

INTEGRATION IN PRACTICE: CHALLENGES FOR RESEARCH AND POLICY

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The paradox of interdisciplinarity

Recent years have witnessed a growing consensus on the need for interdisciplinary research to inform policy. The concept of interdisciplinarity is widely embraced and the practice recognised as a worthwhile endeavour. Calls from funding bodies to work across disciplines in addressing research problems are growing in frequency. Yet Caruso and Rhoten (2001) draw attention to the paradoxical situation in which, in a climate of increasing demand for interdisciplinary work, there are relatively few examples of its success in practice and even fewer examples of its use in policy integration. Current awareness of the need for policy development to take on board issues that cut across conventional areas of responsibility at local, national and international levels is not yet being matched by effective action.

It is by no means easy to apply an integrative approach in research and, all too often, projects intended to be interdisciplinary merely include expertise from different disciplines without the real integration that so often remains 'elusive' (Newell, 2001). Many calls for interdisciplinary research make mention of innovative methods to address cross-boundary problems. Often, however, there is a danger of what Dervin (2003) calls the 'pastiche' method of interdisciplinary research. The danger is that in striving to cross disciplinary boundaries, researchers simply expand the list of things to consider in addressing a research question and produce outputs that are diverse and often inconclusive.

That policy makers still tend to be bound within their own areas of expertise is hardly surprising given the degree to which they are bombarded with disparate information from a wide variety of sources. Dervin (2003) argues that, without systematic treatment, interdisciplinarity can itself contribute to 'the plethora of theories, concepts, approaches, methods, and findings which plague researchers within and between fields and bewilder policy maker and practitioner observers' (p1). She points to the growing dissatisfaction of policy makers with research outputs that are at best confusing and at worst contradictory. Here we argue that this situation is likely to persist unless the research evidence on which decision makers rely can itself reflect coherently the holistic nature of the social, environmental and economic problems that policy aims to address.

An increasing number of research funding bodies are encouraging programmes that take an interdisciplinary approach. In doing so they demand that research proposals demonstrate a commitment to integrating the expertise and understanding of researchers from a range of different experience and backgrounds. In the UK, for example, a programme funded through a collaboration involving three research councils and two government departments aims to advance understanding of the social, economic, environmental and technological challenges faced by rural areas by enabling researchers from different scientific disciplines to work together. The results of this Rural Economy and Land Use (RELU) programme should support the achievement of sustainable rural development by informing policy on the social and economic vitality of rural areas and the conservation and protection of the rural environment.

This paper is based on research for a scoping study that forms a small part of the wider RELU programme. The study involves researchers from both social and natural science backgrounds. Our aim is to integrate natural and social science data into a spatial database that can be used for analysis to inform rural policy-making in England and provide a knowledge base for furthering policy integration. A further aim is to highlight and address the methodological issues that arise in working with spatial data from sources in the social and environmental domains. Here we use our experiences from the study to date to exemplify some of the synergies and conflicts that can arise from integrating social and natural science methodologies. We first identify the stages of the research demanding fresh interdisciplinary approaches. These range from initial conceptualisation and definition of the research problem, through research design and data collection, to the interpretation of findings in an interdisciplinary framework and their dissemination to a diverse audience of potential users. At each stage we find the need to challenge traditional discipline-based assumptions and develop new forms of systematic interdisciplinary communication and co-operation. Here we tease out general aspects of these challenges that are of relevance to both research and policy. Our aim is to draw parallels between the difficulties encountered during the practice of research and those confronting policy makers.

The research process

Conceptualisation of the research problem

The very nature of sustainable development means that it is not amenable to single discipline lines of inquiry. UK government definitions of the concept include social, environmental and economic strands (DETR, 1999). But the essence of sustainable development is that these are not separable in their impacts on rural life. In the study that forms the basis of this paper, the task is to compile a spatial dataset that incorporates social, environmental and economic variables relating to rural conditions in England and Wales. One of the first tasks for the research team was to establish a rationale for selecting the data with real relevance in order to avoid the risk of drowning in the vast range of available information. We needed to keep a clear focus in our work.

We soon discovered a natural tendency to classify information as social, environmental or political and economic. But we wanted to develop a mode of thinking that broke down this traditional association with particular disciplinary ways of viewing rural conditions. After much discussion and debate we designed a framework that embraced, firstly, the physical components of rural areas, whether natural or constructed. Secondly came consideration of the qualities and character of both places and people in the countryside and, thirdly, information about living and working there. Influencing all of these aspects of rural conditions are the political and economic structures resulting from a history of, often diverse, policy making. Figure 1 illustrates the interdependencies between components of the scheme. Under each category we assembled examples of the kinds of information that might be selected for inclusion (Table 1).

This framework helped to focus the study design and eased discussion as it moved our thinking away from the abstract, lending it solid form. We were aware that in making this shift from the abstract to the practical there might arise a tendency for each researcher's own original discipline to dominate his or her thinking. Early discussions, however, soon revealed an unexpected phenomenon. Although the investigators all have experience in dealing with both social and environmental data, much of their recent research has tended to lie in one or the other of these traditional domains. One might have expected that more familiarity with social problems, for example, would lead to a researcher giving higher prominence to social aspects of rural life. However, this was not the case. The tendency was quite the opposite. The opportunity to explore the less familiar environmental aspects of rural problems in fact led to an emphasis and interest on these by the researcher with more social knowledge, and *vice versa*. The lesser-known elements of the study took on additional interest for each person. In this particular study, involving only three researchers, regular and frequent face-to-face discussions are going some way to achieving a balance of interests. This may not be so easy where there are more researchers or where they are located at distances that do not allow them to meet as often.

A less tangible challenge to conceptualising cross-disciplinary problems stems from established ways of thinking. Social policy researchers, for example, are inclined to think on a shorter time scale, perhaps extending to human generations but rarely encompassing the sort of long term thinking that underlies consideration of ecosystem change or global cycling of carbon and water. Indeed one critique of sustainable development asks not only for whom sustainability is needed, but also for how long (Blowers and Glasbergen, 1995). It is easy to share concern and interest for the wellbeing of the next generation or two but much harder to conceptualise, let alone care about, the needs of people seventy, or even seven, generations hence.

Changing mindsets in this sense is not something that can be accomplished quickly. Rather it depends on a continuous process of communication in both formal and informal arenas. As a result of frequent discussion, the development of a common language began at this early stage of the research. What did we mean by 'sustainable,' for example, and how did the social meaning of 'settlements' relate to physical 'land cover'? Even the nuances of particular words can be important. Among health researchers we discovered that 'access' to services implicitly includes hospital or surgery waiting times; for transport researchers 'access' implies consideration of public transport nodes, service routes and frequency; and for researchers interested in social inclusion, 'access' involves affordability and personal mobility.

Getting to grips with the literature

Much of the early discussion in the RELU study related to the literature, both on rural conditions and on data availability and methodology. It is here perhaps that the first practical challenges arose. A researcher working within a particular discipline becomes intimately familiar with the range of academic journals in his or her field, their relative quality and the key or most influential authors. Venturing into a new field of study without this knowledge can be a daunting and confusing experience. In some ways this experience is positive as the literature search is not constrained by prior expectations and habits and may lead to new and fruitful sources of information. On the other, it can be time-consuming and frustrating.

As well as conceptual difficulties in accessing a new body of literature, physical barriers to access can arise where different libraries house material from different disciplines. With the growth in availability of electronic papers and journals, physical access is becoming easier. But a familiarity with the terms and language used by other disciplines is essential if electronic search techniques are to be efficient and effective.

One solution to discipline based literature problem is a division of labour in which each researcher takes responsibility for identifying relevant books, reports and journal articles in his or her original field. These references are then shared within the team so that everyone can read and discuss them. However, in the time-constrained environment of most funded research projects, the opportunity for every researcher to read everything of relevance is something of a luxury. A more effective strategy is for each person to read those articles from the discipline with which he or she is most familiar, to make notes available to all members of the team, and to explain in discussion how this reading informs the research in progress. To some extent this helps to overcome another problem of discipline based literature, that of 'expert' language or jargon and the use of acronyms that increasingly pervades much of the literature, especially that from official sources. The transmission of information by one researcher to the whole team requires a translation into plain language. This not only benefits those less familiar with the subject but can also clarify the thinking of the person who reads the original article. The strategy does of course mean that the researchers relying only on notes and discussion must trust the original reader's ability to abstract and interpret key information appropriately. It is possible that a different reader may take quite different meanings from document and that under the strategy outlined here important information may be missed.

Techniques and methods

What counts as evidence in an interdisciplinary programme of research? The historical development of research methodology in the natural and social sciences has led to an association of the former with quantitative and the latter with qualitative approaches. We argue here that this is a sterile and misleading assumption to make. There are two separate points at issue. One is that the combination of **knowledge and experiences** in different disciplines can produce a synergy that takes research in new directions and furthers understanding of problems related to sustainable development. The second is that inputs from researchers with expertise in different **methods** can also be synergistic. Knowledge stemming from one methodological approach can be used to raise questions about the potential and limitations of another. Furthermore, it can open up possibilities for applying a particular research method in a context other than that in which it is normally used.

In the RELU study, we are dealing with numbers that attempt to capture a wide range of aspects of rural conditions, whether as direct measures of phenomena or as constructed indicators. Yet the interdisciplinarity of the study forces us to question the meaning of the numbers we use. In any research relying on data not specifically collected for that research purpose, there is a need to understand the methods of data measurement, the sources of error or uncertainty, and the limits this places on analysis and interpretation. However, in carrying out secondary analysis of data from a familiar source, a single discipline researcher can easily be seduced into trusting the data too far. It is a salutary experience to be questioned in detail by colleagues from other disciplines about the methodology behind data collection techniques.

One of the great benefits of interdisciplinary work is that it provokes questions about objectivity and can make explicit the, often ignored, points at which value judgements are made in research design and practice. These include the choice of data to be collected, the level of measurement and the coding of data for analysis. The notion that any research can be objective and value-free is rapidly losing ground. In the RELU study we rely on many 'official' statistics but we are aware that these cannot always be seen as objective facts. The selection of the data collected by the most 'scientific' environmental bodies, for example, is conditioned by those organisations' own preconceptions of what is important. The level at which data is aggregated is similarly socially constructed. Units of reporting are often chosen for administrative as much as for analytic reasons with the result that different units are used for different statistics. Spatial phenomena tend to vary continuously across a landscape and the, often arbitrarily defined, boundaries used for measuring and reporting details, do not necessarily coincide with breaks in the data. This presents what is known as the modifiable areal unit problem (MAUP) that has concerned spatial analysts since the 1980s. Openshaw (1984) shows that changing the scale or boundaries of the areal unit alters quantitative measures and the results of statistical tests.

This is a matter of great importance in the current RELU study. Here we take as our basic spatial unit the Super Output Areas (SOAs) that constitute the elements of a new statistical geography created for the outputs of the 2001 Census of Population in the UK and are specifically designed for the collection and publication of small area social statistics. They have the advantages of being consistent in terms of population size and of allowing access to data that might, for reasons of confidentiality, be unavailable at the smaller area levels. The formation of SOAs is currently constrained by administrative ward boundaries but while the latter may change over time, the intention is that the SOA boundaries will remain stable. SOAs have been designed on the basis of social and administrative considerations making them ideal for some purposes. It is these units that form the elements of analysis in constructing, for example, the English Indices of Deprivation (ODPM, 2004) and they are used in the official classification of urban and rural areas (Bibby and Shepherd, 2004). They do, however, vary in area from 1.8 hectares (in an urban area) to over 68000 hectares, and these areas have no physical meaning attached to them. Their boundaries are artificially constructed rather than based on physical features, such as drainage catchments.

The aim of our RELU study is to map onto the SOAs a range of environmental data selected as pertinent to any consideration of rural status and development. However, most environmental data are collected at very different scales. Data on land cover, for example, are often collated nationally to a grid of 1km squares, and species presence and absence data are usually collected over 10km squares. The question that arises immediately is how to map these data onto SOAs.

Data such as land cover exist as area grids, while some data are in the form of point coordinates. While these can be mapped onto SOAs using spatial overlay techniques, this raises questions about accuracy and uncertainty in matching boundaries. A crucial issue for data integration in the RELU study is the uniformity or patchiness of the distribution of a characteristic across each analytic area, and overlaying numerous datasets may exacerbate the MAUP described above. Farmed areas pose particular problems for integrating data. The farmers to whom socio-economic data are attached are located spatially at postcode points that may be some distance from their land holdings – the areas associated with environmental data. The combined expertise and experience of researchers with different disciplinary backgrounds is essential in getting to grips with such problems.

The point of all the above is that an interdisciplinary research project gains benefits from the varied experience and expertise of researchers from different fields. But it can also benefit from the working together of researchers with different methodological skills. Although the two types of benefit often go hand in hand they are not the same.

Dissemination

The findings of interdisciplinary research are, by definition, of interest to a wide range of audiences including lay people, policy makers and other academics. Dissemination strategies have to be adaptable to include a variety of writing styles and formats.

We have discussed above the importance of the language used in communications between researchers from different disciplines and in grappling with the literature. As Brewer (1999) points out, these issues arise again when the results of research are communicated to the outside world. It takes time to translate technical and complex results into plain language but the experience gained through the process of working with researchers from other disciplines pays dividends here. In a successful interdisciplinary project, authors will be well versed in the pitfalls that accompany the use of specialist terminology and acronyms.

Dissemination through academic journals and conferences also requires that discipline specific language be avoided so that papers are readily accessible across a range of disciplines. A trickier problem is to find appropriate outlets for publication. Most learned journals are situated firmly within established discourse communities that have little cross-citation between them. The process of getting published in a journal of a particular discipline requires 'consistent displays of allegiance to a discipline's orthodoxy in how narratives are constructed, in assumptions, in methods, in status hierarchies, and in doctrinal knowledge' (Dervin, 2003: p8). Van Dijkum (2001) goes further, positing the existence of powerful elites more concerned with retaining power than with the progress of knowledge and understanding. Although the opportunities for publishing the results of interdisciplinary studies are slowly expanding, the problem is still a very real one with repercussions for the development of personal careers that we shall discuss below.

Common challenges for research and policy

Certain issues common to both interdisciplinary research and the integration of policy crop up consistently in the literature and in the current RELU study. Effective communication between and within the relevant research and policy-making communities is necessary for the development of the trust that plays a key role in research interdisciplinarity and in policy integration. But good communications depend on the establishment of a common language; and the interactions necessary to build trust and common understanding all take time.

Trust

The issue of trust is crucial to many aspects of interdisciplinary research (Brewer, 1999; Bruhn, 2000; Dervin, 2003). In situations where individual researchers rely on each other to identify, interpret and explain points of knowledge from specific disciplinary areas, there is an implicit requirement that they trust and respect each other's experience and abilities. The same is true where policy makers from different departments come together to share ideas and concerns with the aim of producing integrated approaches to problems.

People with previous experience of working together successfully are likely to have already established a basis for mutual trust and respect. Recruitment of new people to join interdisciplinary teams requires careful thought. Some specific qualifications and experience may be needed and clearly people who have experience in more than one discipline will be an asset to the team. However, a strong commitment to interdisciplinary work and a willingness to learn and to cross boundaries are perhaps the most pertinent criteria on which to make new appointments or work allocations. Once established, the involvement of all members of the interdisciplinary group in the management and planning of work can be used to signal collective ownership and induces feelings of trust and respect from the very beginning.

As interdisciplinary collaboration proceeds, it is communication that is essential to the growth and maintenance of trusting working relationships. Here there is no substitute for face-to-face discussion and interaction. We have pointed above to the role of personal debate in conceptualising the RELU research problem and in achieving a balance of interests in deciding on how work should be allocated. We have highlighted the way in which input from colleagues leads researchers to question their own assumptions and discipline based orthodoxies. The matter of trust also arises in dealing with unfamiliar literature sources. It is important here to know what level of trust to place in various kinds of research findings and once again, discussion with colleagues is invaluable.

Regular and frequent interactions and conversations help to build trust, but also depend on trust so that individuals are comfortable about asking what might appear to be naïve questions. A willingness to ask for explanations is important for the mutual learning on which good interdisciplinary research depends but it often depends on risking one's 'expert' reputation. It is only with trusted colleagues that people are able to reveal intellectual insecurity and thus gain the benefits of others' knowledge. Although e-communications are useful for conveying information about administrative and organisational matters, they cannot act as an effective substitute for personal interaction and discussion of substantive issues.

Dervin (2003) provides an interesting theoretical angle on dialogue and discussion. She argues that the development of productive dialogue in interdisciplinary studies requires a clearer methodological underpinning. It is not sufficient to rely only on spontaneous, normal communication. More formal structures are needed to promote and encourage real understanding and reflexivity in the development of interdisciplinary ideas. There is a role here for management of the programme to include, for example, seminars or workshops on the process of interdisciplinary work.

Trust is needed not only between members of a research or policy-making team but also between that team and the outside world, other researchers and institutions. In the RELU programme, different project teams are encouraged and enabled to meet and exchange ideas with one another and to form networks with potential users of the research. In a study of interdisciplinary research centres in the United States, Rhoten (2003) distinguishes between network 'hubs' and 'bridges'. Hubs are the people who have many overall connections to other researchers or policy-makers while 'bridges' have connections that are specifically interdisciplinary. It is a combination of both hubs and bridges that lead to the most productive working relationships. In a research project or policy-making setting, more senior or experienced members are likely to be hubs while newer members, methods experts or technicians often form the bridges. What is important is the level of trust that exists between the two.

Language

Of course, since the development of trust depends on communication, language has an essential role to play. In the RELU study we are continuously developing a common language that influences not only the form of verbal communications but also our conceptualisation of the research objective. Learning one another's specialist languages is proving useful in deciding on the search terms to use with electronic bibliographies and in reading the literature.

Improved communication using natural language as opposed to expert terminology can help overcome many difficulties in understanding. We have noted above how the need to communicate one's own knowledge to someone from another discipline has benefits in demanding that a researcher is clear in his or her ideas. Overcoming the obfuscation produced by disciplinary jargon produces an impetus for a more lucid style of speaking and writing that also aids public understanding and accessibility. Nevertheless, in transferring knowledge from one discipline to another, or from the academic to the 'real world' community, it is always possible for small shifts to occur in the meaning of concepts. The finding of a common language for communication does not necessarily occur automatically. It may require careful planning and facilitation, highlighting again the need for constant discussion in a climate of trust and respect.

Time

In referring to the experiences of the RELU study above, we have frequently mentioned the time needed to achieve interdisciplinary in thought and in practice. It takes longer to get to grips with the literature if it comes from an unfamiliar field and, even if the reading workload is shared, time must be allocated to sharing knowledge gleaned from the literature with other members of the team. Translation of expert into natural plain language is time consuming, especially if written down. Indeed, one of the advantages of expert terminology and acronyms is that they serve as a form of shorthand for those who speak the language.

Time is also important where interdisciplinary work involves the use of different research methods. 'It is an uncomfortable but indisputable fact that a project in which different traditions and methods of

research practice are used together is more demanding of time, resources and patience than one in which qualitative and quantitative methods are used separately' (Huby and Dix, 1992: 186).

Above all, the essential process of building trust through discussion and debate adds additional time demands to any programme. In the early stages of the RELU study more time was spent in these activities, and in developing networks with policy organisations and researchers from other projects, than in carrying out the research itself. One of the lessons learned to date is that in any future proposals to do interdisciplinary research, more time must be allowed for these valuable interactions. But although the rewards are undoubtedly of enormous value, they are not immediately visible. Nor are they easy to quantify. This may lead to difficulties in persuading funding bodies of the necessity to incorporate time allowances for interdisciplinary interactions.

The difficulties that time constraints pose for good interdisciplinary research are magnified in the case of integrated policy formation. Mutual trust and respect between colleagues can save time in that the ideas and opinions of those colleagues can be accepted without too much query. However, the building of such level of trust does itself take time. In the policy world few people have the flexibility to spend time discussing more esoteric points of language or theory, or indeed to read literature that requires translation into plain language. This makes the matter of trust even more crucial for policy makers. Political attention spans are notoriously short yet the integrated policies so much in demand necessitate longer time frames and long-term commitment.

Personal risks and rewards

Involvement in interdisciplinary research currently carries both intellectual and career risks for individuals. It is still met in some quarters by a deep-rooted prejudice that implicitly labels a researcher who works between disciplines as 'jack of all trades, master of none'. The willingness to admit ignorance and to ask very basic questions together with the challenging of discipline based assumptions can lead to the intellectual isolation of an interdisciplinary researcher working in a traditional setting and based in a single department.

Resulting intellectual insecurities can be allayed to some extent by the respect and trust of fellow interdisciplinarians. But they tend to be exacerbated by difficulties encountered in publishing research findings in peer-reviewed journals, the main form of recognition of academic prowess. Even though there is a growing demand for research that crosses traditional disciplinary boundaries, it is still difficult to persuade high prestige journals to accept interdisciplinary papers. One reason is the difficulty of evaluating interdisciplinary research outputs. Because of the relative infancy of interdisciplinary research it can be difficult to find reviewers who are able to see beyond the blinkers of accepted wisdom in a particular field. In the peer-review process, the designation of 'acceptable' practice can limit the perceptions of reviewers about alternative interdisciplinary approaches. On the other hand, publishing interdisciplinary work outside of one's own discipline can damage reputation and acceptability within that discipline. This situation may fuel the fears of new researchers who need exposure in peer-reviewed journals to further their academic careers. Both job prospects and promotion processes in universities rely heavily on the assessment of publication records in the established literature.

Interdisciplinary research is by no means an easy option. Individuals often risk losing the short-term benefits of recognition of subject specific 'expertise' and foregoing a clear place in their institutions. Yet it is capable of providing considerable intellectual benefits for individual researchers. The interest and excitement offered by working with colleagues from other disciplines does much to offset its disadvantages. This may be especially true for newer researchers. Rhoten (2003) found indications that graduate students perceived fewer positive effects of working within the interdisciplinary research centres in her study. 'Nevertheless, while most concerned about the professional repercussions at an individual level, the graduate students in our sample were often the most enthusiastic about the epistemological need for, and were engaged in the scholarly practices of, interdisciplinary research' (p5).

Crucial to promoting a respect for interdisciplinary work, whether in research or policy making, is training in a range of approaches and methods so that interdisciplinary problems can be addressed from a

range of angles (Wong, 2002). This aids understanding and leads to a rigorous and robust research value more likely to be recognised by other disciplines and sectors. Training can also play an important role in communication and confidence building. In the UK, the Natural Environment Research Council (NERC) and the Economic and Social Research Council (ESRC) have established a joint funding scheme for PhD studies. Its aim is to develop a cohort of people able to work at the interface between the social and environmental sciences. This kind of initiative to legitimise interdisciplinary training may be more difficult in the policy arena than in academic institutions. But expertise in working across disciplinary boundaries is capable of producing long term gains in improving policy direction as well as in improving theoretical understanding.

Institutional structures and bureaucracies

We have seen above that the benefits of interdisciplinary collaboration are currently higher intellectually than they are professionally, at least in academia. Academic jobs and rewards are structured within sets of accepted practices that push researchers towards insularity. Current funding for higher education establishments in the UK, for instance, include the Research Assessment Exercise (RAE) that rewards publication in established specialist journals, especially single authored papers or books. Institutional impediments to interdisciplinarity related to incentives and funding also exist for policy makers as separate government departments compete with one another for their shares of the Treasury pot. New structures are needed for a sharing of resources that recognises and rewards interdisciplinary goals and objectives. Whether in universities or government departments, systems to distribute credit for direct and indirect costs need to reflect contributions from the different sections.

A history of reliance on single discipline approaches to problems has left a legacy of structural and bureaucratic barriers to interdisciplinary progress. Management information systems remain largely segregated by department adding additional hindrances to the pursuit of interdisciplinary understanding. The author of a recent PhD thesis, funded by the joint NERC and ESRC initiative described above to promote interdisciplinary work, was not allowed to include on the cover of her thesis both of the departments in which she worked. In the case of our current RELU study, some persuasion was needed to ensure that researchers other than the principle investigator had access to the project budget. Our newly appointed research associate, working across two departments, had to negotiate twice the administrative hurdles for gaining access to university facilities and services. At the wider programme level, the fact that the funding UK Research Councils have different strategies for data management has implications for project plans to access and store data. Impediments caused by departmental segregation are often magnified when we turn to the policy arena. The UK's Department of Transport, for example, is currently creating a data repository including information on access to rural services. At the same time the Department for Environment, Food and Rural Affairs is creating its own, separate, data storage system. The failure to combine both data systems does not reflect a lack of awareness of the way they complement one another, but rather concerns the bureaucratic framework within which government departmental affairs are conducted.

These barriers are not insurmountable and there is an increasing recognition of the need for change. Nevertheless they do still give negative signals about the values placed by established interests on integrated research and policy.

Conclusion

This paper has summarised some of the personal, practical and institutional levels at which potential barriers to integration exist for both researchers and policy makers. Personal expectations, forged during training and experience within traditional disciplinary boundaries, can colour ideas about what are possible and legitimate goals to pursue. Practical difficulties may stem from limited familiarity with the language used within separate disciplinary areas, the range of information already available in a diverse literature, and the accessibility of existing primary data. At an institutional level, personnel and budgetary management structures can militate against the efficiency and effectiveness with which integrated research and policy is developed. Lessons learned in the research context have clear resonances for the furthering of sector-integrated approaches in environmental policy.

To reach an integrated understanding of the challenges of sustainable development, more needs to be done to foster collaborative working. The level and kinds of communication needed to foster trust in professional relationships depend on a common language that takes time to establish. Changes in funding, institutional and bureaucratic structures are needed to recognise and legitimate the pursuit of interdisciplinary research to inform policy. Dervin (2003) suggests that growing calls for interdisciplinary studies are actually a manifestation of the need for more coherence. Above all, then, is the need to support research that provides this coherence, rather than simply increasing the amount of information out of which policy makers have to make sense.

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Figure 1: A framework for describing rural areas

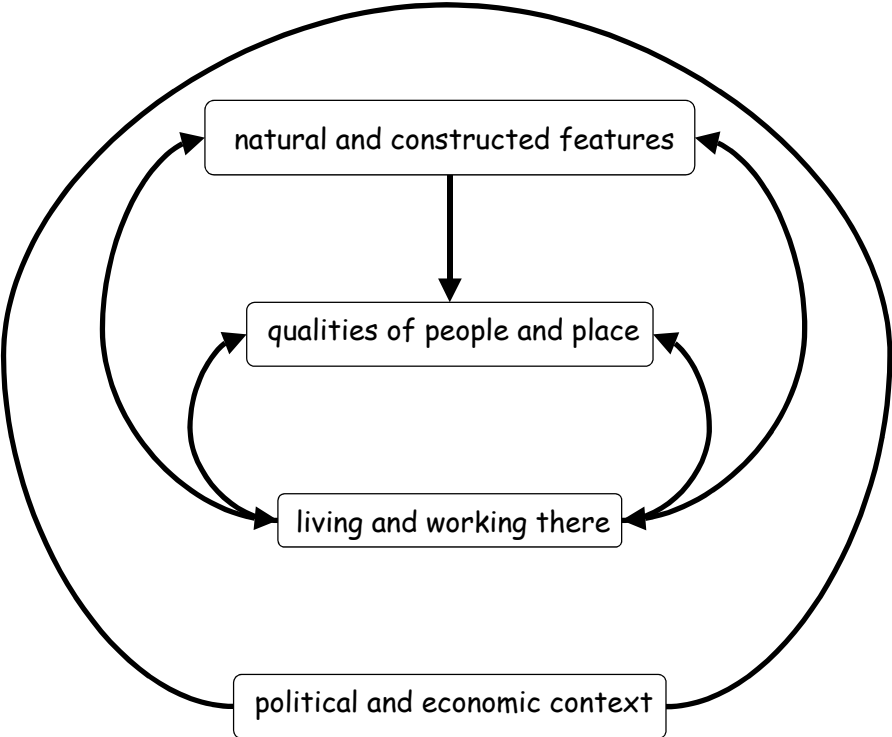


Table 1: Some key characteristics of rural areas

Category	Sub-categories	Examples
Natural and constructed features (What is there?)	Land	Area, vegetation, water bodies, topography, settlements, rivers, roads
	Infrastructure	Quarries, power stations, wind farms, industrial sites, landfill sites
	Facilities	Schools, post offices, shops, transport nodes, GP surgeries, libraries, public houses, village halls
Qualities of people and place (What is it like?)	Ecosystem health	Biodiversity, land use
	Pollution	Air, soil and water quality
	Amenity	Tranquillity
	Climate	Rainfall, temperature
	Demography	Number of people, in-migration, age, gender, ethnicity, health
Living and working there (How is it used?)	Housing	Demand, supply, affordability, homelessness
	Access to services	Transport, IT
	Income & wealth	Benefit receipt, elderly and child poverty
	Employment	Sectoral employment, unemployment
	Education & skills	Young people, adults
	Behaviour	Crime, trade, recycling, participation
Political and economic context (What policy influences exist?)	Protective designations	SSSI, AONB, National Park, Green Belt
	Area status	Rural regeneration area, countryside character, CAP subsidies, ONS class
	Administrative position	County, District, Ward, Health Authority
	Politics	Parliamentary constituency