

“Databases, Naturalists and the Global Biodiversity Convention” - Research Report

Background

This one-year project was carried out by social scientists at Lancaster University who wanted to understand the ways in which information and database technologies are designed and used to inform biodiversity policies in the UK and globally. It was funded under the ESRC's Science and Society Programme.

The construction of novel forms of information and communication technologies has, since the 1992 Global Biodiversity Convention, been seen to be a matter of urgency in the biodiversity policy domain. Global biodiversity is held to be in crisis and understanding the extent of its loss and the biodiversity that remains is deemed as an important underpinning to national and global policymaking (Royal Society 2003). Using 'science studies' perspectives, the research aimed to focus on 2 different UK-based data frameworks/software used to gather, collate, exchange and represent data about the distribution of plant and animal species within the UK: the 'National Biodiversity Network' (NBN) and 'MapMate'.

The initial hypothesis of the research was that these two database technologies harbour very different underlying philosophies, with possible significant implications for their uptake by contributors, and their robustness and use by national and international policy. Whilst the first data framework, the National Biodiversity Network (NBN) has been assembled very much with wider global policy needs in mind, the second – a database named 'Mapmate' – is driven largely by the practices and expectation of groups of field naturalists and recorders in the UK. The study aimed to explore the relationships between standardising data frameworks and those who gather and contribute data.

As the social sciences and humanities have documented, natural history, taxonomy and other 'databasing of nature' activities, have always been 'co-produced' with dominant social, political and cultural trajectories and visions (Foucault 1992 [1966], Thomas 1984, Richards 1993, Grove 1995, Bowker 2000, Bowker and Star 2002). Seen from a social science perspective, the ordering of information about the natural world will inevitably harbour implicit and unaccountable visions of the social, of nature and governance. Science studies practitioners have long been interested in investigating the nature of these implicit visions, especially their public dimensions (Wynne 2005), in order to open them up for critical discussion and debate. This research was designed to build on this research and to engage with database designers, data contributors and database users in doing so.

Objectives

The research aimed to:

1. Explore two related paradoxes: first, that whilst nationally/globally oriented biodiversity databases (such as NBN) sustain powerful connections to policy responsibilities, their connection to local, dispersed communities of data producers may be relatively weak. Second, while *localised* networks of data contributors (e.g. to Mapmate), *are* sustained by strong internal social and epistemic connections, these latter networks lack connections to national and global data bases.

2. Explore the different implicit visions of science, society, nature and environmental governance embedded within NBN and Mapmate, so as to render them more explicit and potentially open for debate.
3. Identify the communities of contributors to and users of each/both database and the ways in which their practices and expectations are potentially changed or accommodated by the technologies.
4. Lastly, the research set out to explore, with database designers and users, the potential fruitfulness of intermingling the two distinctive philosophies of constructing information about the natural world seen in NBN and Mapmate.

Objectives 1, 2, and 3 were carried out as anticipated. As we shall highlight at section 4 of the 'Results' section, Objective 4 was modified to encourage further reflection and reflexivity about the construction of databases (further in line with point 2 above), rather than to suggest how to design them in future.

Methods

a) Interviews

An examination of the design, use and policy visions associated with NBN was carried out through interviews and focus group discussions. It soon became clear that the relationship between NBN and the data collation software initially associated with NBN, called 'Recorder', also needed to be understood. Accordingly, interviews and discussion groups and participant observation were carried out with NBN, Mapmate *and* Recorder designers, data gatherers and users. The researchers therefore had three, rather than two, 'objects' for research and analysis.

The researchers selected practitioners from three different groups:

- software and database designers
- data gatherers
- data users

Individuals from each group relating to the three types of data technology were interviewed (16 interviews in all, see Annex 1, Table 1).

b) Participant Observation

Participant observation often took place at the computer screen, particularly with database designers, giving the researchers occasion to reflect upon the particular challenges faced when the object of study is virtual and fluid rather than geographically fixed (Star 1999, Hine 2005, Mackenzie 2006,). Maria Pacha, the main researcher, also observed discussions and interactions of relevant project stakeholders at the annual meeting of the National Federation of Biological Recorders, Edinburgh, November 7-9th 2005.

c) Focus Groups

In February 2006, three focus groups were carried out. Two researchers were present at each focus group. The three focus group recordings were transcribed and coded through *Atlas TI* and subsequently analysed by the three researchers together. Through the focus group discussions the researchers gained a good sense of people's priorities, challenges encountered and particular concerns about specific technologies and desires for change. Focus group transcripts now provide a good foundation for further discussion of issues at the workshop due to be held in November 2006.

d) Workshop with database designers, data gatherers and data users

A workshop will be held about the research's findings at the Natural History Museum, London, as part of the National Biodiversity Network's Annual Meeting in November 2006. The aim of the workshop will be to create discussion among practitioners (designers, data gatherers and data users) about some of the assumptions and philosophies embedded within the three different softwares. The researchers will then encourage practitioners to look forward and to think about the implications for the future design of biodiversity software. A booklet containing a summary of the results of the research will be presented and disseminated at this meeting.

Results

We present the results of the research in 4 sections:

1. Histories and social lives of Recorder, Mapmate and the NBN
2. Data exchange and issues of trust
3. Visions of humans, nature and the political embedded within softwares
4. Science studies and the engineering of technology and reflexivity

1. Histories and social lives of Recorder, Mapmate and the NBN

In tracing the historical development and social networks associated with Recorder, Mapmate, and the NBN it soon became apparent that each one was 'co-produced' (Jasanoff 2004) by a historically specific configuration of naturalist practices, perceptions of nature (e.g. as threatened biodiversity) and technology (the advent of DOS and Microsoft technologies). By examining the social relationships that each technology created around it, we were able to shed light on the question as to how databases potentially change or accommodate the knowledge making practices, visions and expectations held within different constituents of the biological recording and policy communities.

Recorder

In the early 1980s, most biological data was recorded and stored on record cards and exchanged within specific communities of recorders with a shared interest in certain groups of organisms. The first example of software designed to cater specifically for naturalists' needs was created by an invertebrate specialist with an added passion for computer programming. In the early 1980s he designed the 'Invertebrate Site Register Database' using the software 'Advanced Revelation'. This later became Recorder 3.

During the 1990s, Recorder 3 underwent significant changes, driven in particular by raised user expectations with the advent of 'Windows' for user-friendly, graphic design interface and the signing by the UK of the global Convention of Biological Diversity in Rio in 1992. The latter event introduced the need to adapt biological recording in the UK to include habitat surveys and other more complex data. This led to a perceivable shift away from the needs of local recording towards more complex software uses and a need to standardise and centralise diverse and large datasets. The Joint Nature Conservancy Council (JNCC) and the NBN Trust (see below), both bodies with responsibilities under the Rio Convention, provided institutional and financial support for the development of a new version, Recorder 2000.

Recorder 2000 was more complex than many naturalists needed and it lost popularity within their communities. The organisations developing the software have always been aware of the possible risk of marginalizing locally-rooted naturalist communities, however. Considerable thought has gone into elaborating more recent versions with naturalists' needs in mind (Recorder 2002 and 2006). The most recent development has been the design of a simple

recorder interface, 'Recorder Web', which 'talks to' recorders using browsers and offers tactile, graphic, user-oriented interfaces for data capture and reporting. Despite the efforts made in the naturalists' direction, Recorder 2006 is hailed by its designers and main institutional users as a 'definitive deliverer of standards' and its complexity understood as a function of its advantages as a standardisation tool. The observation often made, that technological developments have not been matched with a socially sensitive and robust training 'roll-out' framework, suggests a neglect of social infrastructure in favour of technological fixes, to the severe detriment to technological up-take and success (Latour 1996 and Seely Brown and Duguid 2000).

Policy and data collation institutions have been the principal imagined users of the software. Naturalists with quite a different set of passions, needs and expectations are seen as users whose practices need to be standardised. It is therefore not surprising that relatively few copies of the software and required licences have been purchased and the majority of these have been by conservation institutions rather than individual naturalists and specialist societies; although about 1600 CDs of the software have been sold, only about 500 individuals actively use it across the UK (Interview with Recorder Designer).

Mapmate

The first version of Mapmate appeared in the mid 1980s as a result of the combined recording and computing interests of a moth enthusiast. The software became immediately popular within local natural history societies and demand for the package gradually spread throughout the UK. To deal with unprecedented uptake of Mapmate, a company, 'Teknica', was created. At present (2006), 7000 licenses have been issued and the community of active users numbers over 6000. The relative popularity of Mapmate amongst the amateur naturalist community has spread in recent years to organisations such as the Royal Society for the Protection of Birds and the Botanical Society of the British Isles and at least two of the country's Local Record Centres have opted to use Mapmate in place of Recorder.

In the designer of Mapmate's words, this is a technology 'for the people' and is maintained by and further supports a peer-to-peer network of data contributors and users:

'Mapmate is like a community of users that have a distributed database that they all share in....What is creating it and behind it is a community of users and all the data is all over the place. That is how we always thought about it, rather than just like a programme: ... a tool that allow you to do this with other people' (Mapmate designer).

Mapmate is perceived by statutory conservation institutions to be somewhat limited in potential, given that it is used and is useful within closed circuits of naturalists managing small data sets. Indeed, a series of technical hiccups and political disagreements have made it difficult to translate Mapmate data sets into a form compatible with policy needs. It is worth noting however, that most Mapmate users are more interested in maintaining a known, trustworthy community of naturalists and reliable and relevant data sets for their own recording purposes; they do not aspire to large scale biodiversity mapping, global reporting and preservation.

The National Biodiversity Network

A perceived need to centralise the UK's biological records in a digitised accessible form for multiple global users inspired the design of the NBN in the early 1990s. Whilst recognised naturalist-based organisations had supported and promoted such a vision, it required government-level financial and institutional backing. This was forthcoming and was shaped and supported by the Convention on Biological Diversity.

By 2000 the NBN had become a trust and the most prominent of its many objectives was: 'to enable central and local government policies that might affect our biodiversity to draw upon the widest possible sources of information' (NBN website, accessed March 2006). In 2004 the main delivery mechanism of NBN - the 'NBN Gateway' - was launched on the World Wide Web. Its main job was to 'simplify the job of sharing and using information on biodiversity'. By 6th March 2006 it hosted 19, 817027 million species records which had come from 150 datasets.

The establishment of this database and the associated system for data sharing has met with considerable challenges. Although the NBN Trust is still optimistic about future relevance of the NBN, very few advantages of the technology were shared with the research team. Below are some of the disadvantages of the NBN documented by the research:

- Unclear target audience for the NBN gateway. The gateway presents itself as 'all things to all people'
- Perceived of as a centralising, bureaucratic system aimed at national government and far removed from the needs of volunteers collecting data
- It has focussed on refining standards and tools at the expense of understanding its users and developing trust in the system
- Data completeness and quality is variable and not always transparent or relevant to users (since scale can be too large). The 'user-interface' is confusing
- Lack of financial support for small organisations and individuals expected to contribute data to the NBN
- Local Record Centres (who hold many of the UK's species and habitat records) see the NBN as a threat. It undermines their local data archiving and dissemination role.
- Recorders do not see the benefits of sharing their data through the NBN
- Most species data is not recorded in ways that would maximise its benefit to nature conservation.

We can perceive that the NBN Gateway has been adapted to act as a boundary device straddling the different worlds, outlined above, of data users, decision makers and designers. Whilst, at the outset, it may have been explicitly coupled with the design and promotion of Recorder, interviews with NBN trustees strongly suggest that the NBN designers (and some users) have begun to find ways of encouraging the entry of data from alternative software packages (e.g. Mapmate and Biobase). It is clear from this observation that NBN designers are, like Recorder designers, creatively considering ways of rebuilding trust between recording communities and available technologies.

By looking at the way that the histories of these three technologies have intertwined with social groups and users, the researchers were able to think through how the technologies might have configured the practices of naturalists and other users (Ackrich 1995). What was surprising to the research team was the apparent lack of impact of the technologies upon already established recording practices. As we shall see, the technologies were themselves forced to adapt to social norms and ways of inventorying nature, rather than the users having to adapt their own practices.

2. Data exchange and Issues of trust

Trust is a currency explicitly highlighted within the biological recording community when tracing data ownership and judging data quality and is vital for robust digitised data management and exchange (e.g. Van House 2002, Beaulieu and Simakova 2004). In their consideration of low naturalist uptake of the new technologies, the NBN Trust and designers

of Recorder have tried to incorporate naturalist ‘practices of trust’ into the hardware through mechanisms designed to make data ownership and quality transparent (accreditation, codification, intellectual property issues). A question for the research has therefore been whether data contributors feel these ‘translations’ or ‘hardwiring’ (Bowker and Starr 2002) of their own ‘practices of trust’ work for them.

Consideration of trust has been at the heart of Mapmate since its inception and continues to play an important role in sustaining the software’s popularity. Data is exchanged through specific giving and receiving relationships and is therefore firmly personalised; a data receiver has to accept the offer of data rather than to browse through a free-floating data set. In this way data quality is validated, the trustworthiness of the contribution is assessed through a conventional but ‘hard-wired’ digital peer-to-peer judgement of data.

One of the ways in which the NBN has tackled trust and the arbitration of data quality has been by including ‘metadata’ with contributed datasets. The importance of good quality metadata for large biodiversity databases has been stressed by Bowker (2000) where metadata is taken to be information accompanying ‘raw data’. At its simplest metadata consists of the ‘4Ws’: Who collected it, Where did they collect it? When? What was found? However, it is important to note that even good metadata, or ‘data of known quality’, cannot overcome the fact that NBN data are felt by many to be out-of-date, incomplete, and of little use to an expert either in the field or within a policy institution.

The trustworthiness of data in part depends upon recognition of the uses to which it is put. A consideration of data utility and hence data quality and meaning must therefore take into account Clarke’s and Fujimura’s (1992) reflections upon what it means for a piece of data or technology to ‘work’. Trust is mediated by the following questions:

- a. To what end was the data gathered in the first place?
- b. To what end will the data set be used once accessed on the Gateway?
- c. Who (including which institutions) will use my data and do I trust them to use it appropriately?

3. Visions of humans, nature and the political embedded within softwares

The research was stimulated in part by research in the historical, anthropological and social studies of science and technology that have examined the way that technologies harbour within them: ideas of users and the public/society (e.g. Akrich 1995) ideas of nature (Harraway 1991) and ideas of governance/the political (e.g. Scott 1998)

It was recognised that these elements are not necessarily deliberately incorporated within the infrastructure of the software: they are often constituted by implicitly held values and expectations (Van Lente 1993); they may come to be part of the software through other abutting needs (e.g. the need to symbolise action at a local, national or international level to others); they may come to be incorporated through cultural ‘grooving’ effects or stubborn path dependencies (Bowker and Starr 2002).

The researchers have asked themselves the question, ‘why are we attempting to pick out these connections in order to render implicit assumptions visible?’ ‘Why not leave this job to historians of science and technology?’ (e.g. Jon Agar 2004). In recent science studies work, however, there have been calls to reveal the politics around the artefact as contingent, lively and still present, potentially opening up a space for further deliberation about their appropriateness, and the choices that may be available for making them other than that which they are about to become (Pfaffenberger 1992, Latour 2004). Making explicit the ideas of society, nature and politics embedded within particular technologies is, in other words, a way of doing politics around the assumed and taken-for-granted trajectory of that object.

The previous section on the ‘histories and social lives’ of the technologies showed that the vision behind Mapmate was revealed by its designer as being ‘for the people’ - a kind of ‘communitarian’ vision. Accordingly the software flexibly adapts to changing user needs. On the other hand we found that Recorder and the NBN initially aimed to discipline its users in order to produce complete, panoptic and standardised representations of data. More recently both NBN and Recorder have tried to incorporate ‘technical fixes’ (including moving into live web interfaces) which they hope will make their data frameworks more accessible to practicing naturalists. It remains to be seen however, whether such technical fixes tune into naturalists’ needs and existing practices.

We represent below the main ways in which the technologies incorporate ideas of governance and nature.

Governance

Audit and standards

The idea that ‘we need to know what we’ve got before we know what we should be protecting’ has become a form of nature-audit that arrived with the Convention on Biological Diversity (Midgely 2004, Midgely 2005, Adams 1997, Adams 2001, Robertson 2000) and has driven the structure and the funding behind large scale data frameworks like NBN and Recorder. This orientation brought with it the needs for standards:

‘When I think of Recorder, my understanding internally is that it is a device for delivering standards, and those standards cover verification of the data, validation of the data, understanding the ownership of the data, transfer of data successfully but refer back to the copyright owners and all those kind of things.’ (Recorder Designer 24/09/05)

Standardisation as a tool for governance is rejected, however, in Mapmate technology:

‘I think that the main problem is trying to force us in one model, I think that is actually wrong. What I think is that we need a system that can cope with any model and that not to be a problem.’ (Mapmate Designer 30/09/05).

As for the NBN, it has become more open to diverse sources of data and different data formats in order that it can collect and represent data that is usable by policy.

Governance: use and non-use

NBN is now starting to be used to provide policy level statistics from within the JNCC. But this entails working with data at a very different order of detail than the data which may be submitted to NBN Gateway:

‘Once you get to the level of governments and things like DEFRA...What they’re interested in is a much higher level: that 30% of our species are still, are declining or, you know, that we are set a target that by the year 2010 we’ll have halted the decline in farmland birds...The wildlife stats I’ve been doing are hoping to provide answers to those sorts of questions.’ (Focus Group 1)

However, our interviews suggest that professional conservationists may still by-pass NBN as a data source and contact individuals whom they can trust to give them the latest up-to-date information on a given species or location. Unused in this way, the NBN is in danger of losing authority. Its impressive capabilities to collate data and create ‘reports’ for biodiversity governance at national and international level, are impotent without either the input of

reliable data from those on the ground monitoring and recoding biodiversity, or the understanding of what that data means (its genealogy and its meta-data framings, Bowker 2000).

Paradoxically the two data frameworks (NBN and Recorder) that are specifically designed for improved governance of biodiversity, seem vulnerable to emptiness, weakening them as tools of governance. A possible and not unlikely scenario may develop whereby, *symbolically*, the database performs well at national and global levels of biodiversity governance. An underlying circuit of actors in-the-know about species trends and decline may view this symbolic show of data as shallow, however, alienating them from the official data gathering technologies and driving them into circuits of knowledge production and exchange that have no purchase on biodiversity policy or decision making. A question for governance in this case then, is, 'is symbolism enough?' (see Wynne 1982 who ends his analysis on precisely this question).

Nature

Experience of the natural, particularly seen through NBN and Recorder networks, became more obviously data-shaped in the 1990s onwards (with a sense that these standardised representations of nature were mobile and communicable and would render nature protectable by high level policy directives). 'Biodiversity', from 1992 onwards, became in the UK something to capture through Biodiversity Action Plans (BAPs): one had to know what nature existed in order to pronounce evidence-based priorities for national and international level conservation action. Although this vision of 'nature' as 'data' was contested (Marren 2000, Robertson 2000, Green 2000, Sergeant 2000) it established an unprecedented national data auditing and data collation effort from the mid-1990s onwards (Midgely 2004, Adams 1997, 2001). From Recorder 2000 onwards, designers of the technology aimed to standardise representations of nature, to homogenise records and record keeping. Biodiversity in this sense, became less diverse in its representation – a paradox that science studies scholar David Turnbull has concerns about (Turnbull 2003).

The place of nature within Mapmate networks differs significantly. Here experience of the natural remains closely attached to, and the shared property of, amateur naturalists who have usually found and observed the organisms recorded *in situ*. However, Mapmate, in one sense, is not interested in data *per se*. As the designer of Mapmate suggested, 'it is not about knowing where everything is' it is more driven by the enjoyment that the community of users gains from sharing and exchanging records. The vision of nature in Mapmate is one where nature and culture are bound tightly together. Without the pleasure of gaining and exchanging records, no nature would be seen. The research began to look at these issues as ones of cosmopolitics (Stengers 1997: 'cosmo' for non-human elements) and to consider how these inclusions and exclusions of the human and nature could be rendered more transparent for debate.

4. STS and the engineering of technology and reflexivity

The research set out to explore, with NBN and Mapmate technicians, data contributors and database users, the potential fruitfulness of intermingling what appeared at the outset to be two distinctive philosophies of constructing information about the natural world. At a basic level this was envisaged as thinking about putting the most highly regarded and useful aspects of Mapmate, Recorder and NBN together in order to imagine and design some new data framework and software in the future.

This aim soon seemed overambitious and even naive in the face of on-going database developments (web versions of Recorder, web interfaces within NBN) that were creating their

own convergences (with Mapmate and each other) in any case. The researchers realised soon after research was underway that the most productive normative contribution to the biodiversity database domain was to encourage further reflection and reflexivity about the construction of databases and the implicit values being built into them, rather than to suggest how to do it. So, for example, drawing on the results presented above, we aim to open out for discussion at the workshop in November 2006 certain questions:

- How are you configuring your users?
- What kind of nature are you helping to construct through the software?
- What are your assumptions about the governance of nature?
- Is there anything you want to change concerning users, nature and governance?
- How might this be achieved technologically and socially?

Activities

Claire Waterton received a travel grant from SSRC/ESRC under their Visiting Fellowship scheme and spent just under two months in Santa Clara University visiting Geoffrey Bowker and Leigh Starr, both STS scholars with an interest in databases. She attended a two week seminar on 'Values in Design', where she represented the SiS databases project. During July/August 2005 CW prepared a draft paper for Science Technology and Human Values (STHV). This was reviewed by Geoffrey Bowker and Leigh Starr, was presented in a double session on 'Interoperability' at 4S Conference, Pasadena, and is being revised, ready for submission to STHV. As a result of this trip CW made many good contacts for the research and Geoffrey Bowker and Leigh Starr are due to visit Lancaster University in August 2006 as keynote speakers in the conference "Getting Underneath the Fact: natural categories and biological facts as historical and emergent objects".

Claire Waterton was invited to participate in a meeting held in Belgium for historians and sociologists of science, technology and medicine to discuss issues of 'Science and the Political' for the Science and Society unit within the DG for research, European Commission, June 29-30, 2006.

Outputs

We have been awarded £3000 from the Science and Society Programme 'PIPES' awards to put together a booklet aimed at technology designers and users which will a) communicate the main findings of the research, b) stimulate reflexive thinking about biodiversity software.

Dissemination of research

Poster presentations

The poster, *Databases and biodiversity policies in the UK: centralization of information vs peer to peer networks* was presented at the following events:

1. Social Science and Biodiversity (SoBio) workshop organised by the European Centre for Nature Conservation. Segovia, Spain. September 22-24 2005
2. National Federation of Biological Recording meeting, Edinburgh. Nov 7-9 2005.
3. National Biodiversity Network Annual Meeting. London 18th November 2005.

Paper presentations

British Ecological Society Annual Meeting. Hertfordshire. September 5-7 2005. Prepared by Maria Pacha, Rebecca Ellis and Claire Waterton. *Databases and biodiversity conservation: from global policies to local views.*

'Cosmopolitical Softwares' Seminar presentation by Maria Pacha, Rebecca Ellis and Claire Waterton for CSEC Seminar Series, Lancaster University, 21st March 2006.

'An STS tour in and around some databases of our time' Seminar presentation by Claire Waterton for STS Mixtures, Lancaster University, May 4th 2006.

'Databases and the philosophies of becoming', Seminar presentation by Claire Waterton to Centre for Mobilities Research Day, Lancaster University, 17 May 2006.

The researchers are currently writing a booklet to convey the results of the research that are relevant to the naturalist, policy and user communities.

We aim to submit two academic/policy articles in addition to that aimed at STHV (see above): one academic article for sociologists of science and policy; and one aimed at the biodiversity and database designer/user communities.

Impacts

The research team have been invited to host a workshop, present their findings, and launch the booklet at the NBN Annual Meeting, London, November 2006.

Future Research Priorities

- The priority after this short study is now to further analyse and publish its findings.
- In the future it would be interesting to look at whether web-based interfaces and/or attempts to enrol marginalised recorders change the social, natural and governance potential of these softwares.
- The study also offers some insight into the potential of STS researcher-software designer relationships: a study of cross-communication and learning here would be interesting.

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Annex 1

Table 1: Interviews with designers, data gatherers and data users across three data frameworks (NBN, Recorder and Mapmate).

	NBN	Mapmate	Recorder
(1) Software and database designers	<ul style="list-style-type: none"> • NBN Director • NBN technical liaison officer • NBN Societies and Schemes officer • Director, Biological Records Centre- • JNCC Project manager of the NBN Gateway 	<ul style="list-style-type: none"> • Mapmate designer 	<ul style="list-style-type: none"> • JNCC Recorder designer • JNCC Recorder officer
(2) Data gatherers	<ul style="list-style-type: none"> • Amateur naturalist specialising in mosses • Amateur naturalist specialising in invertebrates • Amateur naturalist specialising in invertebrates • Amateur naturalist specialising in plants and invertebrates 		
(3) Data users.	<ul style="list-style-type: none"> • Representative from Somerset Environmental Records Centre • Development officer for the Botanical Society of the British Isles (BSBI) • Leader of the project “Local Change” of the BSBI • Chair of the National Federation for Biological Recording 		

[N.B. We have merged the cells in rows 2 and 3 in Table 1 due to the fact that these interviewees’ contribution to and use of NBN, Mapmate and Recorder cannot always be cleanly delineated]

**Table 2
Focus groups**

(1) Software and database designers 10 th February- Peterborough	<ul style="list-style-type: none"> • Dorset Software Technician • Recorder Designer (JNCC) • NBN Gateway Project Manager (JNCC) • Data Access and Quality Officer Manager for NBN
(2) Data gatherers 17 th February – Natural History Museum, London	<ul style="list-style-type: none"> • Amateur naturalist - Moss and Liverwort Specialist • Amateur naturalist - Invertebrate specialist • Amateur naturalist - Invertebrate specialist • Amateur naturalist - Invertebrate specialist • Buckinghamshire and Milton Keynes Environmental Records Centre Representative • Hampshire Local Record Centre Representative • Sussex Biodiversity Record Centre Representative • Lancashire Environment Directorate Representative
(3) Data users 24 th February - Natural History Museum, London	<ul style="list-style-type: none"> • Kent and Medway Local Record Centre Manager • Greenspace Information Manager for Greater London Wildlife Trust • Scottish Natural Heritage Biodiversity Officer • Patrick Roper Associates • Biodiversity UK Officer - Natural History Museum • English Nature (Biodiversity Unit)

