

A New Russian Heartland: End of Project Report

Background to the Project

Last year, 2004, marked the centenary of the publication of Sir Halford Mackinder's seminal paper on the 'Geographical Pivot' that formed the basis of his Heartland Theory, a set of ideas concerning the inherent strategic benefits of the Eurasian landmass that informed the Cold War policy of containment. It was also 40 years since another Geographer, David Hooson, published a monograph entitled 'A New Soviet Heartland?' that mapped the extent of the Soviet Union's 'effective occupation' of the Eurasian landmass. When the ESRC announced its New Security Challenges Programme, the timing seemed right to conduct a reassessment of Russia's effective occupation of its national territory. The dramatic, political, economic and socio-demographic changes brought about by the collapse of the Soviet Union have also redrawn the map of Russia. Furthermore, new sources of information and new mapping technologies (the availability of Geographical Information Systems, hereafter GIS) provide opportunities to map new geographies. The New Security Challenges Programme demands that we 'accept an expansive understanding of research on security which will be concerned with conflict and coercion which threatens the stability of societies, or of groups, or of individuals within'. This project has sought to determine how the contemporary geographies of the Russian Federation threaten the territorial cohesion of the state and present a variety of security challenges to the Russian State, both central and regional, to the states that share borders with Russia and to the global political and economic system as a whole. While the project has generated its own analysis of these issues, based on an updating of Hooson's original framework, it also seeks to provide data and maps for other to use in their research (the website contains numerous maps that can be downloaded), in other words, a resource to help 'spatialise' more traditional studies of security issues relating to Russia.

Objectives

The primary aim has been to assess the impact of Russia's recent economic and demographic crises upon the effective occupation of its national territory. A secondary aim has been to identify actual and potential threats to Russia's internal cohesion and external relations. The central hypothesis being that the Soviet period, for economic, ideological and strategic reasons, witnessed an expansion of the 'effective national territory' with the boundaries of the then Russian Soviet Federated Socialist Republic (RSFSR). After Hooson (1966: 342), the 'effective national territory' is: 'that major part of the country which consistently produces a surplus in relation to its population and which, by implication, is therefore supporting the country in a real sense.' During the late Soviet period, state policy promoted the economic development and settlement of peripheral regions of the RSFSR, most notably the 'North' and Siberia and the Far East. At the same time, emphasis upon heavy industry and the 'Military-Industrial Complex (VPK in Russian) resulted in the concentration of economic activity in a small number of industrial regions (concentrated in the Moscow and Leningrad regions and parts of the Volga and Urals regions). The net result was an economic geography, population distribution and a settlement system that supported the goals and logic of the Soviet State. Now that the Soviet system has gone the Russian Federation is experiencing an adjustment to its 'effective national territory'.

The aims of the project have been realised through the achievement of two more specific objectives.

1. *The construction a GIS (using ESRI's Arc-GIS software) on Russia's regions that contains information relevant to the re-worked version of the six criteria identified by Hooson (1964) as the factors determining the*

changing geography Russia's 'effective national territory'. To include a benchmark evaluation of the situation at the end of the Soviet period 1989-91, the dynamics of change during the 1990s and analysis of the current situation in 2002-2004 in terms of effective national territory. The creation of times series data that run from the late Soviet period through to 2002-04 has proved problematic. Data from the 1989 and 2002 Censuses have been used to map demographic change. Political data on elections etc. were not relevant to the Soviet period, but a great deal of data has been collected on the electoral geography of Russia during the 1990s as well as the recent State Duma and Presidential elections. Limited economic data from the late 1980s have been included in our analysis, but a comprehensive dataset of regional economic indicators has been created for the period 1990-91 to 2001-02. The datasets created and the series of maps we have produced represent the most comprehensive description of the contemporary Russian socio-economic and political landscape that we are aware of. However, this is still very much a project in progress, only 5 of 16 volumes of the 2002 Census results have been published and there is clearly much more work that should be done.

2. *The use of the GIS to assess the national situation and identify individual regions and groups of regions within Russia that pose a threat to Russia's internal cohesion and that have the potential to influence its international relations.* In the initial proposal we anticipated a region-by-region profile of each of Russia's 89 Federal subjects. In the end we decided against this approach. First, because a number of directories have been published recently that provide such profiles, the most recent being 'Russia: All 89 Regions Trade and Investment Guide (published by CETC Publishing Ltd.)'. Second, the delayed publication of the 2002 Census results meant that we were limited to the sorts of data published in existing directories, in other words there was no obvious value that could be gained from producing yet another set of profiles using the same data. Third, and most importantly, analysis at the national scale made it very clear that such profiling was unnecessary to achieve our broad aims, the economic, political and demographic dimensions that we analysed could be explained without reference to detailed profiles. In sum, we were able to identify regions and groups of regions that pose a threat to Russia's territorial cohesion without the profiling.

Methods

The project's research design was derived from the original study by Hooson. Hooson identified six criteria, these were re-organised and revised into three dimensions with six sub themes:

ECONOMIC DIMENSIONS

- The scale of contribution to the national economy
- Economic specialisation and resource dependence

POLITICAL DIMENSIONS

- Regionalism
- Ethnic considerations

DEMOGRAPHIC DIMENSIONS

- Population growth/decline
- City growth/decline

Three methods were employed in the project: first, the analysis of previous research on the economic, political and demographic dimensions of Russia's post-Soviet transformation; second, the collection of quantitative data on these same three dimensions, and third; the use of a GIS to

map aspects of all three dimensions. Each of these methods produced a definable set of outputs: the literature based research resulted in three working papers by the project Research Assistant and an annotated Bibliography; the quantitative data collection resulted in the creation of a series of excel spreadsheets and an Access database (for use with the GIS); and the creation of the GIS enabled the production of a series of maps. The internal division of labour within the project was that Professor Bradshaw focused on the economic dimension, Jessica Prendergrast (the RA on the project), on the political dimension, and both worked on the demographic dimension. Together all of these outputs were combined in a major co-authored journal article to be published in *Eurasian Geography and Economics* in early 2005. In addition to the Leicester-based research effort, two papers were commissioned from Russian Geographers, one on the economic and demographic dimensions (also to be published in *Eurasian Geography and Economics*) and a second on the political dimension is to be published as a working paper via the project website (it is currently in the final stages of editing). These papers provide a distinctly Russia view on the issues raised by Hooson's original analysis and also provide the Western reader with access to recent Russian research. To date, the project has not employed sophisticated statistical analysis of the datasets generated. First, because such analysis was part of an earlier ESRC project carried by Professor Philip Hanson and Michael Bradshaw that resulted in the edited collection entitled *Regional Economic Change in Russia* (rated outstanding). Second, a great deal of material has already been published that analyses levels of regional inequality in Russia, including a paper by the Bradshaw and Vartapetov (2003) (this is currently being updated using data from the project). Third, as with the profiling issue, most of the published research uses the same sets of data so there was little that this project could add, that said there is still a great deal of information to come out from the 2002 Census and that will lend itself to statistical analysis and we would hope to do this in a follow-up project. It is worth emphasising that the original contribution of this project lies as much in the creation of the GIS and the mapping of the various dimensions of the geographies of Russia's transformation, as it does the reassessment of Hooson's original work. In the process of mapping the results we have sought to use some innovative techniques to visualise the contemporary Russian landscape (for example, see the 3-D maps that have been included in the Appendix).

Results

Discussion of our findings is organised around the three dimensions presented above. A more detailed summation of our analysis and findings can be found in the article submitted to *Eurasian Geography and Economics*, a draft of which we have included as a nominated output.

The Economic Dimension: As noted above, this component of the project benefited from previous ESRC-funded research. The first stage of the analysis was an update of work on restructuring and regional change. It is now accepted that the Russian financial crisis of 1998 represented a watershed in the relationship between national economic performance and regional change in Russia. Prior to 1998 the emphasis was on the geography of decline associated with transitional recession and the collapse of the Soviet-planned economy. The most important factor explaining economic performance seemed to be inherited economic structure, with those regions dominated by the resource sector showing the greatest resilience; while those specialising in manufacturing and light industry suffering the most. The substantial rouble devaluation that resulted from the 1998 crisis created an 'import substituting' opportunity for the manufacturing and consumer-oriented sectors of the economy. Because the cost of imports increased domestic production was again competitive, furthermore, many enterprises had idle capacity that meant the production could recover without substantial new investment. Geographically, this post-1998 recovery benefited the European regions of the country where most of this economic activity was located and where most of the market resided. At the same time, increasing export revenues from

exports of natural resource (primarily oil and gas, but also ferrous and non-ferrous metals and forest products) meant that the resource-producing regions were still making the largest contribution to the national economy. This activity benefited the northern and eastern regions of the country.

It is against this national backdrop that we addressed the economic dimensions of Hooson's framework, first, the contribution of various regions to the national economy and second, the level of economic specialisation and resource dependence in the Russian economy. Analysis of the regional pattern of contribution to the national economy revealed an increasingly high level of concentration and consequently an increasingly fragmented economic geography in which a small number of relatively isolated groups of regions contributed the bulk of Russia's national economic output. In 1990, using the Soviet measure of Net Material Product (NMP) the top 10 regions accounted for 39.3 percent of the economic output of the Russian economy. In 2001 the top ten regions accounted for 53.3 percent of total Gross Regional Product (GRP). While there are problems comparing NMP and GRP, analysis of other economic variables also shows a very high level of geographical concentration. An analysis of the changing relationship between foreign economic activity and regional development was carried out as part of this study (the forthcoming paper in *Geografica Polonica*) and it revealed that on average between 1995 and 2002 the top ten regions accounted for 82.13 percent of Russia's FDI and in 2001 the top ten regions accounted for 63.4 percent of total exports and 78 percent of imports. Comparison of the regions included in the various 'top tens' reveals the same dozen or so regions, topped by Moscow city and Moscow Oblast and Tyumen Oblast (Russia's major oil producing region), also regular members of the top ten are: St Petersburg, Tatarstan, Bashkortan, Samara, Sverdlovsk and Krasnodar. Given that the Russian Federation is comprised 89 federal subjects (87 regions and the federal cities of Moscow and St Petersburg), this means that the vast majority of Russia's regions make a very modest contribution to the national economy and to Russia's international economic standing. Thus, in a very real sense Russia's 'effective national territory' is highly concentrated. Three-dimensional mapping of regional variations in GRP shows a very strong bias towards the northern and eastern regions. This is related to the second theme analysed in the economic dimension, namely economic specialisation and resource dependence. The structural consequences of the economic decline suffered by Russia during the 1990s and the recent economic recovery has been an increasing reliance upon resource production and export. While there has been recovery elsewhere, the general trend is for a 'primitivisation of Russia's economic structure, in other words an increasing share of economic activity is in the resource sectors. Geographically this favours the eastern and northern regions of the country where most of these activities are concentrated. At the same time these are some of the least populated regions of Russia, consequently per capita measures of GRP tend to exaggerate the role of these regions. Nonetheless, the current situation presents a clear spatial mismatch between those regions that contribute the most to the national economy and those that house the majority of the population. This has political consequences that are discussed in the next sub-section.

The Political Dimension: the literature on territorial aspects of the Russian Federation has tended to focus on three issues: centre-region relations, the role of the ethnic republics and electoral geographies. While we have collected and mapped electoral data, a great deal has been published elsewhere on this issue; instead we focused on two issues that we re-worked from Hooson's original analysis: ethnic considerations and regionalism. The political dimension did not figure highly in Hooson's original work, at that time in the Soviet Union strong central political control dampened expressions on ethnic nationalism and regionalism. However, following the collapse of the Soviet Union these issues have received a great deal of attention due to the relative collapse of central control and a more liberal political environment that allowed the expression of a variety of national and regional identities. The accepted view of Russia during the Yeltsin years

was of a weak and ineffective central state that had lost control over Russia's constituent regions. As a consequence Yeltsin did deals, initially with ethnic republics and then with the more powerful non-ethnic regions that ceded power to the regions. In the absence of a strong Russian civic (as opposed to ethnic) identity, ethnic groups and regions promoted a variety of identities and many ethnic republics introduced programmes to enhance the standing of their 'ethnic' language and culture. The result of Yeltsin's deal making was a form of 'asymmetrical federalism' where some regions were more powerful, or had greater autonomy, than others and the most powerful were the ethnic republics that were also important economic centres, such as Tatarstan and Bashkortostan. In this complex landscape republican status alone was not sufficient as the majority of Russia's republics rank among the poorer regions of the federation. At the same time, there were non-ethnic regions that were economically powerful that used that status to promote a strong regional identity and to secure privileges from the central state. Thus, the economic landscape discussed above interacted with the political landscape to produce a complex, fragmented and inequitable situation.

When President Putin came to office in May 2000 the first thing he did was to introduce a set of reforms that curtailed the autonomous activities of Russia's regions. He spoke of the need to re-establish the power vertical, by which he meant that the federal agencies in the regions needed to regain their authority and regional governments needed to abide by federal legislation. Through reforms in the tax system he changed the distribution of revenues to favour the federal centre, thereby reducing the resource available at a regional level, making the regions more dependent on Moscow. The deals done during the Yeltsin period were not renewed and only a handful of the most powerful regions were able to negotiate with Moscow. Most recently, post-Beslan, he has stopped the direct election of regional governors (though not Republican Presidents) and has further centralised control over the regions. All of this equates to a strong centralising tendency. The problem with this is that it places a great deal of responsibility in the hands of the Federal Government in Moscow to get things right to identify and deal with the regional problems that now face Russia. During the 1990s it was the powerful ethnic republics and regions that were seen as posing a threat to Russia's territorial integrity; our analysis suggests that it is now the reverse, it is the impoverished republics and regions that are the greatest source of instability. Geographically, these regions are concentrated along the southern border of the Russian Federation. Undoubtedly, the conflict in Chechnya has been a major contributory factor, but there are deep-seated socio-economic problems that underlie that conflict. In other words, these regions are suffering from under-development and in many instances this is complicated by their complex ethnic structure and republican status. Republican status is not the explanatory variable as there are regions in Russia's extended 'south' that are ethnically Russian and suffer from similar problems. These regions are not making a significant contribution to the national economy; rather they are a drain on the economy and will need substantial net transfers from the richer northern and eastern regions to overcome the problems that they face. Furthermore, this situation is further complicated by the contemporary demographic situation that is placing added pressure on the 'south', while undermining the economic viability of the more prosperous 'north'. This is a situation that threatens the territorial integrity of the Russian Federation.

The Demographic Dimension: Even before the collapse of the Soviet Union, the Russia population was under demographic stress. If one ignores the short-lived positive benefits of the Gorbachev anti-alcohol campaign during the late 1980s, many of the demographic trends that contribute to Russia's current demographic crisis have their origins in the 1970s and early 1980s. That said there is no doubting that the 'transitional stress' of the 1990s has added new problems. At the same time the collapse of the Soviet empire has resulted in considerable return migration on the part of the Russian diaspora located in the other post-Soviet republics, especially from the Transcaucasus and Central Asia. This migration stream has promoted population growth in the

southern border regions of Russia. Economic crisis within Russia has also promoted a migration stream out of the northern and eastern regions, especially the Russian Far East. With the benefit of detailed district-level population data from the 1989 and 2002 censuses, the project has mapped the demographic dimension in considerable detail. At the macro level the pattern is relatively clear-cut. During the inter-censal period very few regions have benefited from positive natural increases (those regions that have are the Islamic republics); instead as the population has aged most regions have recorded natural decrease as death rates have exceeded birth rates. The residual pattern of population change is a direct result of migration. The northern and eastern regions have experienced significant out migration, while the southern regions have been the major beneficiaries of in-migration, some of which is internal economic migration, but most of which is migration from the other post-Soviet republics (so of which is forced), as well as people displaced by the conflict in Chechnya. More detailed mapping at the sub-Oblast and Federal District level reveals a highly fragmented population distribution. Within regions people have moved from rural areas to oblast centres leaving large expanses of depopulated territory. This is as much a problem in the Central Federal district as it is in the Far East. In the Far East, a region that accounts for 36.4 percent of Russian territory, the out-migration of the population is now raising real security concerns in Moscow, especially given the possibility of substantial Chinese into these empty lands. In the Russian South the problem is very different. As discussed above, the very regions experiencing population growth are some of Russia's poorest economically and complicated politically.

At a national scale, there is a somewhat paradoxical situation of both an increasingly fragmented inter-regional distribution and an increasing concentration of the population in urban centres. Again, somewhat paradoxically, international comparison suggested that central planning has left Russia with an urban hierarchy that has too few large urban agglomerations. Experience suggests that the types of 'agglomeration economies' that are generated in large city-regions are critical to a country's economic competitiveness. In short, the spatial distribution of Russia's population is likely to impose major welfare costs on the central state and is not conducive to sustainable economic growth. This is a situation that seems certain to deteriorate further as all the population estimates suggest continued decline. When one combines analysis of the economic geography of Russia with the demographic projections, the mismatch between the regions that generate income and those that house people is likely to become more pronounced. This may not become a political problem if the central state can build a political consensus in favour of the redistribution of income from the sparsely populated resource-exporting regions to the relatively impoverished southern border regions. At present it seems that such adjustments will come from increased central control and federal programmes targeted at problem areas, rather than a coherent regional strategy aimed at maintaining territorial cohesion.

Conclusions: the territorial cohesion of the Russian Federation:

In our analysis we have evoked the European Commission's notion of 'Territorial Cohesion' in seeking to assess the consequences of the contemporary situation in Russia. In their Third Periodic Report on economic and social cohesion in the European Union, the European Commission (2004, p. 27) sees the objective of 'territorial cohesion' as being: 'to help to achieve a more balanced development by reducing existing disparities, avoiding territorial imbalances and by making both sectoral policies that have a spatial impact and regional policy more coherent. The concern is also to improve territorial integration and encourage cooperation between regions.' Our analysis suggests that the contemporary processes of geographical change and Russia's 'effective occupation' of its national territory present a number of problems that threaten the state's territorial cohesion. These can be summarised as follows:

The Siberian dilemma: which refers to the fact that in the near future the resource regions of 'Siberia' are likely to remain major contributors to the national economy, yet they are experiencing significant population decline and economic downsizing. The challenge is to develop a new model for Siberian development that is not dependent on substantial permanent population and this is more 'sustainable' from an economic and ecological viewpoint.

The Moscow effect and the missing millionaires: which refers to the excessive economic and political dominance of Moscow and the peculiarities of Russia's urban hierarchy that may undermine the development of new economic activity in the regions and thus sustainable economic recovery. Similar problems have been faced elsewhere and policies to reduce Moscow's primacy and to promote the development of major city regions in European Russia may be needed to create constitutions for economic growth.

The fragile borderlands: which refers to the growing social, demographic and political problems in the southern borderlands of Russia. This is probably the single greatest threat to Russia's territorial cohesion, not in terms of the threat of succession, but in terms of the potential for further social unrest and conflict and a general situation of lawlessness. This situation demands that the federal government develop a more active regional policy that address both the economic and welfare needs of the population.

Archipelago Russia: which refers to the fact that instead of a major belt or zone identifiable as the effective national territory, the contemporary landscape is more an *archipelago* of islands of relative prosperity that contribute the bulk of the national economy. Instead of Hooson's New Soviet Heartland with its core region, expanding Volga-Baykal region and marginal areas, in 'Archipelago Russia' (after Dienes 2002), outside of the integrated economy is a vast 'dead space'. This may be an overly pessimistic vision of contemporary Russia, but it does drive home just how dramatically things have changed as a consequence of Russia's transformation.

Today Russia is a fragmented State; the mappings of the economic, political and demographic dimensions presented in this project suggest a complex geographical reality that defies simple generalisation. There is no doubt that the Soviet system bequeathed a geography of population and economy ill suited to the needs of a market economy, but it is also clear that the actions during the 1990s more often than not made a bad situation worse. This project has demonstrated that the geographical dimensions of Russia's transformation do pose major challenges to the State's territorial cohesion and this is a source of new security challenges to Russia, her neighbours and the world more generally.

Activities

In addition to the Leicester-based research activities, the project resulted in a number of conference presentations, a special session at the International Geographical Congress and an end-of-project seminar for a non-academic audience at Chatham House last September. The level of activity was far greater than anticipated in the original proposal and this has stimulated interest in the project and its findings.

Conference presentations and sessions

'A New Russian Heartland'? A paper presented to the Ed. Hewett Forum for Former Soviet Affairs, The Brookings Institution, Washington D.C. March 2004. This presentation was at the invitation of Dr Clifford Gaddy and Dr Fiona Hill and enabled Professor Bradshaw

to present some initial project findings to the Russia-related academic and policy-making community in Washington D.C.

‘A New Russian Heartland?’ A paper presented at the Annual Meetings of the Association of American Geographers, Philadelphia, March 2004.

‘Geographical Perspectives in Russia’s Resource Curse’. A paper presented at the Centre for Russian and East European Studies (University of Birmingham) Annual Conference, Cumberland Lodge, Windsor, June 2004.

‘A New Russian Heartland?’ Special Session at the RGS-IBG Annual Conference, with the IGC-UK, Glasgow, August 2004. This was a special session dedicated to the project and included papers by the projects two Russian participants: Dr Andrey Treyvish (Institute of Geography, Russian Academy of Sciences and Moscow State University) and Dr Nikolai Petrov (Moscow Carnegie Centre and Institute of Geography, Russian Academy of Sciences), as well as Timothy Heleniak (UNICEF), an internationally-recognised expert on Russian Demography.

‘A New Russian Heartland?’ Special Seminar organised for the Russia and Eurasia Programme at Chatham House, London, September 2004. The majority of the seminar was dedicated to reporting the findings of the study; it also included presentations by Timothy Heleniak (UNICEF) on ‘Geographical Dimensions of Russia’s Demographic Crisis’ and by Professor Graeme Herd (George C. Marshall European Center for Security Studies) on ‘The Security Implications of Russia’s Demographic Crisis’.

Publications

Working papers

Prendergrast, J. 2004, *Regional Identity and Territorial Integrity in Russia*, Working Paper No.1, New Russian Heartland Project, Department of Geography, University of Leicester, 35 pages

Prendergrast, J. 2004, *There are republics and then there are republics: Who matters*, Working Paper No.2, New Russian Heartland Project, Department of Geography, University of Leicester, 39 pages

Prendergrast, J. 2004, *The Regional Consequences of Russia’s Demographic Crisis*, Working Paper No.3, New Russian Heartland Project, Department of Geography, University of Leicester, 35 pages

Petrov, N. and Smirnyagin, L. 2005, *Russia’s Changing Socio-Political Space*, Working Paper No.3, New Russian Heartland Project, Department of Geography, University of Leicester, 25 pages (at final editing stage)

Journal Articles

2005 Bradshaw, M J ‘Foreign economic activity and regional change in Russia: continuity and change’, *Geografica Polonica*, forthcoming.

- 2005 Bradshaw, M J and Prendergrast, J 'The Russian Heartland Revisited: An Assessment of the Impact of Russia's Transformation', *Eurasian Geography and Economics*, Vol. 46, forthcoming.
- 2005 Treyvish, A, 'A New Russian Heartland – Population and Economic Dimensions', *Eurasian Geography and Economics*, Vol. 46, forthcoming.

Other output

A New Russian Heartland? A Selected Bibliography, 61 pages (available via website as a word document and an Endnote or Procite file).

A Powerpoint presentation of end of project seminar at Chatham House available at project website as a PDF

Project Website: <http://www.geog.le.ac.uk/russianheartland/index.html>

A CD with project working papers and bibliography, the Arc-GIS boundary sets, project datasets and maps is to be made available at a modest charge for academics and market rates for commercial users.

Impacts

In some ways it is still too early to tell. The formal publications are yet to appear in press and we are only now in a position to advertise more widely the outputs of the project. Certainly, the intent of the project generated a great deal of interest at the various conferences and seminars and those that have visited the project website and used the working papers and bibliography provided very positive feedback. A key aim of the project website is to make our findings available to other users for teaching and research purposes. For example, Professor Held (Marshall Center) is using our maps in his lectures at the Marshall Center for Security Studies. When the articles are published in *Eurasian Geography and Economics* this will give the project a high profile, we are also disseminating the project website URL via various list serves and specialist websites.

Future Research Priorities

This was a modest project designed within the small grant framework of the New Security Challenges Programme. In 12 months it achieved its major aims and objectives. Some of our plans were frustrated by the delayed publication of the 2002 Russian Census. With the benefit of hindsight this may have been a blessing as we were in danger of being swamped by data. Instead we have produced a focused study that has created a GIS to analyse the geography of economic, political and demographic change in Russia. We have identified a number of regional problems that threaten the territorial integrity of the Russian Federation (the Siberian dilemma, Moscow and the missing millionaires, the fragile borderlands and archipelago Russia); these require further study and analysis to understand the processes that are generating them and thus the policies that might ameliorate them. At the same time, the bulk of the 2002 Census has still to be published and there is worth in processing and mapping that data, both to address the problems identified above and to produce datasets and maps for others to use in their teaching and research. It is planned to submit an application to ESRC to pursue both of these aims.

Appendix: Sample Maps



