefits of linking the two processes (assessment and presentation) are considerable and have been set out in a paper published by the Lincoln Institute in 2000 (German et al, 2000), using evidence from Lucas County, Ohio (also see section 4 below).

2.3 What is the current best practice of land value mapping?

The evidence from two recent surveys in the UK (Vickers, 2000b; Reduce the Use, 2001) is that property tax stakeholders understand the value of value maps, even in a country where they have hardly been used at all.

A new survey has just been launched by Vickers to find out whether such maps are valued around the world more generally and, if so, what factors affect their development and use. Findings will not be available until the end of 2002 but early indications will be reported at FIG XXII[ii].

2.4 Mapping Land Values in a GIS

The power of GIS to help visualise large, complex datasets is evident in Figure 1 where we map land value information collected by the Lucas County Auditor. The map shows the value of land on a parcel by parcel basis in the area around downtown Toledo, Ohio[iii]. Blue parcels are those which have a lower land value than average; the red ones are those parcels which are more valuable than average. The darkest red parcels are the most expensive of all. Although there is a clear trend of increasing land value towards Toledo's Central Business District (CBD) it is perhaps relatively hard to pick out because of the heterogeneity in value of some of the parcels which are geographically close– there are low value parcels within the CBD for example.

If we were to map the land values for all the parcels in the whole of Lucas County it becomes

impossible to detect trends since most of the parcels are too small to be visualised – there is simply too much detailed information to convey on a single map (Figure 2). One of the ways in which cartographers circumvent this problem is to aggregate smaller zones into larger zones but there are many problems with this approach, not least that the geographic variation in the land value can be lost [iv].

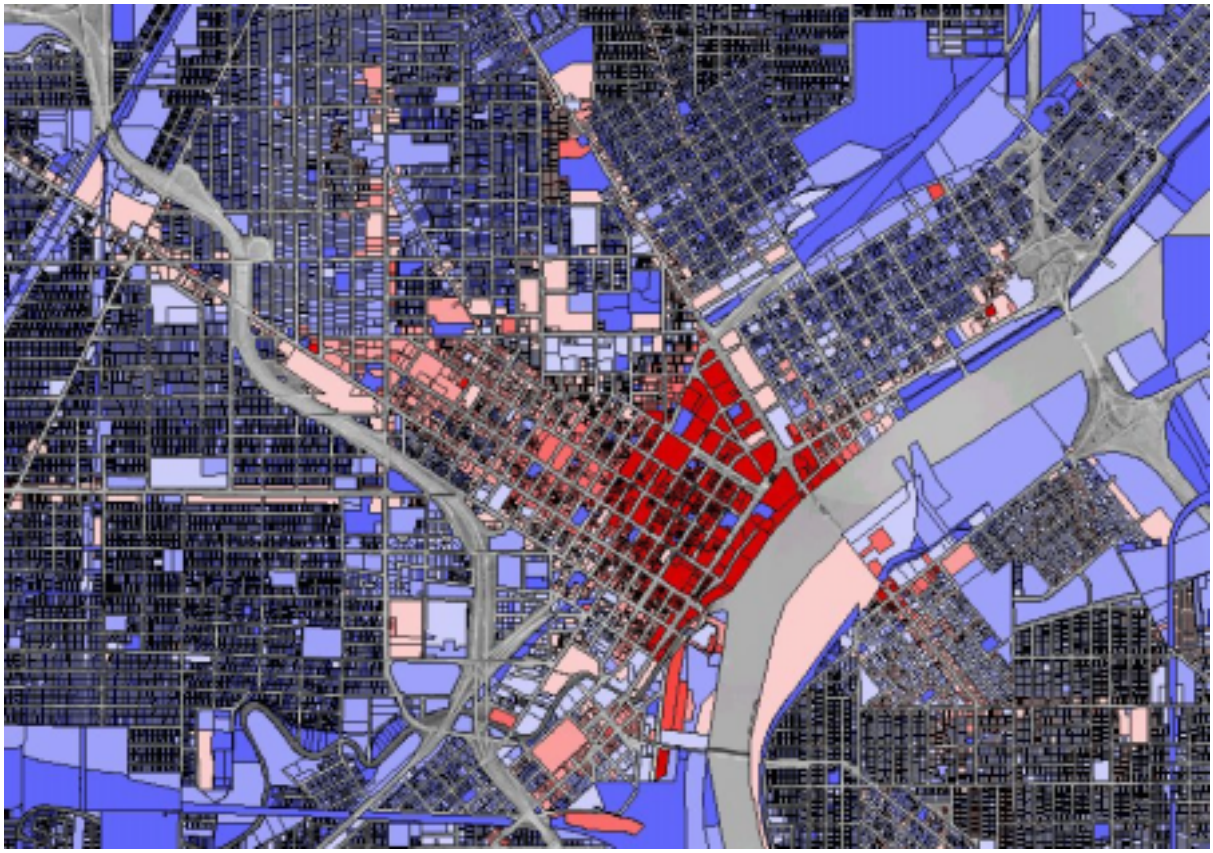

Figure 1: Land Values around downtown Toledo, Ohio (courtesy of the Lucas County Auditor's Office)

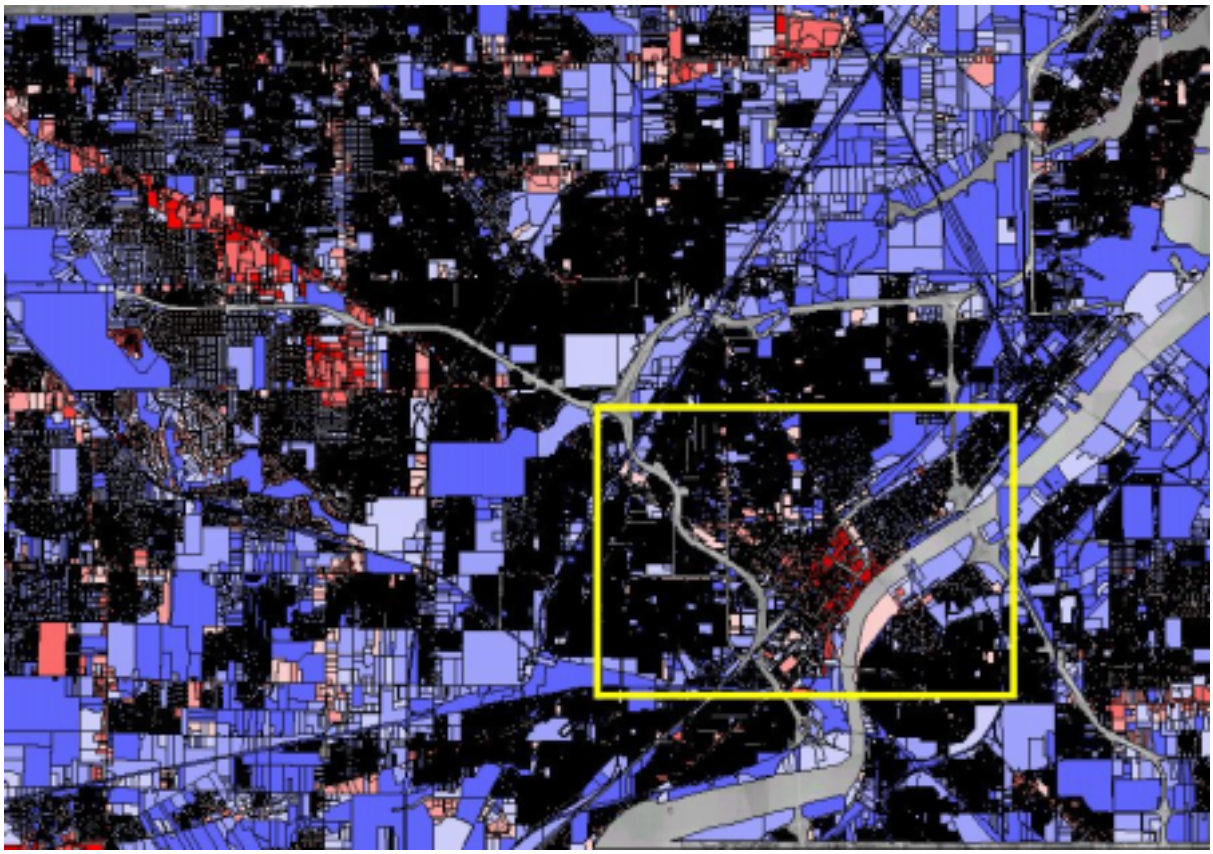

Figure 2: Land Values in Toledo – the yellow area is the extent of Figure 1 (courtesy of the Lucas County Auditor's Office)

This is in contrast with other comparable maps such as topographic and meteorology maps which also are geographically extensive and contain a lot of information. The key difference between the two approaches is that it is often easier to visualise topographic and meteorological maps because they are represented as *continuous* surface measures rather than as discrete objects like the land parcels in Figures 1 and 2. By representing the data in this way (which involves the localised smoothing of the parcel data) it is possible to map large areas without degrading the often subtle geographic trends which can be missed when data are aggregated into larger regions.

3 LANDVALUESCAPE – A SURFACE OF VALUE

3.1 Surface representations of digital data

The use of surface representations of non-physical data has a long history, arguably going back to the 'social physics' tradition in geography (Stewart, 1947). For reasons outlined in section 2.2, these mapping exercises tended to be of limited size and coverage. It is only as digital datasets have become more common over the last 15 years, allied to the increasing power of computers, that surface or field representation of data has become more common (Tate, 2000).

Surface representations are increasingly used in the UK to map large data sets including the Census of Population (Bracken and Martin, 1989). The UK's Department of Local

Government, Transport and the Regions has also commissioned research which uses surface representations to visualise and integrate a wide variety of governmental datasets (Thurstain-Goodwin & Unwin, 2000).

3.2 Surface Representations of Property Data

There is also a long history of using surface representations to describe land values. For example, Anstey's land value maps, use contours of value (or isovals) to map changes in land value in the City of London (Anstey, 1965). Knos explored the relationships between land values and other factors (such as the distance from the CBD and the distance from major thoroughfares) in Topeka, Kansas (Knos, 1968).

Despite these early attempts, there has been little rigorous application of these methods in the real estate profession and while some Chartered Surveyors – most notably CB Hillier Parker - have regularly generated rental contour maps they do not map land value explicitly (Schiller, 2001 p 135).

To support the case for LVT, the visualisation of land values is imperative. The word 'landvaluescape', describes a three-dimensional or surface model of land values, where the 'z' (height) component of a 'traditional' landscape is replaced with 'v' - the value per unit area of land sites (Vickers, 2000a & b). In Figure 3, which is of the same spatial extent as Figure 2, the pattern of land value, expressed as a contour map, the broader patterns of land value become much clearer. As a means of visualising a large land value dataset, it is extremely powerful.

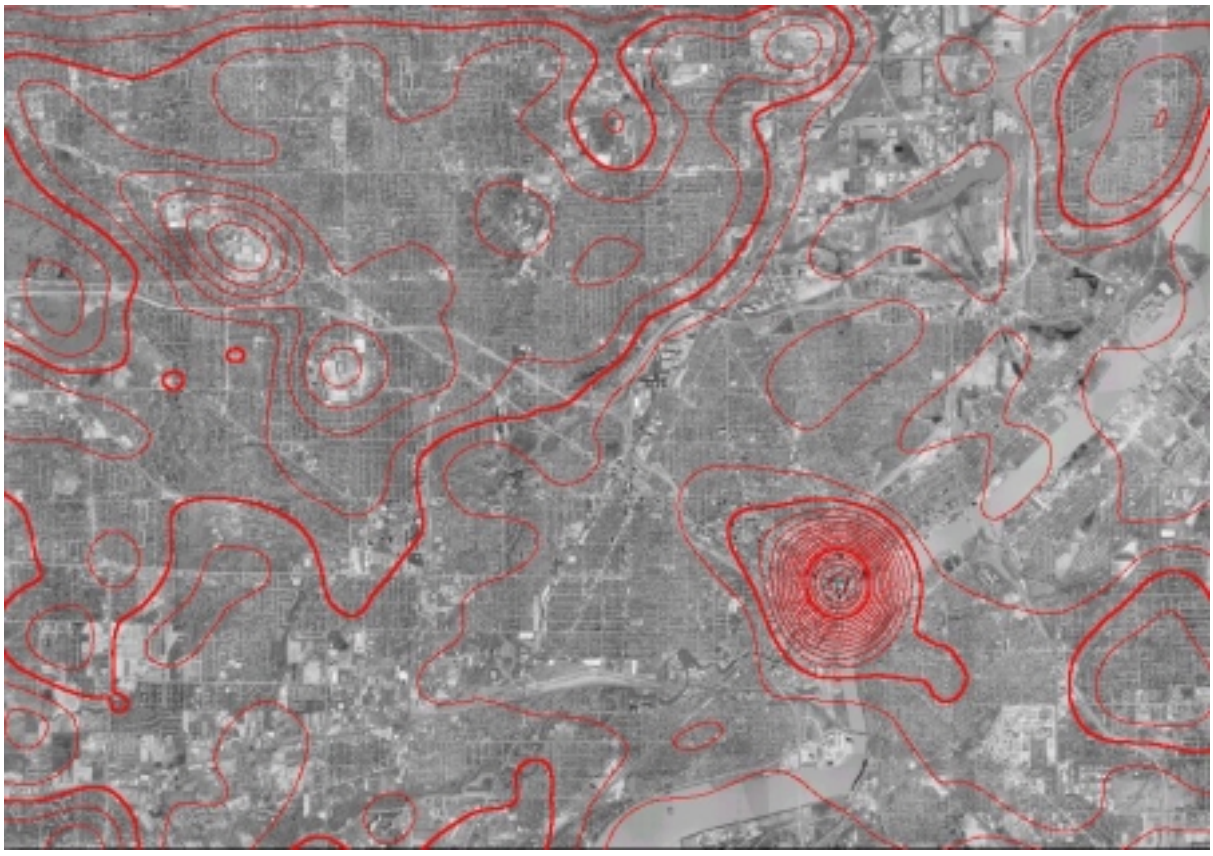

Figure 3: Toledo's Landvaluescape

There are a number of different techniques that can be used to generate a landvaluescape from land value data. Using *Smooth Pycnophylactic Interpolation*, for example, it is possible to interpolate a data surface directly from the parcel data themselves (Tobler, 1979). This approach is rarely found in commercially available GIS so it is generally necessary to convert the polygonal parcel information into point data. This is best achieved by identifying the centre points (or *centroids*) of the parcels and assigning the land value data to those points. Once in this format, the data can be converted into data surfaces using one of a number of interpolation techniques including *spline, inverse distance weighting* and *kriging*. It is beyond the scope of this paper to discuss these techniques in any great detail, for further information on these techniques we recommend the reader 'Geographic Information Analysis' (Unwin & O'Sullivan, 2002)

3.3 Land Value data – the key element

Whatever algorithm is used, the key to generating a landvaluescape is obtaining land value data. In this project we have been fortunate to be able to use land value data held within the Lucas County cadastre. However, applying the same techniques in the UK context is more problematic since land value data simply do no exist. Although studies elsewhere (Gloudemanns, 2001) indicate that land values can be derived from analysis of property market values including very few bare land sales, this has not been attempted in the UK.

The UK has had, by global standards, a relatively homogenous, advanced and complete set of land information data sets, which are rapidly being digitised in a fairly coherent and determined manner (see Table 2 in Vickers 2000b). However there is a problem in Britain, alluded to in the title of this paper. For historic reasons, there has never been a national cadastral survey. Legal land parcels do not necessarily coincide with physical boundaries of sites and topographic maps at the largest scale do not record legal boundaries unless they coincide with physical features. Large areas of the country, including parts of cities and some one-fifth of freehold titles[v], are unregistered. The public bodies responsible for land registration are quite independent of those responsible for topographic mapping.

NLIS, the project in England & Wales that could resolve problems caused by lack of a cadastre, is sponsored by Ordnance Survey (OS - the mapping agency), Her Majesty's Land Registry (HMLR), the Valuation Office Agency (VOA) and a consortium of local authorities. For the time being, NLIS applications that use land parcels generally depend upon an 'implied link' to create closed polygons for land parcels, where these do not exist on the OS map base. OS has undertaken to create these links as part of MasterMap, its new seamless structured thematic database that goes live in 2002. Meanwhile HMLR's latest five-yearly review indicates that it will complete a national digital index map of land parcels by 2010, even if there is still not a complete land register (Edwards, 2001).

In countries where the property tax is levied on the owner, the land register and the tax assessment lists combined with a cadastral map enable value maps to be made. The UK is unusual in that property tax is levied on occupiers, not owners. Consequently the valuations are of 'hereditaments', which coincide with neither legal land parcels nor polygons on OS maps. To the authors' knowledge, no study has been done to show the extent of mis-matches between local rating lists, land and property gazetteers and OS map features.

From current UK data, it is only possible to create maps showing rateable value of hereditaments. The situation is further complicated by two things: firstly, there are different property tax systems throughout Britain for residential property and for commercial property. The domestic property tax since 1993, Council Tax, is based upon a crude estimate of capital value and has not been updated since it was introduced: new houses are valued as though they had been built in 1993. The national non-domestic rate (NNDR) is based upon notional rental value of a business occupying the property. NNDR is reassessed every five years.

The second complication is caused by holes in the valuation rolls. Vacant land and buildings are not taxed, nor is agricultural land, therefore official valuations are not maintained in these cases. British value maps, if they relied upon official rating lists, would therefore be incomplete.

4 ANTICIPATED BENEFITS OF LANDVALUESCAPE

What follows are just a few of the benefits that the authors envisage being realised as research and use of the landvaluescape concept develops. It is worth noting that most of the examples of value maps today are unconnected with existing or proposed LVT. Lucas County Ohio assesses land and buildings separately yet has no plans to introduce LVT. However what its County Auditor says of his data and its usefulness we expect is typical:-

"We were able to clean up much errant data just by having the public view parcel information. Also this data has great economic value to the city and region. It provides the opportunity for the successful development of the land and buildings in the county."[vi]

4.1 Economic monitoring.

Land values reflect the economic health and wealth of a geographic community. Almost every decision or action by a public or private body can have an effect on land values. It may be difficult to separate the effects of multiple economic factors but the more detailed and frequent the monitoring of property transactions and the remodelling of the landvaluescape, the more sophisticated can become the understanding of links between cause and effect. Landvaluescape modelling can be an audit tool. Seldom does current economic analysis of public policy include the effect on land values. Examples of where it could are:-

4.1.1 Regeneration and renovation.

Nobody likes living next to a slum property. As a street becomes 'gentrified', even the value of properties that remain untouched goes up. Public regeneration projects benefit landowners more than any other part of society. The British UTF recognised this (Rogers, 1999).

4.1.2 Moving a bus stop.

Shops that sell to bus passengers will be affected by the relocation of a bus stop (or indeed any other public transport infrastructure) as the rents that shop occupiers and owners can afford to pay or charge will change. In residential areas, the presence or absence of a nearby bus route affects house prices.

4.1.3 Takeover or closure of a factory.

Whole neighbourhoods or cities can be dramatically affected by changes in world markets for all kinds of goods. Apart from factories whose products – and hence plant and facilities – are

obsolete, it is the **land** values in these 'rust-belts' that are hit, not the building values.

4.1.4 School 'league tables'.

A school that is known to produce good exam results will attract socially mobile families and enhance house values in its catchment area. Investment in education thus has a spill-over effect, benefiting even local home-owners that have no school-age children.

4.2 Planning and zoning

If the consequences of actual decisions can be audited using landvaluescape, then it ought to be possible to model the likely consequences of planned actions and hence improve decision making. This is particularly relevant in the sphere of urban planning and zoning of land uses. The factors involved in 'eco-morphology' may be much more complex than those which affect the physical world in geo-morphology, but there is the potential for a new sub-field of economic geography that could support sustainable development. Validating this hypothesis is the subject of doctoral research at Kingston University just begun (Vickers 2001).

4.3 Improving tax assessments and reducing appeals

The Chief Auditor of Lucas County, who is also Chief Assessor, acknowledges the importance of value maps in review of tax assessments (see above). The argument is that a map can highlight anomalies in assessments more readily than a spreadsheet. It is more accessible to the general public, as well as to tax professionals. However in Denmark, where value maps were made available for these reasons until the full computerisation of the system twenty years ago, it seems that they may have served their purpose. Now that better ways of improving initial assessments and providing them to the public are in place, the cost of preparing value maps is considered unjustified. This may be partly because the tax rates are low but Müller[vii] suggests that the nature of the Danish formula for producing land value assessments is not conducive to GIS or map display.

4.4 Enabling LVT

LVT provides the most effective mechanism through property taxes to extract the unearned benefits of economic decisions and compensate those who suffer from those decisions (Josten, 2001). Closer links between the valuation and planning professions ought to accompany its introduction (Hudson, 1975). LVT needs – and CAMA/GIS enable – for there to be much more frequent and sophisticated property tax assessments, especially in high-value urban areas. It is no accident that Sydney – possibly the most prosperous city in the world that has LVT – already assesses land values annually and is considering twice yearly reassessments.

5 CURRENT LANDVALUESCAPE RESEARCH IN BRITAIN

There are two ongoing research projects in Britain involving landvaluescape and the authors: one in Liverpool, and one in London. So far, the authors have merely been using Lucas County data to demonstrate the potential benefits to interest groups not only in these areas, but also in Scotland (where a debate about LVT is active) and in Northern Ireland, where a province-wide CAMA project for residential property is about to start.

5.1 Piloting LVT in Liverpool

Following the UTF report in 1999, in June 2000 Liverpool City Council passed a motion calling on the Government to allow it to pilot LVT as a policy for urban renewal[viii]. The city has long had severe problems of economic decline and many other policies have been tried with limited results.

Vickers 2000b showed that there was overwhelming support for having one or two pilots of LVT before any national decision took place on property tax reform. Taken together with the support in the same survey for use of land value maps as part of NLIS, there was a good case for a project to help Liverpool develop and cost its plans for piloting LVT. Two further David C Lincoln Fellowships in LVT have been awarded (in November 2000 and 2001) to investigate what would be necessary before a pilot of LVT could commence.

Lincoln specifically asked Vickers to study the use of GIS as part of this research. Vickers appointed Thurstain-Goodwin to produce demonstration products for a 'show card' that was used in a face-to-face survey of 100 Liverpool business-tax payers in May 2000. This survey showed even more strongly that value maps would help the public accept property tax reform (Reduce the Use, 2001).

In the remaining stage of this project, the authors will use data from a plot-by-plot trial land valuation of a part of inner-city Liverpool to produce cost estimates for the implementation of LVT for Liverpool either city-wide or in a limited Business Improvement District. Value maps similar to those produced for Lucas County will be prepared for the trial area and shown to interest groups and officials as a visual aid in discussions about the impact of LVT. The procedures for land valuation and value mapping used in the Liverpool trial will be recorded for UK public officials as the basis for any future LVT pilot.

The main use of the landvaluescape concept and GIS in the Liverpool project is therefore as an aid to demonstrating the effect of a tax shift off buildings and onto land, both overall and in detail, to government officials at all levels and to taxpayers.

5.2 London: The Land Value Effect of the Jubilee Line Extension

This project arose out of two linked debates: funding public transport infrastructure; and giving London's new Mayor his own revenue source.

When the new UK Labour Government re-established regional government for the nation's capital city in 2000, it proposed to hand responsibility for the London Underground (LU) rail network to the Mayor. First, however, it was to sell off the fixed assets of LU to three consortia on 30-year leases (called Public Private Partnership - PPP) to pay for future investment. The Mayor would get to run the trains without ownership of - or responsibility for - the tunnels, track, signalling or real estate around the stations that LU currently owns. Before, during and after the Mayoral elections, all but the Labour Party candidate opposed the Government 's plans, which it claimed were necessary because there was no money to pay for maintaining and extending the rail network in London. At the time of writing, controversy over PPP still rages and the contracts have yet to be signed.

A major new extension to one of the LU lines, the Jubilee Line, was constructed between 1995 and 1998, south of the Thames connecting Westminster with Stratford (the Channel Tunnel rail link's planned terminus) in East London via Docklands, a large regeneration area

now the home to some of the world's top financial institutions. LU and the Government jointly commissioned a set of studies in 1997 to investigate all aspects of the impact of the Jubilee Line Extension (JLE) on the local area. The Mayor's transport executive body Transport for London (TfL) took charge of this project upon his election and the Mayor appointed an American Transport Commissioner, Robert Kiley, as head of TfL

Dramatic increases in property values and a surge of redevelopment around new JLE stations became apparent even before the JLE opened. Interest in the possibility of funding transport infrastructure from land values has never been higher. A South London property owner carried out his own study of property prices and concluded that the JLE could have been paid for several times over via LVT (Riley, 2001).

This project aims to demonstrate more rigorously than Riley, using landvaluescape modelling over a time-series spanning the construction period of JLE, that land values in the metropolis can always be expected to rise sufficiently to pay for transport infrastructure investment projects. TfL have agreed to give the authors access to the data they are using for their own studies, which do not include value maps. The VOA has also agreed to release appropriate data on NNDR assessments to the authors.

Whereas the Liverpool project seeks to establish land values for a separate LVT levied on each site, the JLE project is only interested in identifying changes in gross property values and the consequent value response surface. Indirectly if not directly, these changes will be attributable almost entirely to the JLE. By comparing changes in property values near JLE stations with changes in similar property values near stations on pre-existing lines in this part of London, it is hoped to convince sceptics that there is a land market effect which could solve the Mayor's problem of paying for essential transport improvements. Central to this will be the ability to visualise land value data in order to see the changes – landvaluescape is the ideal means of doing this.

5.3 Conclusions

This paper is an early snapshot of a major and complex study, in an area that seems strangely not to have previously attracted much research. Since the authors embarked on their work, they have received considerable encouragement and interest. The indications are that for various reasons and in many quite different countries this interest in the landvaluescape concept and the convergence of CAMA and GIS will grow rapidly. As links between researchers within and between these two fields develop, it is expected that techniques for capturing, normalising and analysing property value data in surface models will improve rapidly. The drivers for future research include:

- the globalisation of property markets and the need to understand and exploit trends in land values for the benefit of investors;
- a trend towards more sustainable fiscal policies, using property taxation – and specifically LVT – instead of more perverse taxes on 'goods' like income and wealth creation;
- governments' interest in policies that promote sustainable urban development, the need to sustainably fund public infrastructure and to understand the inter-relationships between land values and urban planning;
- increasing digitisation and integration of the land-based information that makes up value

maps and increasing power, affordability and sophistication of systems needed to process that information.

In the UK, all these factors are evident – if only as yet to discrete communities of academics, officials and practitioners working largely in isolation. It is the task of landvaluescape researchers to communicate the power of the concept and of the tools it needs to those diverse groups, thereby levering in increased resources to speed up the implementation of applications.

REFERENCES

Alonso, W. (1964). Location and Land Use: Toward a General Theory of Land Rent. Cambridge Mass, Harvard University Press.

Anstey, B. (1965). A study of certain changes in land values in the London area in the period 1950-1964. Land Values. P. Hall, Sweet & Maxwell.

Bracken, I. and D. Martin (1989). "The generation of spatial population distributions from census centroid data." Environment and Planning A **21**: 537-543.

Connellan,O. McCluskey, W & Vickers, A (1998). "The Role of the Surveyor in Land Value Taxation" Proceedings of XXI International Congress of Surveyors (FIG'98), London: RICS.

Danish Ministry of Taxation (1996). Property Valuation and Taxation in Denmark, Copenhagen.

Edwards, A (2001). HM Land Registry Quinnennial Review, London: HMLR.

German, J. C., Robinson, D. & Youngman, J. (2000). "Traditional Methods and New Approaches to Land Valuation" Land Lines July 2000, Boston: Lincoln Institute for Land Policy.

Gloudemans, R. J. (2001). "Key Issues in Land Valuation" Paper for David C Lincoln Fellowships Symposium on LVT. Boston: Lincoln Institute for Land Policy.

Howes, C. K. (1980). Value Maps : Aspects of Land and Property Values. Norwich, Geobooks.

Hudson, P. R. (1975). Administrative Implications of Site Value Rating. London: Land & Liberty Press.

Josten, R (2001). "Land Value rating: A Possibility to Reform the German Property Rates" Journal of Property Tax Assessment & Administration **6**(3):63-80.

Knos, D. S. (1968). "The Distribution of Land Values in Topeka, Kansas". Spatial analysis; a reader in statistical geography. B. J. L. Berry and D. F. Marble. Englewood Cliffs, N.J.,, Prentice-Hall**:** 269-289.

Müller, A. (2000). Property Taxes and Valuation in Denmark, paper for OECD seminar Vienna.

Reduce the Use (2001) Land Value Tax Survey & Report 2001 (unpublished report avaiable from) Progressive Forum, London.

Riley, D. (2001). Taken for a Ride: Trains, Taxpayers and the Treasury. London, Centre for Land Policy Studies.

Rogers, R. (1999). Towards an Urban Renaissance. Report of the Urban Task Force, London: E & FN Spon.

Schiller, R. (2001). The Dynamics of Property Location. London, Spon Press.

Stewart, J. Q. (1947). "Empirical mathematical rules concerning the distribution and equilibrium of population." Geographical Review **37**(461-485).

Tate, N. (2000). "Surfaces for GIScience." Transactions in GIS **4**(4): 301-303.
Thurstain-Goodwin, M. and D. Unwin (2000). "Defining and Delineating the Central Areas of Towns for Statistical Monitoring using Continuous Surface Representations." Transactions in GIS **4**(4): 305-318.
Tobler, W. (1979). "Smooth pycnophylactic interpolation for geographical regions." Journal of the American Statistical Association **74**(367): 519-530.
Unwin, D. and D. O'Sullivan (2002). Geographic Information Analysis. New York, John Wiley & Sons.
Vickers, A. (2000a). "Prospects for a Smart Property Tax", Proceedings of AGI2000 Conference, London: Association for Geographic Information.
Vickers, A. (2000b). "British Perceptions of a Smart Landvaluescape", Journal of Property Tax Assessment & Administration **5**:4 (39).
Vickers, A. (2001). "The Embryology of Ecomorphology", unpublished paper for GI2001 Conference at Belfast, University of Ulster.

BIOGRAPHICAL NOTES

Tony Vickers began his working life as a graduate trainee with an international construction company, preparing and completing housing and industrial projects in north-west England. He then served twenty years in the British Army, fourteen as a military survey officer, including spells at Ordnance Survey UK, in Australia and Hong Kong. He gained Distinction in a Masters degree in Information Systems in 1994 and then worked as head of policy for a national charity. He began research into land value taxation in 1999, soon after being appointed as Chief Executive of the Henry George Foundation of Great Britain. He founded the Progressive Forum www.progressiveforum.cjb.net in 2000: it 'goes international' at FIG2002.

Mark Thurstain-Goodwin read geography at Girton College, Cambridge with emphasis on geography and property. After graduating in 1990, he worked at Property Market Analysis (PMA) for nearly four years, prior to deciding to further his career by training as a GIS specialist at UCL. On completing his Masters, he joined the Centre for Advanced Spatial Analysis (CASA). He is the project manager of the DTLR's Town Centres project 'Defining Boundaries for Statistical Monitoring' which uses extensive GIS, surface modelling and spatial statistical techniques. As a result of his research, comprehensive town centre statistics will be published for London for the first time in Spring 2002, and for the rest of the country later in the year. He is also working on developing innovative GIS modelling techniques to better understand town centre sustainability, including the use of sustainability indicators in GIS, the integration of disparate datasets, and spatio-temporal modelling.

NOTES

[i] In this paper, 'property' is always used to mean 'real property', i.e. an interest in real estate including fixed assets but not including personal property.

[ii] If you would like to participate in this survey, please contact Tony Vickers at tonyvickers@cix.co.uk

[iii] The data for this analysis came from the Lucas County Auditors' AREIS Project. The dataset is extremely rich and we have only mapped one of the many variables that make up the dataset.

[iv] The aggregation of areal units also introduces other issues, such as the Modifiable Areal Unit Problem, which we will not discuss here.

[v] Quoted from note 5 of the Explanatory Notes to the Land Registration Bill currently before Parliament which applies only to England & Wales. The Bill aims to make registration compulsory for all new estates in land but is not retrospective.

[vi] J German in a personal e-mail to Vickers.

[vii] In a personal e-mail to the authors 14 Jan 2002.

[viii] No local authority in the UK can choose to change its property tax system.