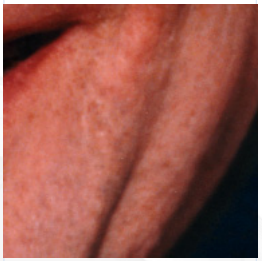
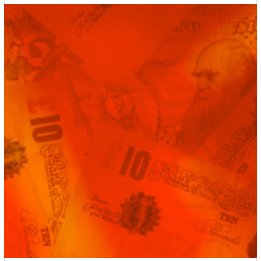
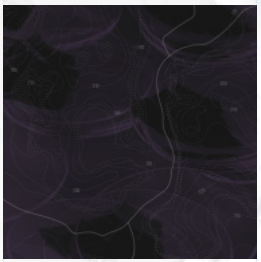
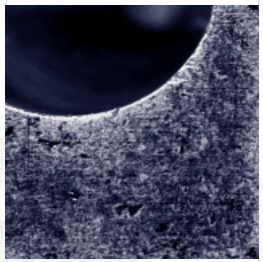
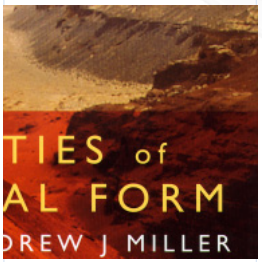
contents











Graham Clarke Head of School 1998–2001

This Quinquennial Research Report celebrates the achievements of the School of Geography over the last five years and was put together in Summer 2001. The growth of the School since 1995/1996 has been rapid, as is clear from the graphs accompanying this introduction. **Leeds is now amongst the top three Schools of Geography in the UK** in terms of staff numbers, student numbers, research output, research income and many other measures. Often it ranks at the top of the discipline. The School has become a considerable concentration of academic effort, both nationally and internationally, within geography and beyond. A few examples of our research are described in the pages which follow, accompanied by references to further sources. This includes a full list of all the staff who make this work possible, an illustration of some of our key publications since our last report, details of our doctoral and masters students, and a summary of our major grant income over the last two years. The report ends with a selection of maps to help you find us in 'real' space as well as our locations in cyberspace, email and telephone numbers. We plan to produce this report on a five year cycle with annual update reports mounted on our web site in intervening years.

This report was brought together by Sheelagh Cobb, Danny Dorling, Mark Newcombe and Maureen Rosindale. We are very grateful to Mary Shaw for providing the excellent photography which illustrates it, to Adam Davenport for persevering with taking all the staff photographs, and finally to Phil Rees who agreed to fund the production of the report just before taking over as our new Head of School in August 2001. This report, in many ways, represents the cumulation of the efforts of Graham Clarke, Head of School from August 1998 to July 2001 and aims to present the School, with all its diversity, as a whole. Graham will be enjoying well earned research leave during 2001/2002.

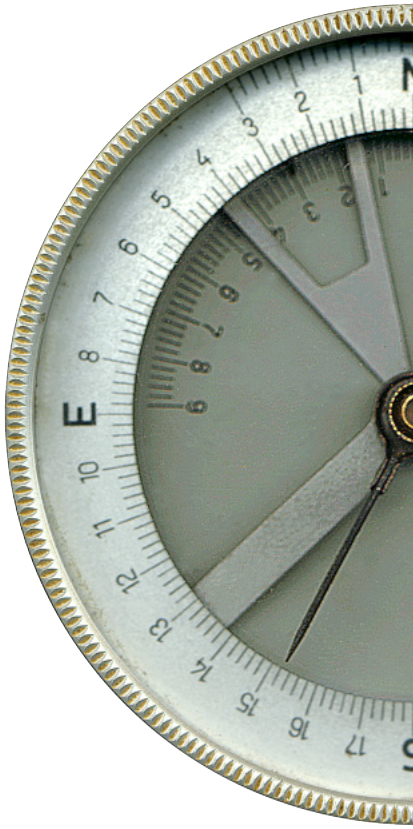
Phil Rees Head of School 2001–2004

Research in Geography at Leeds

"Our research in 2000/2001 is organised through four research groups, which drive forward research agendas. Individuals also collaborate across groups and with external researchers. Research is promoted through investment of earnings and overheads to stimulate new activity."

For instance, we allocate £40k directly (and more indirectly by returning some overhead to grant holders) per year of research overhead for investment in conference attendance and new research ideas, and we have invested heavily in the School's web site *(http://www.geog.leeds.ac.uk)* which provides research publications on-line.

The School of Geography at the University of Leeds is a leader in innovative geography research: our research quality is recognised through research council, government and industry funding and a stream of important findings and publications. Key recent achievements of our four research groups are as follows:



- The *Population, Society and Space* research group, led by Debbie Phillips, has played a pivotal role in the ESRC/JISC Census Programme, which delivers key socio-demographic information to UK researchers. The group has many other interest which are reflected later in this report.

- The School leads the world in *Geocomputation and Business Geographics.* The research group, led by Danny Dorling, has developed new methods of spatial data analysis, used extensively in commerce, innovative cartographics and seminar research on health inequalities.

- The outstanding work of the *Environmental Management* research group, led by Adrian McDonald, focuses on the dynamics and sustainability of human-resource interactions in water, forests, air and food fields. The group has developed a distinctive approach that combines research, policy and consultancy contracts.

- The *Earth Surface Processes and Environmental Change* research group, led by Stuart Lane, has built on its international reputation in soil erosion modelling with new research in computational fluvial dynamics, the dynamics of braided rivers, glaciology and Holocene climate changes and alluvial sedimentation.

The results of the School's research, reported in the 2001 Research Assessment Exercise, have been published in 14 books, 132 journal papers, 41 book chapters and 9 other forms, though these represent only a fraction of our written research outputs. The School has attracted external awards worth £10.5m in the last five years, £3.6m from Research Councils; £2.9m from the UK govern-ment; £1.9m from the European Union; and £1m each from foreign governments and UK industry. This represents an average of £60k each year per research active staff member.

Research Infrastructure and Administration

The key to the School's research success is its research infrastructure. The School has invested in IT systems, a GIS laboratory, in image analysis capability and has four excellent IT staff. We provide a workstation to each academic, researcher and doctoral student. The School has three laboratory technicians and invests £50k per year in physical laboratory equipment, including an ICP-AES, a particle sizer and a new DIONEX. Our Graphics Unit of five staff provides first class support for preparing illustrations and publications. Our Geographic Resources Unit of two support staff focuses on the provision of digital cartographic information. A full time Research Administrator assists staff making external research applications, administers project finances and maintains systems that track research activity. Three other finance office staff maintain our accounting systems. Another six members of clerical staff and four administrators complete our support structure.

The greatest things are accomplished by individual people, not by committees or companies **Alfred Armand Montapert**

Research Training

Our PhD students undertake an ESRC/NERC recognised training programme, are integrated into research groups and benefit from a collaborative research culture. The School receives PhD funding from ESRC, NERC and EPSRC and CASE award partners GMAP, Polk, Yorkshire and Thames Water, DFID, Unilever, EA, Leeds City, ACET Cambridge, the World Bank and foreign governments. Postgraduates contribute vitally to the School's research in glaciology, demography and spatial modelling. A system of six-monthly Research Support Group meetings provides PhD students with clear guidance. They present their research in School seminars and at major conferences. This training and supervision produces a high four-year PhD completion rate. The School has pioneered widely used methods in skills development and IT-delivered courses have been developed in the environmental field. Research into IT supported learning in environmental and census analysis has attracted £800k external funding.

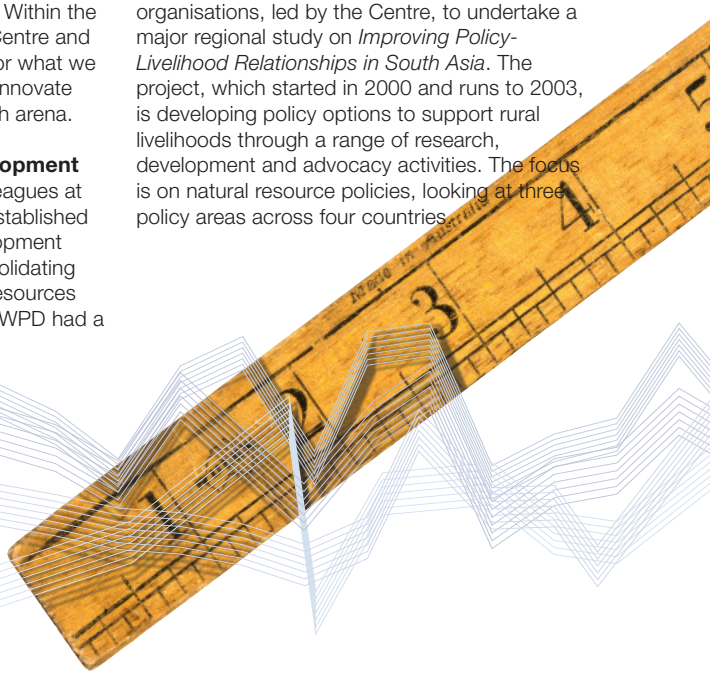
The School has several research centres. Many of these are cross-School and cross-Faculty (e.g. the Centre for Biodiversity and Conservation; and the Centre for Mediterranean Studies). Within the last year, we have established a new Centre and the description below gives a flavour for what we expect our research centres to do: to innovate and to lead in the international research arena.

Centre for Water Policy and Development

John Soussan, along with several colleagues at Geography and elsewhere in Leeds, established the Centre for Water Policy and Development (CWPD) in 2000; with the goal of consolidating the work being undertaken on water resources management and policy issues. The CWPD had a range of pro-jects underway in 2000, the highlights of which are:

At the ministerial conference on Water Security in the twenty-first Century, held in The Hague in March 2000, members of the Centre organised and ran workshop sessions attended by over one hundred and fifty government ministers and many other senior figures from around the world, including Mikhail Gorbachev, Queen Noor of Jordan, Prince Willem Alexander of the Netherlands, Gro Harlem Brundtland, Shimon Peres and Clare Short. They drafted the Ministerial Declaration of The Hague and acted as advisors to the Chairman of the World Water Forum. Following The Hague meeting, the CWPD has received contracts from the Netherlands and Japanese governments, the World Bank, and UNESCO, to assist with the development of water policies and approaches in preparation for the Rio+10 Earth Summit in Johannesburg in 2002 and the Third World Water Forum in Kyoto in 2003, making CWPD a focal point of global water policy development.

The Department for International Development (DfID) has commissioned a consortium of eleven organisations, led by the Centre, to undertake a major regional study on *Improving Policy-Livelihood Relationships in South Asia*. The project, which started in 2000 and runs to 2003, is developing policy options to support rural livelihoods through a range of research, development and advocacy activities. The focus is on natural resource policies, looking at three policy areas across four countries.



Arrivals & Departures

During 2000, the following members of staff arrived in the School:

Tim Baker	Adam Davenport	Joseph Holden	Emma Ramsdale
Dimitris Ballas	Cathy Davis	Chris Keylock	Sam Rose
Robin Butlin	Danny Dorling	Joseph Lane	Rachel Slater
Faisal Butt	Avijit Gupta	Stuart Lane	John Soussan
Matt Chadwick	Barry Hankin	James Lockyer	Oliver Springate-Bajinski
Matthew Clark	Jane Hanna	Anil Namdeo	Chronis Tzedakis
Alex Clemett	Rachel Harrrison	Richard Mitchell	Alistair Walder
Anjan Datta	Gary Higgs	Nick Phelps	Anna Wellard

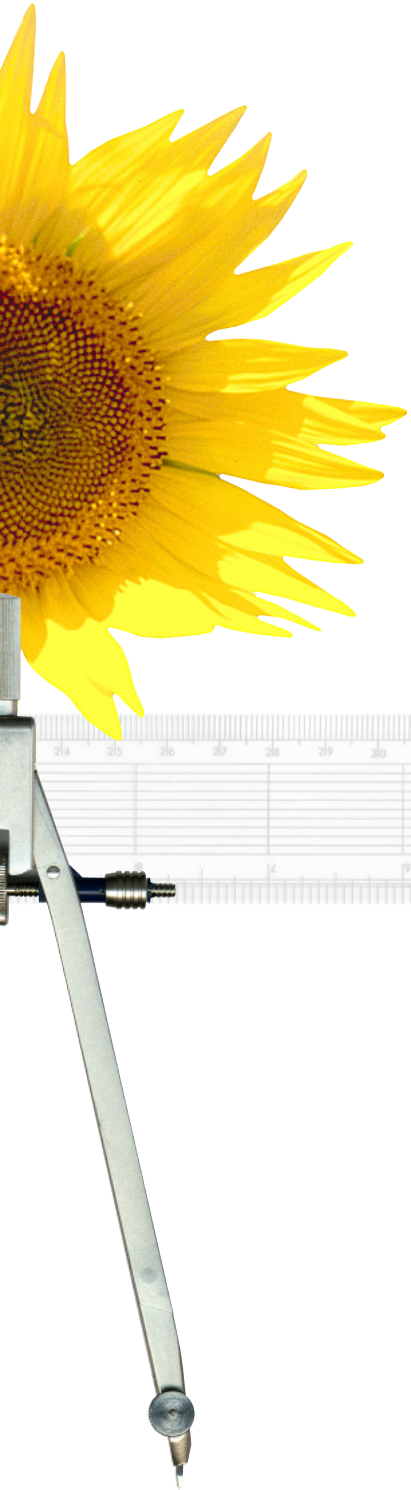
Linda See and Andy Evans took up a shared lectureship. Nick Phelps and Chronis Tzedakis arrived in January 2001.

Stan Openshaw

Sadly, Stan suffered a stroke in May 1999 and retired from the School in 2000. Stan joined the School in 1992 where he continued to build on his research on Cluster analysis and Zone Design. In particular he strove to remove human bias from the scientific process. A strong believer in human-computer machine intelligence, Stan worked to develop an 'explanation machine', which compared clusters in different variables to automatically suggest hypotheses for their causes, while also introducing Genetic Programming to geography. In addition he became interested in the predictive possibilities of Artificial Intelligence, especially for flood forecasting. Perhaps his best known contributions, however, were to the field of GeoDemographics and location modelling, working on the classification of groups of people and gravity models to determine the best locations for shops and services. In 1992 Stan set up the Centre for Computational Geography, a group dedicated to bringing computers to bear on complex social and physical problems, and in 1996 he was involved in cementing the GeoComputational community through the initiation of a set of international conferences. Through these, and the work spawned from his research, his influence is still felt, particularly in Leeds, on a daily basis.

Andrew Convey: an appreciation

Andrew Convey died on the 22 July 2001. Andrew's connections with the School were many and varied. He served as Head of Geography at Trinity and All Saints College, Leeds for many years. After early retirement due to ill health from Trinity and All Saints in 1986, he joined the School first as Honorary Fellow and then as Visiting Fellow. During that time, he worked on his key interest – geographical education across Europe. As well as a researcher, Andrew was also a prolific advocate for the teaching of geography, and was continually enhancing the subject – especially at the secondary level. He published widely on geographical education, and was serving as an educational advisor to the International Baccalaureate Organisation, the Universities of England Consortium for International Activities, the European Observatory for Population Education and Information and the International Geographical Union. He will be missed and our thoughts are with Francoise's family.



Research Highlights

In the last year, members of the School have undertaken world-class research in the areas of Environmental Management, Earth Surface Processes and Environmental Change, Population Society and Space and GeoComputation and Business Geographics.
In this section vignettes of our research are described, each with just a few paragraphs of text and a couple of pictures. These are a microcosm of what can be found, in much greater detail, on the School's website at *http://www.geog.leeds.ac.uk/*

We hope that the following examples encourage you to look further.

Staff/student telephone numbers and email address are listed on page 76.

Avalanches

Chris Keylock has been working with colleagues across Europe to improve our methods of determining snow avalanche risk. The practical implications of improving such methods are obvious, but the science of doing so may be less simple.

Following the disasters in the Alps and Iceland in recent winters it has become clear that there is a real need to improve current approaches to estimating the probable travel distance and damage caused by snow avalanches. At present, the Alpine countries that are subject to avalanche danger use mathematical models, knowledge of local terrain and probable snow volumes to attempt to predict avalanche behaviour. Although some of our work in Leeds focuses upon the physics of avalanche movement and the development of more sophisticated modelling procedures, it is also important to improve the manner in which current modelling tools are applied. It is towards this latter, more practical aim that recent work has concentrated upon. Recently, there has been a move throughout Europe to compare the performance for different numerical models for avalanche flow and to formulate new methods for predicting avalanche hazard. In collaboration with the department of environmental and hydraulic engineering, University of Pavia, Italy, we have been examining the statistical interpretation of avalanche model output and the embedding of avalanche models within a risk framework. This work has looked at predicting avalanche model parameters from terrain data, using Monte-Carlo techniques for improving conventional avalanche hazard zoning assessments and redefining avalanche hazard zoning criteria on the basis of estimated risk.

Avalanche hazard zoning is one of the most important responsibilities of European avalanche institutes. Typically, many nationalities follow the Swiss in defining the areas of high danger as those where avalanches are expected as frequently as once in every thirty years and large avalanches (exerting a pressure on impact of 30kPa) are expected every three hundred years. However, it is conventional for the analysis of the majority of hazards to express danger in terms of risk, or probability of losses. Hence, the practical problem is to translate impact pressure results from a model simulation into probabilities of damage or fatality. In a recent piece of work we used a statistical method for avalanche risk estimation (developed in an earlier study) and an avalanche dynamics model to look at this problem. By simulating a large number of hypothetical avalanche events that stopped at different positions we found that the estimated average damage value differed from that determined using a conventional modelling procedure by a factor of two. This order of error could be significant when planners are attempting to define risk zones, meaning that significant human or economic costs could be accrued.

The photograph (right) illustrates typical avalanche terrain in Iceland. There is relatively little land available for construction between the fjord and the steep mountainside and much of this is susceptible to avalanches. In this sort of environment, accurate terrain zoning and defence provision is essential if fatalities are to be avoided.

www.geog.leeds.ac.uk/people/c.keylock/

Source

Keylock C.J. and Barbolini M. 2001. Snow avalanche impact pressure/vulnerability relations for use in risk assessment. *Canadian Geotechnical Journal,* 38, 2, 227–238.

Business Geography

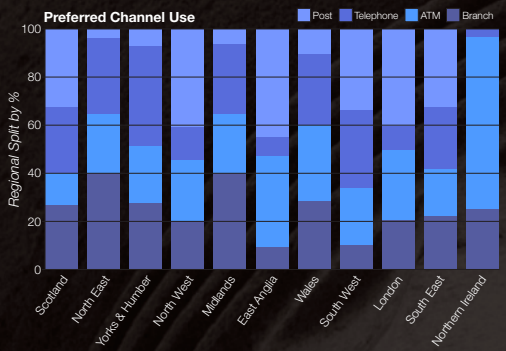
The School of Geography is well known internationally for its work in spatial interaction modelling and retail geography. Here, Mark Birkin describes a taster of that work, and how it has moved on into the areas of genetic algorithms and artificial life proposed by Stan Openshaw many years ago.

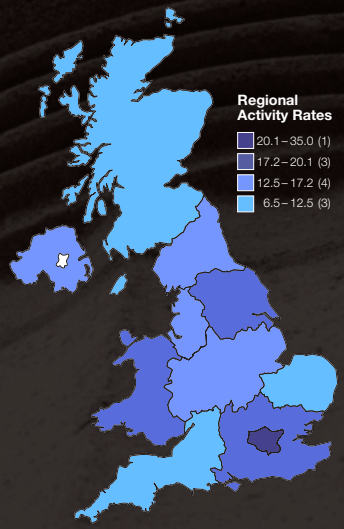
There is a well-established principle in twentieth century retailing that there are three key ingredients for successful trading: location, location and location. Within the last decade, this view has been increasingly undermined, largely by changes in customer attitudes and behaviour. Readers of moderately advanced years will easily recollect the time when it was difficult or impossible to obtain a tin of baked beans on a Sunday. Supermarkets are now moving to 24-hour trading. However changing retail markets are not characterised simply by extensions in the hours and availability of traditional shops. In fact the dynamics are supported by a whole new pattern of product delivery. For example, all the major supermarkets now have a home delivery service. Many financial services customers now receive regular balance statements through their mobile phones. Thus the emphasis in contemporary retail and service businesses needs to move from 'location' to 'distribution'. In addition to shops (or bank branches, car dealerships, and so on), there has been a proliferation in the distribution channels through which customers may access retailers, including cashpoints, mail order, telephone, and of course the internet.

The School has been engaged in a number of projects to understand the impact of the changing distribution on retail and service businesses. In one recent project a Channel Usage Survey was undertaken to examine the changing distribution of financial services products. The survey identified fifteen distinct access channels, with fourteen possible activity types (from cash withdrawal to statement request), and eleven products (e.g. motor insurance, purchase of shares). One thousand customers were interviewed by telephone.

Data from the Channel Usage Survey may also be used to drive sophisticated computer models of retail markets, using techniques from micro-simulation and spatial interaction modelling to genetic algorithms and artificial life. These applications provide significant benefits to users in a whole variety of business areas: network planning, e.g. where to locate new ATMs; product design i.e. how to package an offer so that it has maximum appeal to the right target audience; product marketing – finding the people to whom the products are focused and increasing their awareness of it; branch targeting – identifying the priorities and objectives of individual outlets and channels; mergers and acquisitions – assessing the fit between two organisations in relation to products and distribution mechanisms; and also to policy-makers, such as the Competition Commission.

www.geog.leeds.ac.uk/staff/m.birkin/m.birkin.html





Climate change

Climate change is of great international interest currently. Thinking globally and researching locally, Joseph Holden is, amongst many other things, looking into climate change in the UK uplands.

Climate change in temperate upland areas is important because their peaty soils are significant carbon stores. These may decompose under warmer conditions releasing more CO_2 into the atmosphere. The peat uplands also contain internationally important ecological habitats and are source areas for water supply. With the mean temperature of much of upland England being so close to freezing throughout the winter slight climatic warming is expected to lead to changes in frost occurrence. The importance of frost in controlling the length of the growing season has long been recognised and freeze-thaw activity is also an important erosional process in upland areas. The temperature record for Moor House meteorological station, at 556 m altitude in the north Pennines, UK, provides the longest continuous instrumental climate record in the UK uplands. The latest data are available on the Environmental Change Network website at *www.ecn.ac.uk/online_aws/index.asp* Earlier work had suggested that the warming trend seen in lowland Britain was not evident in the uplands. The mean annual temperature at Moor House since 1931 is 5.2°C. Mean annual temperatures since 1990 are significantly warmer at 5.8 °C. Six of the top ten warmest years at Moor House are since 1990. While mean annual temperatures are becoming significantly warmer in the north Pennines, analyses of seasonal data demonstrates that the warming is actually confined to winter months. On a monthly basis only January and February are significantly warmer with mean temperatures increasing from –0.5°C to 1.2°C. However, mean maximum temperatures have not significantly increased but mean minimum temperatures have. Thus the diurnal range has significantly declined by between 0.6 and 1.0°C between October and April. The result of an increase in mean minima is that frost occurrence is reduced.

Air frosts have been recorded in all months of the year at Moor House and the climate is harsh with over 100 frosty days per year. There has been a dramatic decrease in the number of frost days at Moor House when the past decade is compared to the 1931–1990 period; a 24 % fall from 133 days per year to 101. This is close to the Hadley Centre's 25% frost reduction prediction for northern England by 2065. Clearly frost reduction has come much sooner for this north Pennines site. In terms of erosional and biological activity not only the number of frost days may be important but so may the number of days when temperatures are both above and below freezing. During January 1963 for example, temperatures remained below freezing for 28 consecutive days. Thus freeze-thaw activity may not be as severe as when temperatures fluctuate around zero more frequently. Therefore it is important to calculate whether the reduction in frost days is combined with an increase or a decrease in the number of 'freeze-thaw' days. These have fallen from 102 to 81 per year. Synoptically controlled snow cover at the site has also fallen from 69 days to a mean of 50 per year. 1997 and 1998 were the least snowy years on record with only 27 and 33 snow cover days.

Source

Holden, J. and Adamson, J. (in press) The Moor House long-term upland temperature record – new evidence of recent warming. *Weather.*

Demographics

During 2000, John Stillwell and Arlinda Garcìa Coll (University of Barcelona) worked on a major report on internal migration in Spain. The research was undertaken as part of an ESRC-funded project on *Internal Migration and Population Change in Europe* led by Phil Rees and Marek Kupiszewski.

Internal migration has been a key component in Spain's sub-national population dynamics over the last century, particularly during the 1960s and 1970s, when the rural exodus was at its peak. Since then, as fertility levels have declined and the economy has been restructured, internal migration has continued to play an important, albeit different, role in shaping the distribution of the population across the country. This research considers some of the more recent changes in the distribution of the population and in internal migration during each of the two calendar years, 1988 and 1994, at two spatial scales, provinces and municipalities. The demographic dynamism of the coastal provinces is evident when contrasted, in aggregate terms, with changes taking place in other industrial, urban and rural provinces. A classification shown in the accompanying maps, demonstrates the extent to which the number of municipalities with net migration gains increased between 1988 and 1994.

Registration data for the two annual periods, supplied by the *Instituto Nacional de Estadistica (INE)*, are used to examine the changes in the volume, geographical distribution and demographic structure of internal migration. Whilst it is clear that the volume of migration between municipalities in the same province has increased between 1988 and 1994 more rapidly than the migration taking place between municipalities in different provinces, the efficiency with which the latter redistributes population has declined. Age variations in migration propensities and net migration balances give some indications of the variety of determinants that influence directional migration flows at different stages in the life course. The registration data provides details of place of birth and place of residence before and after the move; consequently, new insights are obtained into the proportion of inter-provincial migration that involves return to the province of birth, the age variations in return proportions and the major flows of return migrants between provinces.

Source

The report is available on the School of Geography web site at: *http://www.geog.leeds.ac.uk/wpapers/00–8.pdf* and further papers published in 2000 based on the research include:

Stillwell, J.C.H. and Garcìa Coll, A. (2000) Inter-provincial migration of the Spanish workforce in 1988 and 1994, *Regional Studies*, 34(7), 693–711.

Figure 1

- PG: Natural gain + net migration gain (1,686)
- PG: Natural gain + net migration loss (277)
- PG: Natural loss + net migration gain (947)
- PG: No change (537)
- PL: Natural gain + net migration loss (1,322)
- PL: Natural loss + net migration gain (933)
- PL: Natural loss + net migration loss (2,355)

Figure 2

- PG: Natural gain + net migration gain (1,783)
- PG: Natural gain + net migration loss (172)
- PG: Natural loss + net migration gain (1,813)
- PG: No change (526)
- PL: Natural gain + net migration loss (645)
- PL: Natural loss + net migration gain (1,190)
- PL: Natural loss + net migration loss (1,928)

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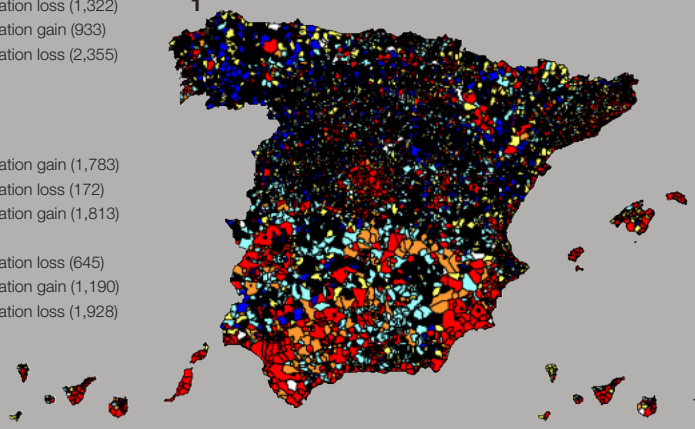

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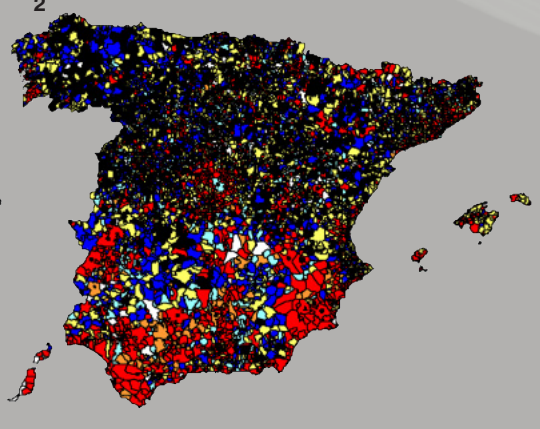


Erosion

Now that governments are coming to terms with the water framework directive, the next challenge is for effective policies of soil protection. Mike Kirkby has been part of an international team developing a Europe-wide model for estimating soil erosion rates, to assess the impact of changing land use, policy and climate.

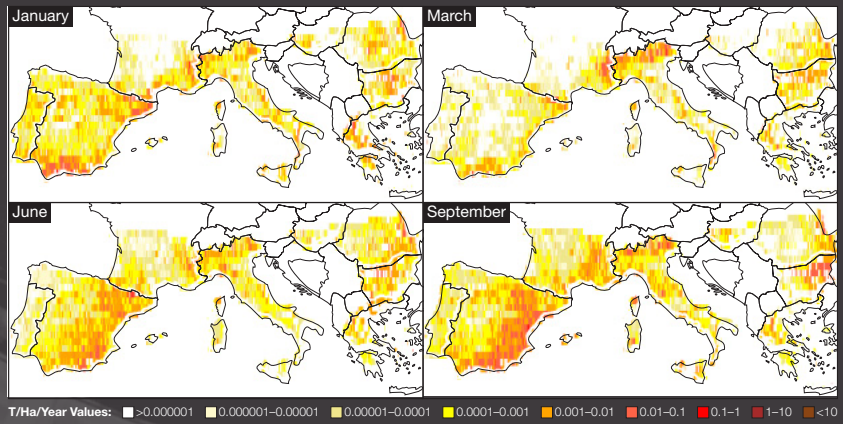
The European Union is now actively considering how to develop policy directives for soil protection, partly linked to the United Nations Committee to Combat Desertification Action plan. These are relevant for much of the semi-arid climatic area which includes Mediterranean Europe, and they partly address wider issues of soil loss from agricultural land and offsite sedimentation and pollution. Limiting erosion by water is one important aspect of any attempt to maintain a sustainable soil resource, although there are also significant threats from soil loss in urbanisation or road construction, industrial pollution and soil salinisation.

At an early stage, it has become clear that there is no objective and consistent basis for paring current rates of soil erosion between regions, and no sound basis for estimating the impacts of changes in agricultural land use and climate. Existing methods have either used a factorial plan like the CORINE assessment, loosely based on the Universal Soil Loss Equation, a widely used but scientifically obsolete model developed in the 1950's for the Eastern USA; or a generalisation based on the sparse and non-systematic network of measurements from small erosion plots, usually supplemented by large helpings of local 'expert' judgement. Since erosion is extremely patchy in both time and space, due to the episodic and localised occurrence of intense storms, this method is, at best, informed guesswork.

What Mike Kirkby has tried to do, through work initiated in the early 1990s and developed, with many international collaborators and research staff at Leeds, through a series of four EU projects, is to develop an erosion model which is physically based, simple enough to be applied at broad regional scales, and explicitly scaleable, so that a consistent family of models can obtain and validate parameters from erosion plot and small catchment measurements, and use them to estimate regional erosion rates. This is the basis of the Regional Degradation Indicator (RDI) model, which attempts to estimate long term mean erosion rates from the distribution of rainfall within each month, land use, topography and The European Soils Database. Land use has been estimated both from remotely sensed data and by applying crop growth models in combination with EU land use data. Existing versions of the model have been applied to southern Europe, and are being developed to take account of the different processes of runoff generation in the north, particularly snowmelt runoff and saturation overland flow.

www.geog.leeds.ac.uk/staff/m.kirkby/

Monthly erosion from 1km AVHRR data for 1995 with average climate



Forests

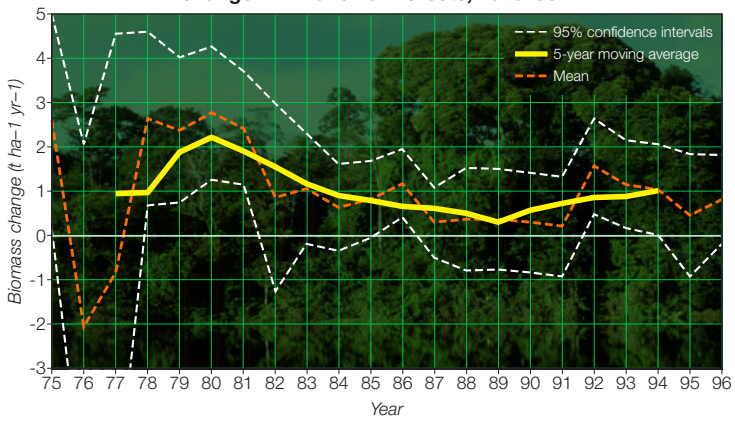
Oliver Phillips' research centres on the ecology and wider significance of tropical forests, especially in the Amazon. Tropical forests are well-known for supporting the world's greatest concentrations of biodiversity, including countless crop relatives and medically valuable species – a global good that is increasingly threatened by deforestation.

As well as being storehouses of biodiversity, tropical forests have a critical role in controlling the climate. For example, the amount of carbon they store, if all released to the atmosphere by deforestation, would cause atmospheric levels of the greenhouse gas carbon dioxide to increase by more than half – potentially enough to cause catastrophic climate change. Forests not only lock up vast amounts of carbon, but they also have a remarkable capacity to process it through plant growth and decay. Each year, the Amazon forest alone inhales and exhales six times as much carbon as we produce by burning fossil fuels, so small differences in the forest carbon balance could have big impacts on the rate of global warming. Recent work by scientists working in the Amazon, led by researchers at Leeds, is showing that undisturbed rainforests are in fact growing faster than before, and in doing so, are acting as massive sponges for CO_2. This discovery shows that forests benefit us in a way that was totally unexpected, as well as helping to clear up one of the big scientific mysteries of the last decade.

Atmospheric pollutants have grown steadily since the industrial revolution began two centuries ago. CO_2 has increased by a third and is still rising, fuelled by industrial emissions, car exhausts, and the clearing of tropical forests. Most scientists agree that significant global warming – the greenhouse effect – is occurring as a result. But scientists have been puzzled because levels of carbon dioxide should be rising even faster than they have been. Total emissions are about 8 billion tonnes a year, yet the rate at which CO_2 is accumulating in the atmosphere is a comparatively modest 3 billion tonnes or so. Some of the discrepancy is explained by uptake by the oceans, but even after allowing for this there was a substantial 'missing sink' of at least 2 billion tonnes of carbon each year in the 1990's. In 1998 Oliver published a paper in that has helped to solve the mystery of the 'missing' carbon dioxide (*Science:* 282:439–442). Working throughout the tropics, his team analysed results from 100,000 trees studied since 1970. In most of the study plots they found that the forests have become more massive. Globally, this effect may account for about 1 billion tonnes of carbon – half the missing sink – with another 1 billion tonnes possibly accounted for by increased growth of forests in North America and Eurasia. A carbon sink in the temperate zone is relatively easy to explain, since large areas are recovering from deforestation in the 19th and 20th centuries, but for tropical forests like the Amazon it runs counter to ecological orthodoxy which holds that undisturbed ecosystems should be at equilibrium, and therefore carbon-neutral. One possible explanation is, ironically, the increasing CO_2 itself – plants need carbon dioxide to grow, and when it's more abundant they tend to grow faster. Other possibilities include the impact of extra nutrients such as nitrogen that rain down on the forests as other areas of forest are burned, or perhaps the small climate change so far is stimulating growth.

Source
http://www.geog.leeds.ac.uk/projects/rainfor

Annual aboveground biomass change in Amazonian forests, 1975–96



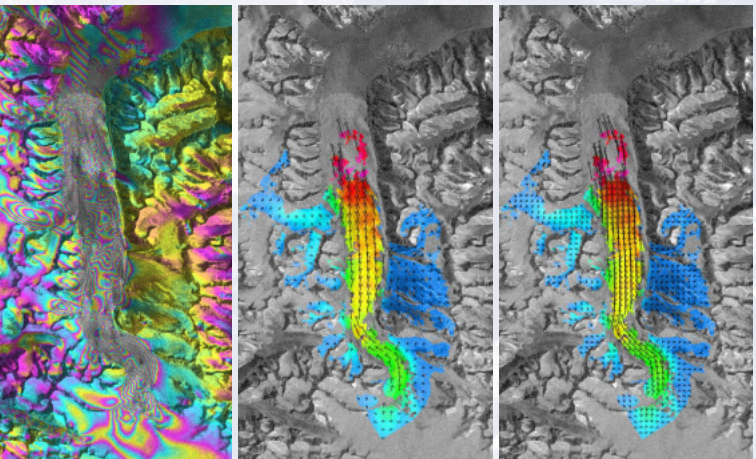
Glaciology

Some of the work of the School of Geography takes its members to both the most inhospitable and beautiful of areas. Here Tavi Murray describes a recent visit to the Arctic and illustrates the arduous work involved in research at the forefront of practical studies in glaciology.

During March-April 2001 Tavi Murray, Hamish Pritchard and Paul Miller spent three weeks in the high Arctic archipelago of Svalbard undertaking 3-D ground-penetrating radar surveys funded by the EU through the Large-Scale Facility programme. This work involved towing the radar behind a snowscooter in collecting data along closely spaced lines.

The position of the radar was tracked to centimetre accuracy using a differential Global Positioning System. The project aims to characterize the basal zone at the margin of a quiescent phase surge-type glacier and hence test models of surge development and propagation in the Svalbard archipelago.

Together with colleagues, members of the glaciology group (Tavi Murray, Hester Jiskoot with Adrian Luckman and Tazio Strozzi from Swansea) have been studying glacier surging in Svalbard in a NERC-funded project 1999–2002. Our aim was to gain a greater understanding of ice flow variability and dynamics in Svalbard by employing interferometric techniques on remotely sensed data. To achieve this aim we have concentrated on glaciers of known surge-type, in particular Monacobreen in NW Spitsbergen, which surged in the early 1990s. An in depth study of the satellite archive has led to an understanding of the entire surge at an unprecedented level of spatial detail. Eleven velocity maps, from September 1991 to October 1997, have captured the surge from near its start to when velocities had returned to normal levels. This data demonstrates how the surge developed rapidly to its peak in 1993 then decayed more slowly and indicate that throughout the event, ice flow is limited by 'sticky spots' probably arising from bedrock obstructions beneath the glacier.



The geocoded interferogram of the area is shown here, formed from two microwave synthetic aperture radar images collected by the Earth Remote Sensing satellites -1 and 2, 1 and 2 June 1995. The colour cycles on the interferogram, known as 'fringes', relate to both displacement and topography, however, this interferogram is most sensitive to displacement. Closely spaced fringes on Monacobreen show when it is flowing rapidly. The interferogram can be processed to produce the magnitude and direction of glacier flow. The velocity map, shown here, is from June 1995.

www.geog.leeds.ac.uk/staff/t.murray/

Historical Geography

Recently there has been an upsurge in research questioning the contested ways in which places have been represented geographically. However, as Robin Butlin describes below, what appears new is often old. Here he describes a sacred and contested place through English and French representations of Palestine in the seventeenth century

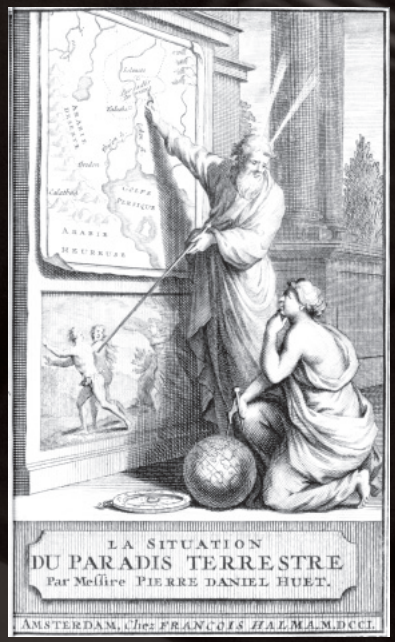
Palestine or the Holy Land has been a centre of religious, political, ethnic and cultural engagement for over two thousand years. As a focus of three of the world's major religions, Christianity, Judaism and Islam, it carries in its historical geographies a multiplicity of both constant and changing meanings, including historic and alarming contemporary experiences of religious and territorial dispute. It has been controlled by major Middle Eastern and European imperial powers, from before the time of the Roman Empire, through the period of the Ottoman Empire, to the period of European imperialism from the late nineteenth century and the resurgence of powerful territorial disputes from the twentieth century onwards. These potent new nationalist trends have often had tragic outcomes, though there have also been experiences of hope and peace.

Over long periods of time, conflicting political, religious and territorial ideologies in Palestine were (and continue to be) of major concern to European scholars, merchants, religions, monarchs and state administrators. Their interests have variously focused on the physical remains of past civilizations, on the detailed cultural characteristics of the indigenous peoples, such as language, society, manners and customs, housing, language, and economy, on the nature of religious belief systems and religious questions, and on prospects for European-Levant trade.

For the historical geographer and the historian, the accounts by these scholars, pilgrims, soldiers, traders, diplomats, and curious travellers who visited or lived in Palestine, including their illustrative maps and engravings, provide sources for attempted constructions of the essences of its 'legendary topography' and its changing scenes of life, in addition to the complex ideologies represented and experienced in this region.

The focus of Robin's research has been, in part, of images of Palestine, as represented in the accounts by various English and French scholars who were writing about and in some cases travelling to the Levant in the seventeenth century. The images and perspectives afforded by individual accounts and exegeses are reviewed against backgrounds of seventeenth-century change in political relations, in theologies, in commercial goals, and in intellectual and cultural discourses.

Source
Iain S.Black and Robin A. Butlin (eds), *Place, Culture and Identity. Essays in Historical Geography in Honour of Alan R H Baker.* (Les Presses de l'Universite Laval, Quebec, Canada, August 2001).



Immigrants

Studies of migration have been one area in which the School of Geography at Leeds has excelled over the last few decades. Here, Adrian Bailey describes some international research on how 'temporariness' affects the employment of immigrants around the world – as immigration rises and the rights of migrants fall.

Immigrants already play important roles in the labour markets of most of the world's largest economies. Indeed, because these countries have ageing populations, we can expect immigrant workers to play an increasingly prominent role in the operation of the global economy. Not surprisingly, a number of countries – including the UK and the US – have designed laws to maximise the net economic contributions of immigrants to national economies. In this regard, more and more immigrants enter countries as temporary workers. Working as a collaborative team, with researchers from the US, Canada, and El Salvador, we explored issues of temporariness among one of the largest such temporary populations world-wide: the Salvadorean diaspora. With fieldwork conducted in the US, Mexico, and El Salvador, we investigated how temporary legal status impacted upon the lives of Salvadorean immigrants and refugees.

Our results showed that temporariness increased insecurity among workers, compounding the hostility many Salvadoreans already felt from racist elements in society. Workers put up with poor work conditions, low wages, and no health benefits. Immigrants remitted large sums of money to family members who had remained in El Salvador. When we visited some of these families, including the one shown in the picture, we found that these remittances were lifelines, supporting the extended family. We also saw evidence of families being torn apart by the resentment that

US earners were not sending more money back, did not visit El Salvador often enough, and did not pay enough attention to children left behind. These feelings were particularly directed against mothers. Indeed, in the US, these same mothers had already spoken to us of being torn apart by the impossible performance being expected of them: to remit, to cut costs, to obtain better paying jobs, to stay healthy.

The children in the picture had not seen their mother for eight years. Their aunt wanted us to take this picture to the mother, both to guilt her into an early return, and to prove that her remittances were being productively deployed to extend the family home shown in the background.

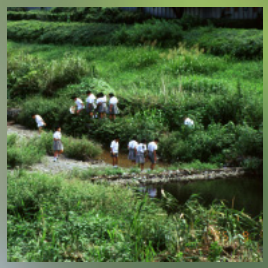
We were also directed to carry pictures of particular features of the house, like the yellow door. Dripping with various meanings, for us the door came to symbolise the broader issue of stepping into the realm of research, where the research process itself loses its detachment from what it is studying.

Source

Bailey, A.J. (2000) Legal Status, Gender and Employment Among Salvadorans in the US, with Richard Wright, Ines Miyares, and Alison Mountz. *International Journal of Population Geography, 6:* 273–286

Japan

Paul Waley's principal research activities in 2000, involved work in Japan looking at the debate over river restoration there which chimes nicely with that debate currently evolving in North America and Europe over similar issues.



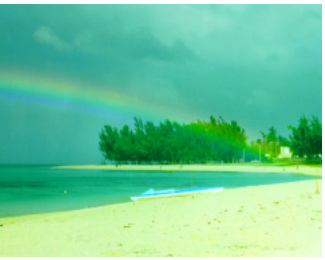
River restoration has been an important focus for environmental work and theoretical discussion in various countries. It is linked to a number of controversial topics, many of them of pressing importance, including policy towards dams and flood control. In Japan, a combination of factors have driven river restoration to the forefront of public debate and concern. While on the one hand instances of flooding continue, on the other, the government has been rocked by the strength of protest against its policies. The unthinking use of concrete has become axiomatic of the bureaucratic, hierarchical, and technocratic society of post-war Japan, which now has one of the most thoroughly concretised landscapes in the world. Prompted, however, by a number of social changes and led by officials of the Ministry of Construction, the nature of riparian work has shifted in recent years, and today there is a new emphasis on protecting riverine ecosystems through a determined programme of river restoration.

Paul has been looking into various aspects of this new programme over the last few years, mainly through visits to river restoration sites, discussions with officials and members of non governmental organisations and participation in conferences and seminars. In summer 2000 he wrote a paper entitled 'Following the flow of Japan's river culture', published in *Japan Forum* (12:2, pp199–217), the journal of the *British Association of Japanese Studies*. In this paper, he set the programme of river restoration within the broader context of environmental work in Japan. Paul argued that the image of a river culture (*kawa no bunka*) is conjured up to create a spatial and a temporal field of nostalgia and to make the new 'soft' techniques of river restoration acceptable to a wider public, many of them still wedded to traditional 'hard' methods. Images of childhood, of splashing around in rivers in search of invertebrates, are used to legitimise this programme. Resistance, however, is considerable, not least from within the same organs of central government that are instrumental in promoting new forms of river restoration.

At this point, there is much uncertainty surrounding the type of society into which Japan is developing and the nature of the ideological shibboleths that will hold it together. Debates over river restoration and other aspects of flood control reflect this wider uncertainty.

Source

Waley, P. (2000) What's a river without fish? Symbol, space and eco-system in the waterways of Japan. In C. Philo and C. Wilbert, eds., *Animal Places, Beastly Spaces: New Geographies of Human-Animal Relations*, London, Routledge. Pp 159–181.



Top: Beaches replace mangrove and bathing damages near-shore coral

Middle: Release cages with (left to right) park manager, breeding manager, release managers

Bottom: Black River Gorges National Park

Right, Mauritian Kestrel, one of only five left worldwide

Kestrel (Mauritian)

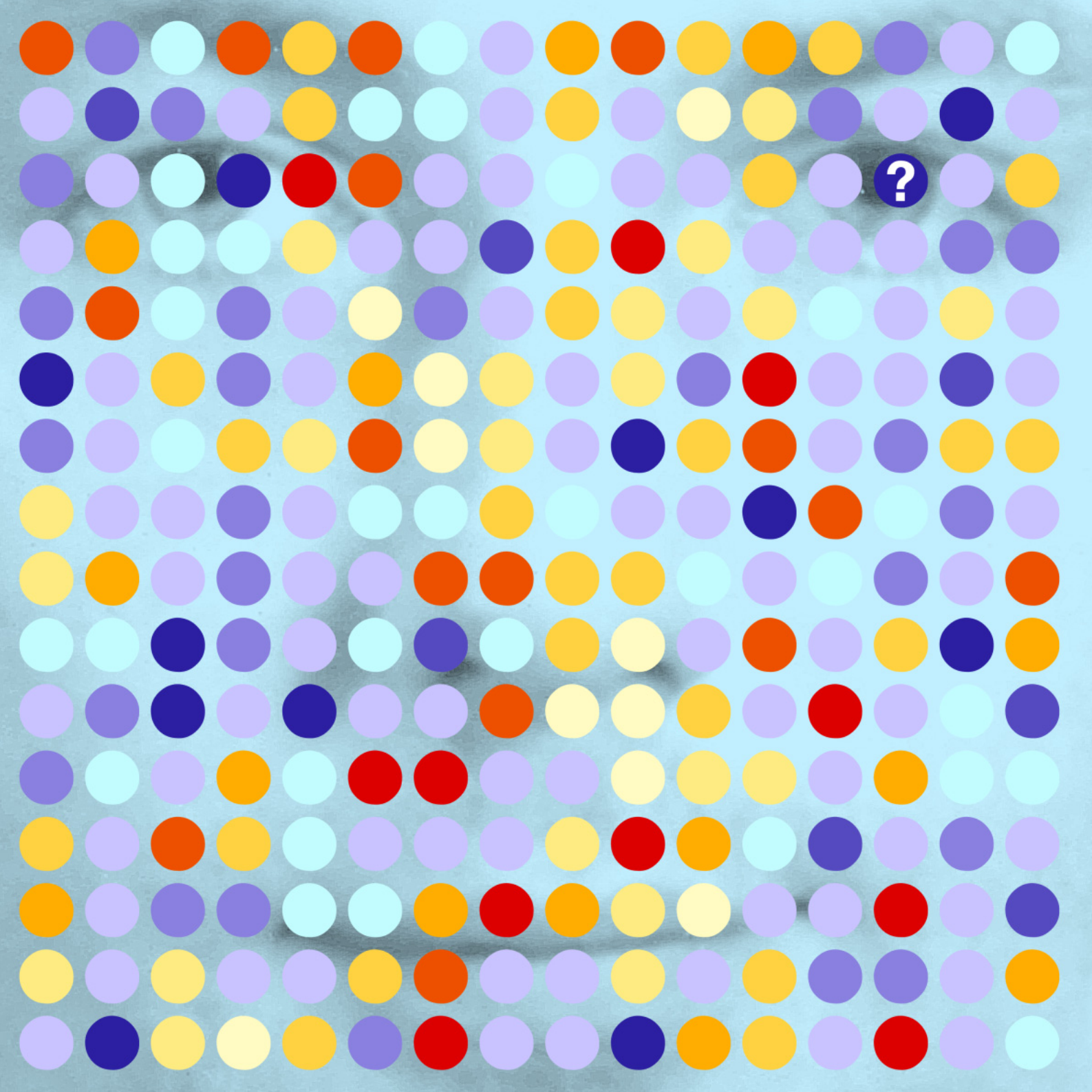
Much, if not most, of the research conducted within the School of Geography at Leeds is international in scope and interdisciplinary in character. Few reaches as far as Adrian McDonald's research. Here he gives one example from an island in the Indian Ocean of 'Environmental Management' – the edge of extinction, and experience into policy.

The University of Leeds has many connections with Mauritius, all, we are sure, completely unconnected to the joy of the climate, landscape and people of Mauritius. Over the last five years, Adrian McDonald has had the privilege of leading a team that worked with local environmental managers (academics, consultants and managers) to identify the key environmental problems and to provide some tools for assessing the problems and possible solutions. The work was very wide ranging and included the air pollution associated with imported coal fired power plants, water pollution for dye house effluents, tourism impacts, habitat loss, bathing water quality, near-shore water contamination and more. Here we outline issues requiring attention if species are to be saved from extinction. Islands are isolated and their biogeography is sensitive because lack of competition has allowed the success of unusual species. In the colonial era species were lost because the land was exploited and habitats were lost. Aggressive or better-adapted exotic species were introduced both accidentally and intentionally. The result was that unique species were lost and more are on the edge of extinction. That pressure continues today through industry and tourism. To save threatened species requires three actions: the removal of predators; the re-establishment of native habitats and supportive breeding programmes. Such actions would be pointless without encouraging current development in a more sustainable style. Culling of some predators (e.g. rats) is effective but other predators are too wily (feral cats) while public sentiment will not allow culling in other cases (monkeys). Habitat restoration is a slow process. It requires training of forest and reserve staff in the recognition of native species and is costly because hand weeding and fencing is required. Captive breeding programmes are required when, as in these cases, only a literal handful of individuals remain alive in a species, and failures and normal loss rates cannot be tolerated. Incubation of eggs by 'domestic' birds and a careful release and hunting training programme are also required. The releases are normally within the Black River Gorges National Park and for this, tourist free zones have been established.

Slides and additional OHPs from a Training Partnerships Presentation can be found at *http://www.geog.leeds.ac.uk/staff/a.mcdonald/talk/talk.htm*

Source

Ecosystems and their Management in (A. Kent, Ed) *Reflective Practice,* pp11–25. Paul Chapman Publishing, London.



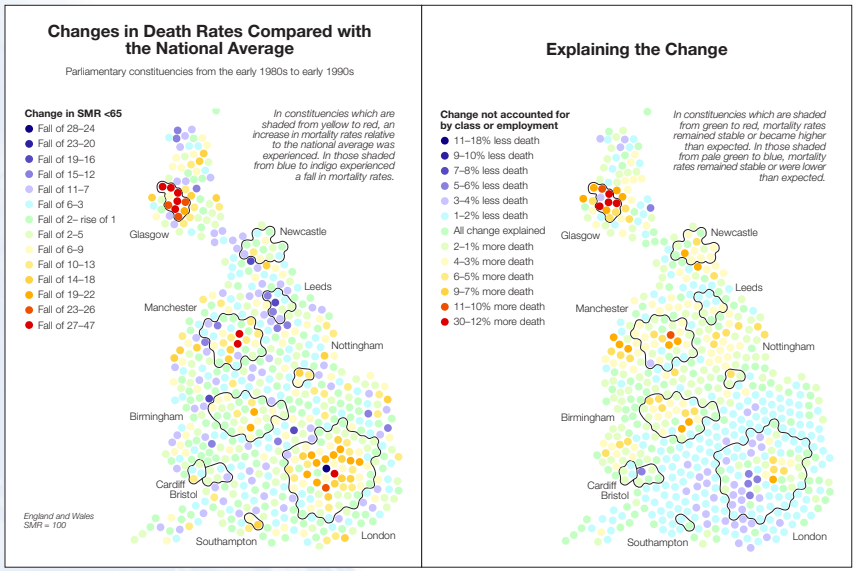
Life chances

In September 2000, Danny Dorling and Richard Mitchell of the University of Leeds, and Mary Shaw of Bristol University, released the results of a major Rowntree Foundation Funded study on lifechances and health in Britain. They found that policies to reduce inequalities in income and wealth, achieve full employment and eradicate child poverty have the potential to prevent more than 10,000 premature deaths each year in Britain – including more than a thousand child deaths.

They concluded that if deprived areas moved closer to the characteristics of an average area, there would be fewer premature deaths. Government policies to tackle poverty and social exclusion could, therefore, have a major impact in making Britain more equal in health as well as income and wealth:

- Returning inequalities in income and wealth to their 1983 levels through redistribution would prevent around 7,500 annual deaths among the under-65s.
- Achieving 'full' employment (where no one was receiving long-term unemployment benefit) would prevent some 2,500 premature deaths a year.
- Reaching the Government's target of eradicating child poverty within a generation would save the lives of around 1,400 children under 15 each year.

These reductions in premature deaths would be concentrated in the most disadvantaged areas. Overall, the report estimates that a combination of all three policies would lead to a reduction of around 56 per cent of the 'excess' deaths in constituencies with above-average premature mortality rates.



The report reinforced the theory that the effects of poverty – and of poverty on health – are cumulative. Improving conditions for today's children will improve the life chances of succeeding generations. In that sense, the estimates the report authors have made of the number of lives that could be saved are conservative.

The two maps shown here present figures for the lives that could be saved and the polarisation of life chances for every constituency in Britain.

Source

Inequalities in life and death: What if Britain were more equal? by Richard Mitchell, Daniel Dorling and Mary Shaw is published for the Joseph Rowntree Foundation by Policy Press.

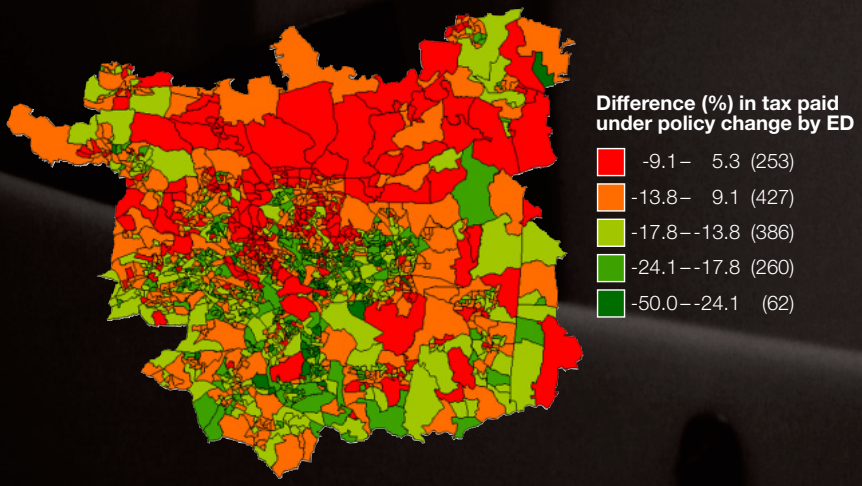
Microsimulation

During 2000, Dimitris Ballas and Graham Clarke worked on microsimulation techniques within the geocomputation and business geography research group of the School. These techniques are increasingly being seen as central to the future of modelling within quantitative geography. Most microsimulation, to date, is aspatial.

Evaluation is a critical step in the formulation of government policies and evaluation can itself influence public opinion. Traditionally, social policies have been analysed at the national level and our focus has been on the impact that they have upon different socio-economic groups and types of households. However, there has been relatively little work on the spatial as well as the socio-economic impact of social policies. In particular, although there have been a number of studies exploring the geography of the changing welfare state and the geography of poverty, there is a general paucity of information relating to the geography of household income, wealth, taxation and welfare benefits. At the School of Geography we have long been arguing that policy-relevant spatial modelling has a lot of further potential for the evaluation of the spatial impacts of major national social policy programmes. Further, we have developed and used spatial microsimulation models in order to perform detailed micro-spatial social policy analysis. An example of such a model is SimLeeds, which was developed and used for policy analysis. For instance, SimLeeds was used to evaluate alternative policy scenarios, such as changes in taxation policy. The figure depicts the spatial impact of a hypothetical progressive change in taxation policy, under which the lower basic tax rates are taken down by 5% and 3% respectively.

As can be seen there would be many localities (enumeration districts) in the north of the city, in which households would have to pay on average more tax if this scenario was adopted. In contrast, there would be over 500 localities in which households would have to pay significantly less income tax. These localities are mostly concentrated in the south of Leeds, whereas the areas that would be benefited less from the policy change are mostly located in the north of the city. There are many other examples of how spatial microsimulation can be used for social policy analysis and impact assessment.

For more details see Ballas and Clarke, 2001; for on-going work on spatial microsimulation at Leeds see *http://www.ccg.leeds.ac.uk/*



Source

Ballas, D. & Clarke G. P. (2001), Modelling the local impacts of national social policies: a micro-simulation approach, *Environment and Planning C: Government and Policy.* 19, pp 587–606

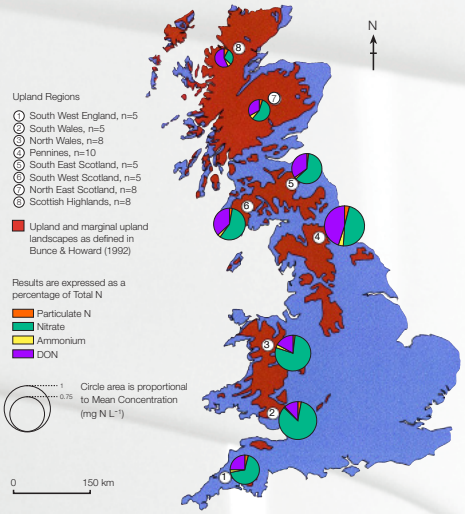
Nitrogen cycle

Pippa Chapman is working in partnership with the University of York and the Macaulay Institute to study concentrations and fluxes of organic and inorganic nitrogen in upland streams of Britain.

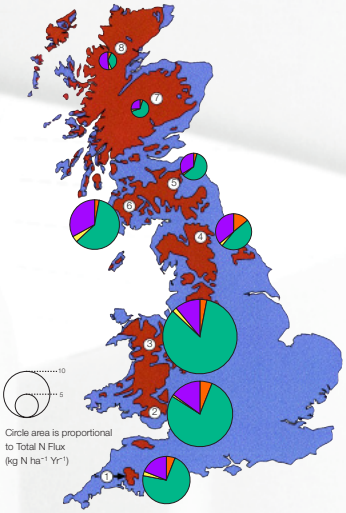
More reactive nitrogen is currently being released into the global environment by human activities, as a result of the burning of fossil fuels and the intensification of agriculture, than by natural processes. This has lead to an increase in atmospheric nitrogen deposition over much of Europe and North America. Research has shown that long-term inputs of the elevated atmospheric nitrogen deposition can lead to saturation of the terrestrial nitrogen cycle, particularly in semi-natural ecosystems, and an increase in the leaching of inorganic nitrogen species (nitrate and ammonium) to surface waters. Increased leaching of nitrate (NO_3) may, in turn, lead to the acidification of the trophic status of streams, rivers and lakes. However, variation in nitrogen deposition generally only explains about 50% of the variance in surface water NO_3 concentrations in Britain. In addition, inorganic forms of nitrogen are not the only forms of nitrogen present in surface waters. A large range of nitrogen containing organic compounds are also present, which are generally and collectively referred to as dissolved organic nitrogen (DON). Little consideration has been given to quantifying DON concentrations in surface waters in Britain and the contribution it makes to total nitrogen fluxes. Without these data it is impossible to evaluate the impact of increased atmospheric deposition on the export of total nitrogen from upland catchments. In addition, the impact of DON on the functioning of freshwater ecosystems, and in particular eutrophication, has largely been ignored.

This study was undertaken to evaluate the factors, particularly catchment attributes, which influence the form, concentration and fluxes of nitrogen in streams draining eight upland regions of Britain, which contrasts with respect to climate, nitrogen deposition, vegetation cover, soil type and geology. The results show that the total nitrogen content of streams varied significantly between the upland regions of Britain. Nitrate accounted for most of the variability in total nitrogen; largest concentrations and fluxes of NO_3 were observed in North and South Wales and smallest concentrations and fluxes in the Highland and Cairngorm regions of Scotland. While this variation in NO_3 concentrations reflected the pattern of nitrogen deposition in Britain, it also reflected variations in land management and the predominant soil type between the upland regions. Concentrations and fluxes of DON also varied between the upland regions, but to a lesser extent than NO_3 concentrations. The DON fraction represented between 11 and 52% of the total nitrogen transported by streams from upland catchments, with the contribution increasing from southern to northern upland regions. In addition, largest concentrations of DON, and smallest NO_3 concentrations, occurred during the summer, when river flows are small and conditions favour algae growth. The potential availability of DON is therefore very important in these headwaters.

Nitrogen Concentrations



Nitrogen Flux



Source

Chapman, P.J., Edwards, A.C. and Cresser, M.S., (2001). The nitrogen composition of streams in upland Scotland: some regional and seasonal differences. *Science of the Total Environment 265*: 65–83.

Old Stone Age

Our historical research in the School stretches back to the ice age and human activity in the Mediterranean at that time. Here, Jamie Woodward describes some of his research on the Palaeolithic (Old Stone Age) period which is often a collaborative effort.

Physical geographers and other geoscientists play an important role in advancing our understanding of the human past, and this fusion of methods and ideas is known as geoarchaeology. The archaeological record of the latter part of the last ice age (between about 30,000 and 10,000 years before present) is of particular interest as this period documents some pivotal stages in the history of our species and saw major environmental changes at global, regional and local scales. Understanding the impact of climate and landscape change on past human societies is a major challenge for both geoscientists and archaeologists concerned with this period.

At the end of the last ice age, southern Europe and the wider Mediterranean region witnessed the demise of the Neanderthals, the emergence of anatomically modern humans and, at the very end of the last glacial period, the beginnings of domestication and agriculture. Most of the evidence for these changes comes from cultural remains that have been preserved within the sediments in rockshelters and caves. However, for several decades the interpretation of these sedimentary records has generated much debate and the leading researchers have employed contrasting methods and theories in their reconstructions. Progress in this field has also been hampered by poor communication between researchers.

To address these and other problems, Jamie organised a symposium in April 2000 in Philadelphia on *Rockshelter Sediment Records and Environmental Change in the Mediterranean Region.* It brought together many of the leading workers in this field and stimulated much debate on issues of sampling, dating, stratigraphic resolution and the differential sensitivity of sites to climate change. The papers from the Philadelphia meeting have been published in two special issues of the journal *Geoarchaeology.* Drawing on examples from sites across the Mediterranean region, Jamie has argued with Paul Goldberg (Boston University) that we must develop more robust conceptual models for the interpretation of these sedimentary sequences so that the archaeological finds they contain can be considered in their proper environmental context. Rockshelters can trap sediments that originate from a range of sources in the landscape and they must by viewed as one part of a much wider geomorphological system. The wider Quaternary (off-site) sedimentary record has often been neglected in the past and establishing the local geomorphological and stratigraphic context of a given site is key to its interpretation.

Source

Woodward, J.C. and Goldberg, P. (2001) The sedimentary records in Mediterranean rockshelters and caves: archives of environmental change. *Geoarchaeology* 16 (4), 327–354.

http://www3.interscience.wiley.com/cgi-bin/issuetoc?ID=78502162

Planning and GIS

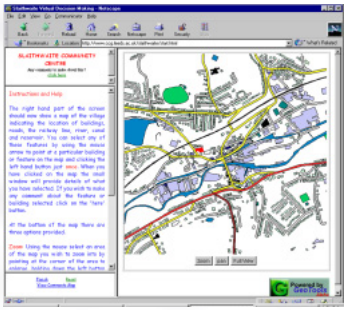
Better decisions about environmental problems can be made with the help of greater public input. Here Steve Carver, Richard Kingston and Andy Evans describe how online GIS can be used to empower the public. Facilitating public involvement in environmental decision-making using online GIS.

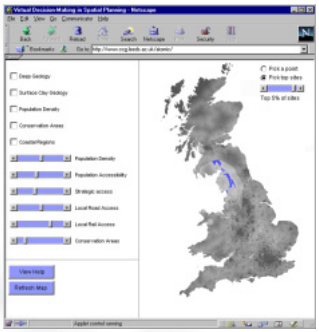
The environment is something most people are concerned about. Yet most of us do not get the chance to become more directly involved in the bigger decisions about our environment; such as where to site a new landfill, how to reduce flooding, and what to do about the rural economy. Opportunities to participate in such decisions are usually limited to commenting on consultation documents or making written representations to our political representatives.

A key obstacle to effective public participation is the lack of access to detailed information in a readily usable and understandable form. The Internet has however brought huge amounts of information within reach of anyone with access to a computer and modem. While Geographical Information Systems (GIS) are used by decision makers to analyse environmental problems, they are complex and expensive software systems and so remain inaccessible to most people. Developments in online GIS made at the Leeds School of Geography have been used to address these problems by making geographical data about specific environmental problems easily accessible, and by providing easy-to-use online GIS with which to use it.

Researchers at the School have developed three case studies focusing on examples of environmental decision problems across a range of spatial scales from local to national. These were a local planning consultation in the West Yorkshire village of Slaithwaite, a regional landscape development issue concerning where to regenerate native woodland in the Yorkshire Dales National Park, and a national study of people's attitudes to siting a nuclear waste disposal facility. Web-based interfaces to each of the case studies were developed to ensure easy access to relevant information, simple GIS tools and the decision-making process itself. In particular, great emphasis was placed on formalising routes by which public inputs are fed into the decision process. There are many advantages of web-based public participation of this kind over traditional means. Results from the research indicate that the public are very receptive to this kind of approach but are very parochial in their interests. Most notably, people are far more likely to show an interest and participate in local decisions that directly affect them, rather than be concerned with national decisions. However, as soon as a national decision about where to place a facility such as a nuclear waste repository are raised, it becomes a local issue and so almost everyone in the vicinity is interested. While much government information and services are now accessible via the Internet, few examples of online participation have been developed. Nonetheless with the greater emphasis placed on accountability and 'joined-up government', it is expected that online public participation will become more commonplace over the next few years.

Source
http://www.ccg.leeds.ac.uk/democracy/



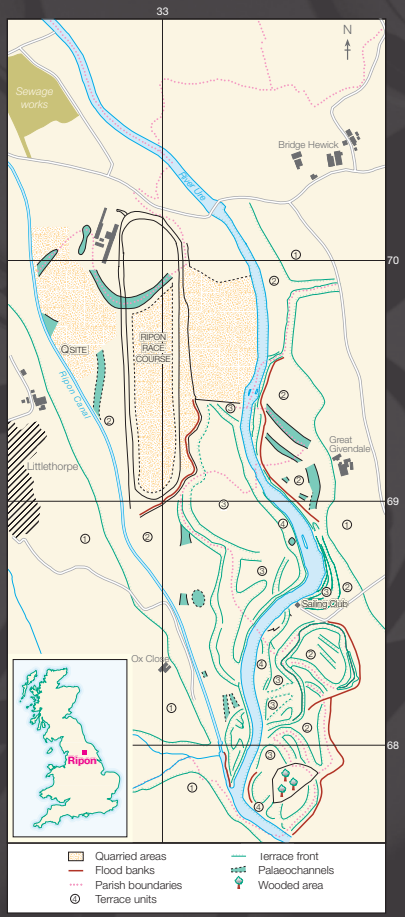


Quaternary

At the School of Geography, University of Leeds, one of our major specialisms involves the study of water and rivers in many of their aspects. One of these aspects involves the study of ancient floodplains to learn more about what the future might hold. Here, Andy Howard, a researcher at the School, describes one facet of this work.

The severe flooding witnessed throughout the UK during the autumn and winter of 2000 has provided some insight into how river systems might be responding to patterns of global climate change, particularly with respect to changing flood frequency and magnitude. The modelling and prediction of this future response is a key research issue for floodplain management over the coming decades and has significant economic and social implications.

An important aspect of any modelling strategy for floodplain management is an underlying understanding of how rivers have responded to past episodes of climatic variability. Since the mid-1990s, initially as part of the NERC-funded Land Ocean Interaction Project (LOIS), the post-glacial geomorphological histories of the rivers of the Yorkshire Ouse basin have been intensively studied. This work, comprising a programme of geomorphological field mapping, sediment analysis and radiometric dating provides one of the most complete records of basin-scale floodplain development and river response to climate change in Europe. Post-LOIS, regular monitoring, recording and sampling of fluvial sediments exposed within valley floor sand and gravel quarries by staff from the School of Geography has continued, and provides an important corpus of information to add to the LOIS database.



In 2000, fieldwork concentrated on the geomorphological field mapping and interpretation of floodplain landforms and sediments along a 3km stretch of the River Ure floodplain near Ripon (see the picture shown here). A unit of peat and underlying calcareous organic mud exposed within the floodplain sedimentary sequence at a quarry adjacent to Ripon racecourse yielded pollen, plant macro-fossils, Mollusca, Coleoptera, and Ostracoda (Palaeoenvironemental analyses were undertaken in collaboration by colleagues at the Universities of Coventry, Hull and Birmingham). These suggest that the sediments accumulated in a shallow, slow moving or stagnant water body, surrounded by marshy, damp, grassland, away from contemporary channel processes, probably of a single thread river system. The climate during deposition of the sediments was no warmer than the present, and possibly slightly colder. The peat unit was radiocarbon dated to *c.*9700 before present and this sequence of fluvial sediments provides the earliest record of post-glacial valley floor river environments yet recorded in the Yorkshire Ouse basin. This fluvial record is close to the glacial-interglacial climatic transition time window and such information from key periods of climatic variability provide important datasets for comparison with scenarios generated through computer simulation.

Source

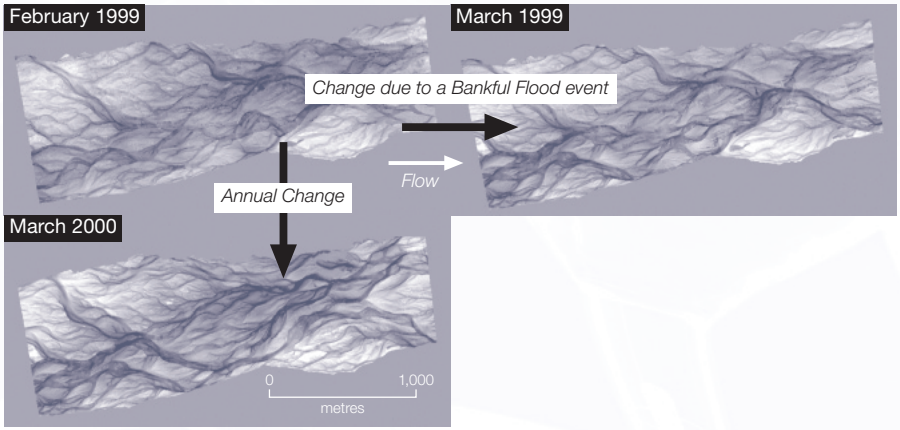
Howard, A.J., Keen, D.H. Mighall, T.M., Field, M.H., Coope, G.R, Griffiths, H.I. & Macklin, M.G. (2000). Early Holocene environments of the River Ure near Ripon, North Yorkshire, UK. *Proceedings of the Yorkshire Geological Society 53 (1),* 31–42.

Rivers

The rivers group at Leeds, Stuart Lane, Richard Hardy, Matt Horritt, Mark Lawless, Tim James and Vahid Tayefi are working from the big through to the little. The last twelve months has seen progress in three main areas: remote sensing; high resolution laboratory measurement; and numerical modelling.

From the Waimakariri River, New Zealand to a pile of stones in Scotland

Stuart Lane has been working with the National Institute of Water and Atmosphere in Christchurch New Zealand *(www.niwa.cri)* and Richard Westaway of the University of Cambridge on a project that is managed by NIWA and funded by the New Zealand Foundation for Research into Science and Technology. The images below show some of the output. The Leeds/Cambridge component of the project has been developing digital photogrammetry for the quantification of the surface morphology of large braided rivers. This is a surprisingly complex process but has been demonstrated to be capable of delivering high quality digital elevation models with a 1.0 m spacing that allow us to see braided rivers as they have never been seen before! Each of these surfaces contains upwards of six million data points. Why do it? By measuring surface morphology, NIWA will be able to get a better understanding of the relationship between flow events of different magnitude, sediment transport and channel change. In doing so, they will be able to advise river managers on how best to manage their rivers. Drafts of a paper that is in press on this topic can be obtained from *s.lane@geog.leeds.ac.uk.* The big problem for this work is that with so many data points, how do we find which data points are right and which are wrong? Thus Tim James has been working upon methods for automatically finding, explaining and correcting error in surfaces like those shown in the diagram above.



The same method used above can also be applied to the measurement of small-scale 'piles of stones'. In studies of flood routing and sediment transport, we have tended to make highly simplified assumptions about the structure of river bed surfaces. We have simply not had the measurement techniques that are capable of measuring these surfaces. The images (bottom right) show a photograph (a) and the corresponding digital elevation model (b) of some water worked gravels from a river in Scotland. The digital elevation model has a 1 mm spacing and elevations are precise to +/ –0.5 mm. These have allowed us to demonstrate that water working of gravels increases their resistance to transport as well as their roughness, so confirming long-held speculations (Butler *et al.*, 2001). This work has been recognised by the Remote Sensing and Photogrammetry Society in 2001 with the award to Stuart Lane of the President's Prize for Photogrammetry.

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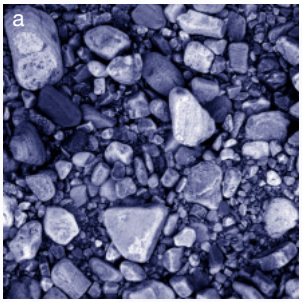
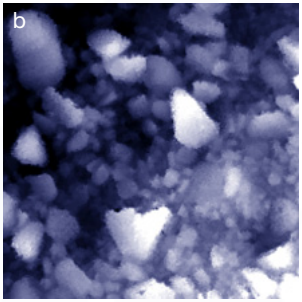
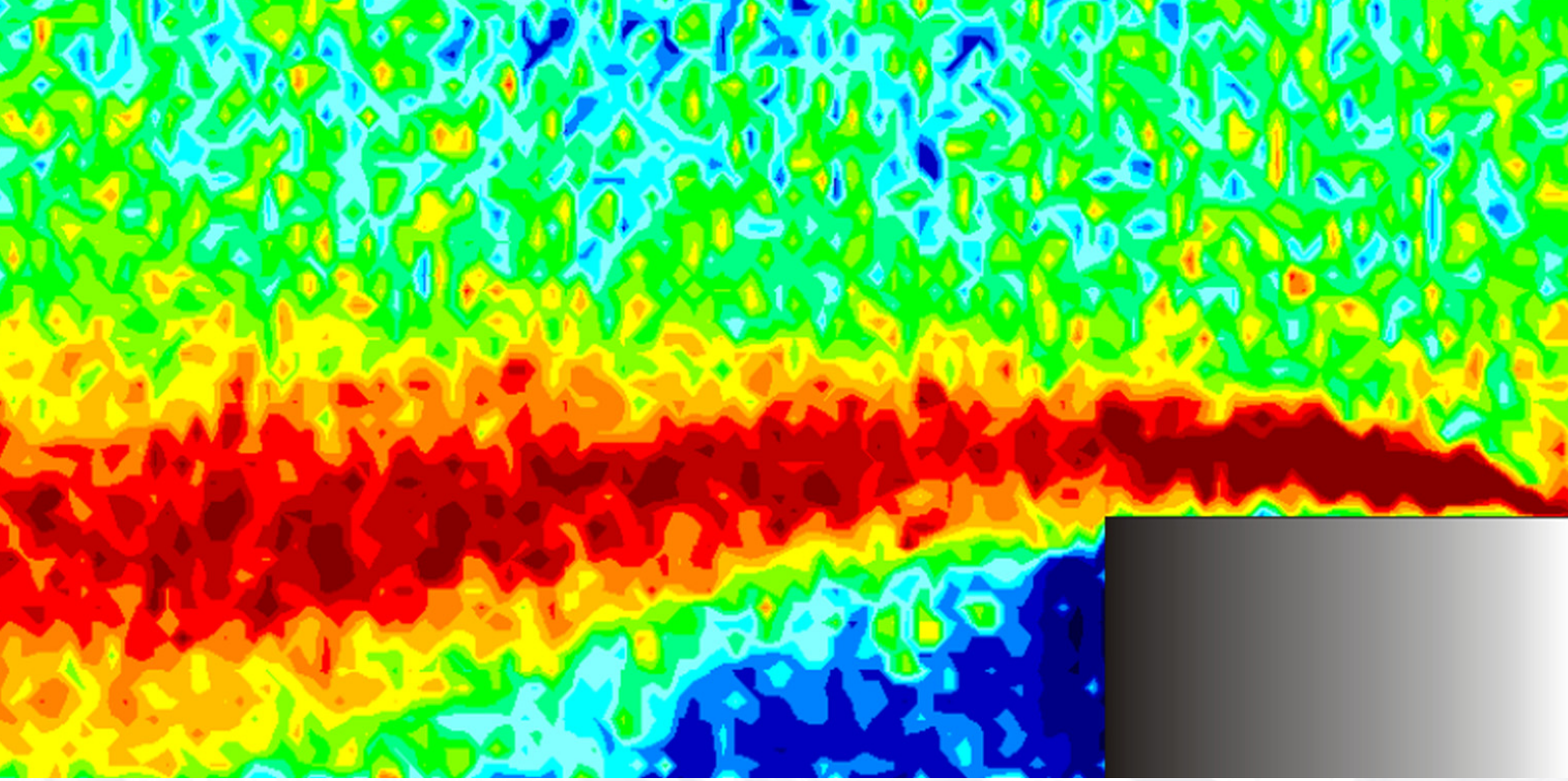






Flow over rough surfaces

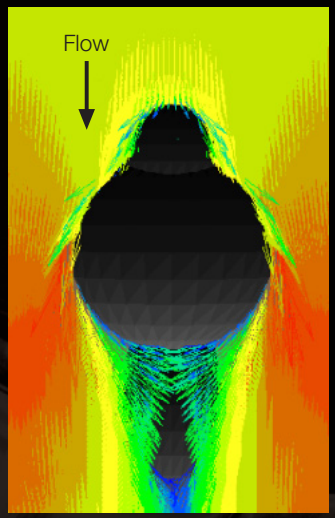
Now that we have been able to measure gravelly surfaces the next stage is to try to measure the flows over them. This has involved strong collaboration with Professor Jim Best in Earth Sciences in Leeds. Jim has just purchased a particle image velocimeter (PIV). This is capable of measuring 3D velocities at 15 Hz at many thousands of points in the flow simultaneously. Mark Lawless is now beginning a PhD to link surface morphologies to flow using a PIV which will tell us about the relationship between gravel surfaces and flow structures.

Numerical modelling

Leeds is at the forefront of developing computational fluid dynamics in 3D for simulating the links between complex natural river channel topography, flow processes and sediment transport. Over the last twelve months, we have been working on two large NERC projects. The first involves Stuart Lane and Richard Hardy in Leeds, as well as researchers in the University of Sheffield and overseas researchers in the Universities of Illinois (Champaign-Urbana), USA and Montreal, Canada. This is concerned with developing computational fluid dynamics for understanding river meanders and tributary junctions. The first of the overseas visits happened during July of 2001, and this has set up some exciting long-term collaborative opportunities for the Universities. This work was recognised by the award to Stuart Lane (and

non-Leeds co-authors) of the Schoemaker Award by the International Association of Hydraulics Research.

The second project has the potential to revolutionise the way that we model natural river channels. Working with Derek Ingham and Lionel Elliott from Applied Mathematics, Stuart Lane and Richard Hardy are developing stable and reliable ways of representing complex topography in numerical grids. The picture (right) shows one of our simulations for flow around two linked gravel particles, similar to that which is being measured in the laboratory using PIV. This example demonstrates the interconnectedness of our research: remote sensing gives us the shape of the river channel; laboratory measurements give us high quality data; the shape of the channel is used to drive our numerical models; the laboratory data can be used to validate them.



The Future

The next few years will see the further development of much of this research. The major new research thrust will be to apply some of these computational methods to problems of growing national (and international) significance. Rob Schindler joins the School in October 2001 with a NERC PhD studentship to work on the treatment of vegetation in CFD code: a crucial control on flooding! The School has recently attracted large amounts of funding from the Environment Agency and NERC to set up a new project based in Upper Wharfedale. This seeks to integrate the hydrology, water quality and sediment movement issues for an upland catchment using numerical modelling. It brings together three School researchers (Adrian McDonald, Mike Kirkby and Stuart Lane) for a new collaborative venture. Vahid Tayefi joined the group in March 2001 to work on modelling floodplain inundation as part of the Wharfe project. Simon Reid joins us in October 2001 to work on improved methods for gravel management in the Wharfe. Finally, Yu Dapeng joins us in October 2001 for the most ambitious part of the project: catchment-wide flood forecasting using distributed modelling. This should begin to allow us to couple upland land use management to flooding at York and so ask a simple question: are floods getting any worse? Finally, we will benefit significantly from the arrival of Dr Matt Horritt as a NERC Research Fellow from the Earth Systems Science Centre, Reading and Geography, Bristol. He has worked on computational fluid dynamics and remote sensing and will bring a new and vital area of expertise to the group.

South Asia



The Department for International Development, UK has commissioned a Consortium led by the University of Leeds to undertake a study into Improving Policy-Livelihood Relationships in South Asia.

The Project's goal was to develop and promote policy options to support rural livelihoods through a range of research, development and advocacy activities. The focus will be on natural resource policies, looking at three policy areas across four countries: Community Forestry in Nepal; Joint Forest Management in Himachal Pradesh, India; Water Policies and Institutional Reform in Bangladesh; Micro-Watershed Management in Andhra Pradesh, India; and Integrated Coastal Zone Management Policies in Bangladesh and Sri Lanka.

This range will provide an opportunity for comparative analysis. In each policy area, the research will analyse policy-livelihood relationships through both the process by which the poor gain access to assets, and the ways in which policies affect this and the origins and characteristics of the policies, their relationship to other policies and laws, the institutional arrangements for implementation, and their interpretation and implementation. As an example this can be seen in Gujarat where the Water Supply and Sewerage Board is responsible for the engineering aspects of 357 rural water supply systems in approximately 3,700 villages. The Department of Narmarda, Water Resources and Water Supply has responsibility for policy matters, the management of rural and urban water supply and budgetary allocations. At the village level *panchayats* are concerned with social welfare, including water resources planning and drinking water. Dutch assistance to Gujarat totalled NLG 35 million (1988–1998), with support concentrated in areas of extreme water scarcity. The research project identified the following three time periods:

(1978–1988) supplied piped water to 98 villages from six tube wells. The evaluation found facilities were in poor condition due to lack of maintenance and operation was poor.

(1987) constructed two additional pipelines and extended the original network. Attempts were made to introduce integrated approaches.

(1997–2002) designed to provide water to 80 villages and one town in a saline intrusion prone area. Development of local institutional capacities to plan and manage local resources was central to the approach.

The objective of increasing the supply of good quality water has been achieved. However there are problems with functioning of systems, often connected to 'ownership' issues. The lack of operation and maintenance capabilities has resulted in questionable sustainability but institutional linkages between the Dutch and Gujarati organisations has resulted in an appreciation for the need for participatory approaches.
The approach adopted in the third-generation project goes some way towards rectifying the lack of institutional processes in earlier projects.

www.geog.leeds.ac.uk/people/j.soussan/

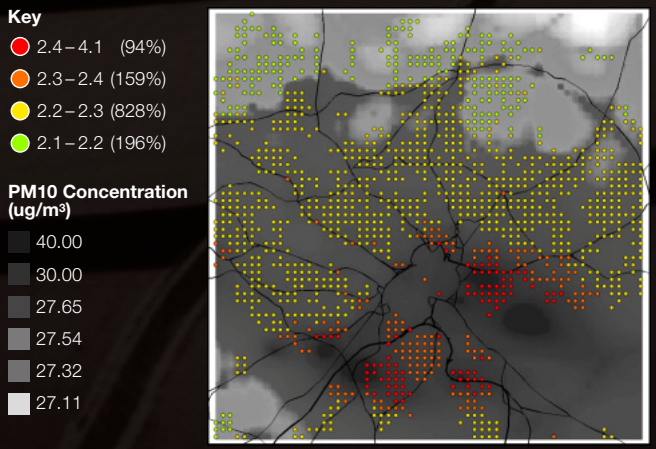
Traffic Pollution

In joint work between the School of Geography and the Institute for Transport Studies at Leeds, Gordon Mitchell and colleagues have studied the impact of urban transport policy on air quality and health. Their work is very briefly summarised here, illustrated by figures showing the degree of social inequality inherent in the geography of pollution.

In conjunction with the Institute for Transport Studies, the School of Geography have been developing a Traffic Emissions Modelling and Mapping Suite, a series of linked numerical models that rapidly provides detailed estimates of vehicle flows and emissions on urban road networks, which together with a stationary source emissions database and a commercial atmospheric dispersion model permits a detailed assessment of urban air quality, (6 toxic pollutants including particulates and oxides of nitrogen, and additionally CO_2 emission and fuel use), and its response to alternative urban transport scenarios.

The health impacts of the modelled air quality are expressed as a 'disease burden', the proportion of a population adversely affected by exposure to environmental pollution. The health model uses dose-response relationships recommended by the government's Committee of Medical Experts on Air Pollution, and a frequency distribution of pollutant concentration, and generally suggests that slightly higher disease burdens occur than estimated using conventional techniques. However, application of the disease burden technique to urban air quality at high spatial resolution (200 x 200m) indicates that city wide disease burdens could be lower than generally believed, due to the respective distribution of pollution and population.

Hospital Admissions Increase due to PM10 (%)



Preliminary application of the model to a large UK city highlights two further observations. Firstly, that government advice on defining local air quality management areas (LAQMAs) on the basis of predicted violations of air quality standards may be inadequate, as the spatial variation in population density means that disease burden 'hot spots' do not automatically coincide with air quality 'hot spots'. Hence LAQMAs defined solely on standard exceedence may be insufficient to achieve the desired degree of health protection. Secondly, analysis reveals that higher respiratory disease burdens are positively associated with non-car ownership and social deprivation (confounding factors such as smoking are accounted for). Thus, this pilot study reveals that the opposite of the 'polluter pays' principle operates, with clear social inequalities. Several transport scenarios and management options are being investigated, including 'business as usual' growth from 1993–2015, infrastructure development, clean fuel technology promotion, and a range of road user charging scenarios with different prices, charge locations and charge type (distance or cordon-based). For each of these scenarios, the air quality and respiratory health implications is being assessed, with particular attention paid to the distributive and social equality issues.

Source

Mitchell, G., Namdeo, A. and Kay, D. (2000). A new disease-burden method for estimating the impact of outdoor air quality on human health. *Science of the Total Environment*, *246*, 2–3, 153–163.

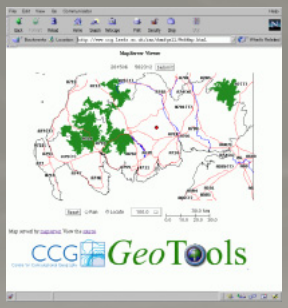
Visualisation

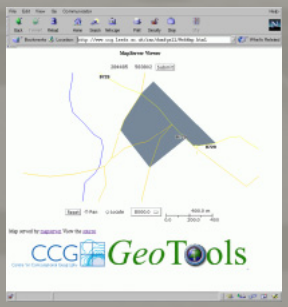
In 2000, the Centre for Computational Geography (CCG) had to operate for the first year without the guiding hand of its founder, Prof Stan Openshaw. Here are two examples of the work which continued following Stan's initial lead, work within the subdiscipline of geocomputation, a subdiscipline invented at Leeds

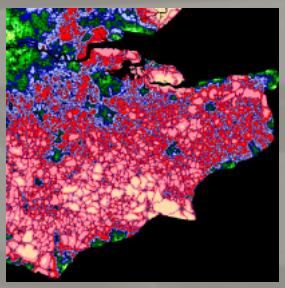
In January 2000, Andrew Turner, Ian Turton and Alistair Walder of the Centre for Computational Geography (CCG) began working on SPIN (Spatial Mining of Data for Public Interest), an EU- funded project, with partners spread throughout Europe, whose main objective is to offer new possibilities in the analysis of georeferenced data. In particular they are developing a state-of-the-art GIS with data mining functionality, having an internet-enabled architecture. Part of their contribution to the project is the extension of existing methods of spatial pattern detection. Their initial objectives were to prepare an up to the minute survey in exploratory spatial data analysis (ESDA), and to provide a theoretical groundwork for the development of methods for handling attribute interaction with spatial locations. Their report concludes that SPIN should provide: tools for visualising exploratory data analysis displays; typical generic data mining classification and prediction techniques (neural networks, genetic algorithms, rule induction and decision trees); various exploratory spatial data analysis tools; linked map and graph displays; some multi-variate statistical methods; fuzzy logic and fuzzy inference based techniques; and, new types of spatio-temporal data mining tools that can handle the special nature of geographical information.

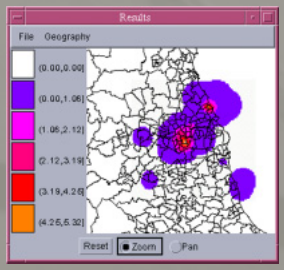
A second example of the Centre's work is GeoTools, an open source Internet aware spatial data visualisation toolkit. Working in collaboration with developers around the world James Macgill and Ian Turton have been developing a working implementation of the OGC specification for web mapping services. These services store vector (and raster) data sets and convert them to images to be sent to a client web browser. Ian has developed a client to help the Dumfries and Galloway police to geo-code road traffic accidents and crimes which do not have an address to attach them to. This is particularly important in the rural areas of the county where the nearest post-coded location can be miles away. Once in use by all their stations it will be possible for the force intelligence unit to carry out detailed crime pattern analysis using tools provided by the School of Geography.

Further details can be found on the project website at *http://www.ccg.leeds.ac.uk/spin*









War

As Robin Butlin showed earlier, in seventeenth century Palestine, the nature of places and events is often, if not always, contested. Examining more contemporary events Marcus Power has been recently studying Geopolitics, representation and colonial war in Africa: the Vietnamisation of Portugal's imperial defence.

Portugal's defence of its African colonies between 1961 and 1974 destroyed the *Estado Novo* fascist dictatorship of Anthónio Salazar, impoverished Portugal and nearly bankrupted the colonies. This research focused on Portuguese involvement with colonial conflict in Mozambique, Angola, Guinea-Bissau and Cabo Verde, which was heavily structured around the US experience in Vietnam and has had major and continuing consequences for the national 'psyche' and national cultural identification.

In 'post-colonial' times the process of decolonisation has reshaped the ways in which these conflicts are remembered and many recent reconstructions have provided quite partial, dehistoricised accounts. Marcus' research examined the particular example of a series of fifty supplements and seven accompanying films produced by a national Portuguese newspaper in the summer of 1998. *Guerra Colonial* represents an interesting form of 'popular geopolitics', (re)scripting the various political processes and events of colonial conflict from a particular perspective. The demoralisation and frustration of Portuguese troops is neglected in this account however in favour of a focus on bravery, heroism and integrity whilst the role of African conscripts recruited to defend Portugal's African empire is down-played and marginalised. The multiple silences and absences of these textual interventions need to be highlighted as does the need to consider a range of other critical and contending versions of the conflicts.

The role of 'Africanization' in Portugal's colonial defence arguably represents a kind of 'celebration in waiting' and a necessary condition for further understanding the messy and mediated nature of Portuguese involvement with conflict in Africa. Marcus's research suggests that many of the African troops that were trained to fight for Portugal later formed an important part of the embryonic nationalist movements in Angola, Mozambique and Guinea-Bissau and that this had crucial implications for the post-colonial (in)stability of these countries.

http://www.geog.leeds.ac.uk/staff/m.power/

Source

Power, M., 2001, Geo-politics and the representation of Portugal's African colonial wars: examining the limits of 'Vietnam syndrome', *Political Geography*, 20, pp 461–491.