# A Review of the Biological Recording Infrastructure in Scotland

**by the Scottish Biodiversity Information Forum**

# INTERVIEW FINDINGS

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## Acknowledgements

All interviews and the analysis and reporting of the interview results have been undertaken on behalf of the SBIF Advisory Group by the SBIF Review Working Group: Ellen Wilson, Liz Edwards, Christine Johnston, Rachel Stroud, Colin McLeod and Lindsay Bamforth.

The SBIF Advisory Group and SBIF Review Working Group would like to thank Mary Ledlie for her assistance throughout the interview process. We also thank everyone who took the time to take part in the interview process.

## Citation

This document should be cited as:

Wilson, E., Edwards, L., Johnston, C., Stroud, R., McLeod, C. and Bamforth, L. (2018) A Review of the Biological Recording Infrastructure in Scotland by the Scottish Biodiversity Information Forum: Interview Findings. Scottish Biodiversity Information Forum Commissioned Report No. 2.



14 November 2018

## Executive Summary

Interviews to elicit perspectives on the current state of the biological recording infrastructure in Scotland, and more widely, were conducted with 41 selected individuals from across the majority of identified roles and sectors. Interviewees were asked to express their vision for an improved infrastructure. Individual requirements were identified and categorised by role, and issues were analysed by data flow pathway stage. The three most common themes were:

- the need for a stable, well-funded, fit for purpose, central database to manage and provide access to attribute rich data of known quality
- the need for clarity, simplification and transparency of data flows for all stakeholders
- the need for an appropriate, simple, long term, sustainable funding model to support provision of services at multiple scales

This document summarises the key findings from the interview process.


## 1. Purpose

The purpose of the SBIF Review interviews was to gather information about what is working well and less well within our biological recording infrastructure and to gather ideas for potential improvements. The interviews were run in advance of the SBIF Review Questionnaire and were designed to extract more focused information from a selection of key individuals chosen to represent, as far as possible, all identified roles (**Table 1**) and sectors (**Table 2**) involved in the biological recording infrastructure. These individuals were identified as being those who would be able to articulate a clear vision for a future infrastructure because of their in-depth experience, expertise and detailed knowledge of current issues and ways of working. The interviews were planned and conducted prior to a questionnaire being issued to a wider audience so that the outputs of the interviews could inform the design of the questionnaire and verification of its results.

## 2. Methods

*i. Interviewee selection*

The roles and stakeholder sectors emerged following early meetings between Ellen Wilson and John Sawyer, and were finalised by Ellen Wilson and Christine Johnston based on knowledge and experience of the biological recording infrastructure. A detailed stakeholder analysis was undertaken to identify key individuals from organisations within the 11 stakeholder sectors. Eleven roles were identified, and a further role, that of Facilitator, emerged as a result of the interview process and was therefore included in the subsequent questionnaire, but does not feature in the interview analysis. Each individual was analysed further to create a matrix for each stakeholder sector to select the key people who both had influence, and were interested in the aims of the Review. This analysis was primarily focused on Scotland, though individuals from across the UK were considered where appropriate. The selected group resulting from this influence/interest analysis were contacted and invited to interview.

***Table 1:*** *List of the roles used in the interviews*

* LERC = Local Environmental Records Centre; NBN = National Biodiversity Network

| ROLE | |
|---|---|
| 1 | RECORDER OR DATA COLLECTOR: you collect biological records for your own or others' use |
| 2 | VERIFIER OR COUNTY RECORDER: you verify the accuracy of biological records collected and identified by others |
| 3 | COLLECTION CURATOR: you curate biological samples or specimens for analysis, exhibition or reference |
| 4 | RECORDING GROUP OPERATOR: you manage the activities and administration of a recording group |
| 5 | RECORDING SCHEME OPERATOR: you manage the activities and administration of a recording scheme |
| 6 | DATA PROVIDER: you publish datasets or derived data products and manage their metadata and licensing |
| 7 | DATA DEVELOPER: you create new value-added datasets or derived data products such as enriched data or trends |
| 8 | DATA USER: you use biological records, added-value datasets or data products for your own purposes |
| 9 | SERVICE PROVIDER: you supply services such as those provided by LERCs or the NBN Trust |
| 10 | SERVICE USER: you use services such as those provided by LERCs or the NBN Trust |
| 11 | FUNDER: you provide funding to support or commission key activities in our network |
| 12 | FACILITATOR: you act as a secretariat to coordinate, and communicate across, our whole network |

***Table 2:*** *List of the sectors used in the interviews*

| SECTOR | |
|---|---|
| 1 | Recorders or Recording Groups |
| 2 | National Recording Schemes |
| 3 | Environmental/conservation Non-Governmental Organisations |
| 4 | Local Environmental Records Centres |
| 5 | Commercial companies and environmental consultancies |
| 6 | Museums, zoos and botanic gardens |
| 7 | Academia and education |
| 8 | Local authorities and national park authorities |
| 9 | National or central government departments, agencies or public bodies |
| 10 | Cross-sectoral partnership or secretariat organisations - e.g. the National Biodiversity Network (NBN) Secretariat |
| 11 | Member of the general public |
| 12 | Other |

*ii. Interview process*

A total of 41 interviews were conducted, covering 48 individuals (**Table 3**). Interviews were conducted by two members of the SBIF Review Working Group to ensure focus could be maintained on conducting interviews, while accurate transcripts were also captured. The majority of interviews were conducted using GoToMeeting teleconferencing, though some interviews where possible were conducted in person. Each interview followed the same structure (**Table 4**) and where conversation moved away from the order of questions the interviewee was not interrupted.

***Table 3:*** *List of stakeholder categories interviewed*

| STAKEHOLDER CATEGORY | INTERVIEWS | INDIVIDUALS |
|---|---|---|
| LERCs | 11 | 12 |
| Commercial companies | 2 | 2 |
| Academia | 4 | 4 |
| Museums | 2 | 3 |
| Local Government | 2 | 2 |
| National and Central Government | 6 | 9 |
| Recording Scheme Operators | 5 | 6 |
| NGOs | 3 | 3 |
| Recording Groups | 2 | 2 |
| National Data Centres | 2 | 2 |
| National Parks | 2 | 3 |

***Table 4:*** *Interview structure and questions*

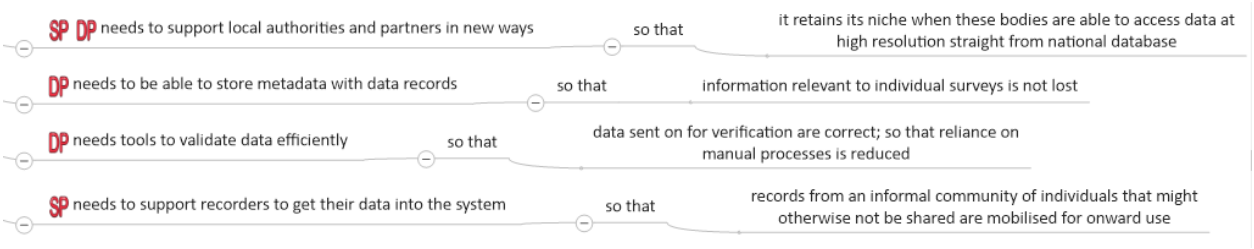
| | INTERVIEW SECTION | QUESTION AREAS |
|---|---|---|
| 1 | Brief background | Your roles and responsibilities within the Infrastructure and a summary of SBIF aims and objectives |
| 2 | Current ways of working | Processes, data or systems used by you or your organisation in association with recording and/or use of biological data; history of systems/processes, facilities provided by these, who uses them, where etc |
| 3 | Problems or Issues | With processes and systems (performance, availability, security, accessibility of systems/data etc) |
| 4 | Requirements and Vision | What are you trying to achieve and what is needed to support this? Are changes to processes/working practices required to support your vision of the future? Do you think you will continue doing everything that you do at the moment? |

*iii. Analysis*

Interview transcripts were read through by two of the working group members to ensure accuracy and quality. All interviews were treated in confidence and shared only with working group. Using a 'ROLE requirement SO THAT benefit' structure, requirements were extracted from the interview transcript and captured in a mind map using MindGenius™ (**Figure 1**). The draft transcript and requirements mind map were subsequently returned to the interviewee for comment and approval. Interviews were carried out in advance of the SBIF Review Questionnaire to provide an opportunity to extract detail on current ways of working, what is working well and what can be improved within the infrastructure and to discuss potential visions for the future with influential individuals.

***Figure 1:*** *Example of requirements structure*

*(Key: SP = Service Provider, DP = Data Provider)*




## 3. Current Situation

*i. Perspectives*

The observations and opinions of interviewees were summarised using 'rich pictures' (**Figures 2 to 4**). Roles have been grouped to reflect the communities depicted by the SBIF Value Model (**Appendix 1**). It is worth noting that having selected Service Providers for interview, few interviewees in this category had significant technical knowledge and so we were unable to produce a substantive rich picture for the technical services community. Many of the Service Providers interviewed mentioned that they did not feel adequately qualified or resourced for the technical needs of their role.

There are clear common themes across roles and communities. Clarity of data flows and a central data repository that removes duplication of data and effort are mentioned as being key improvements by all but two of the eleven roles, across all communities. Also increased verification resource, assisted by automation where appropriate, is important to seven roles. Five roles identify the need for a sustainable funding model across the Biological Recording and Service Communities, while the Data Community are most concerned about easy, open access to data of known quality. Within the Biological Recording Community, those who collate or need to verify records require more resources and support as the volume of data to manage and verify outweighs the capacity of those in these roles. The welcome role of volunteers is currently perceived to be the mainstay of much of this activity but funders observe that this also imposes constraints inasmuch as it prevents enforcement of standard data formats which in turn increases the time required for data processing. However, this view is not mirrored in the comments of those involved in collation and verification.

***Figure 2:*** *Biological Recording Community Perspectives*

***Figure 3:*** *Data Community Perspectives*

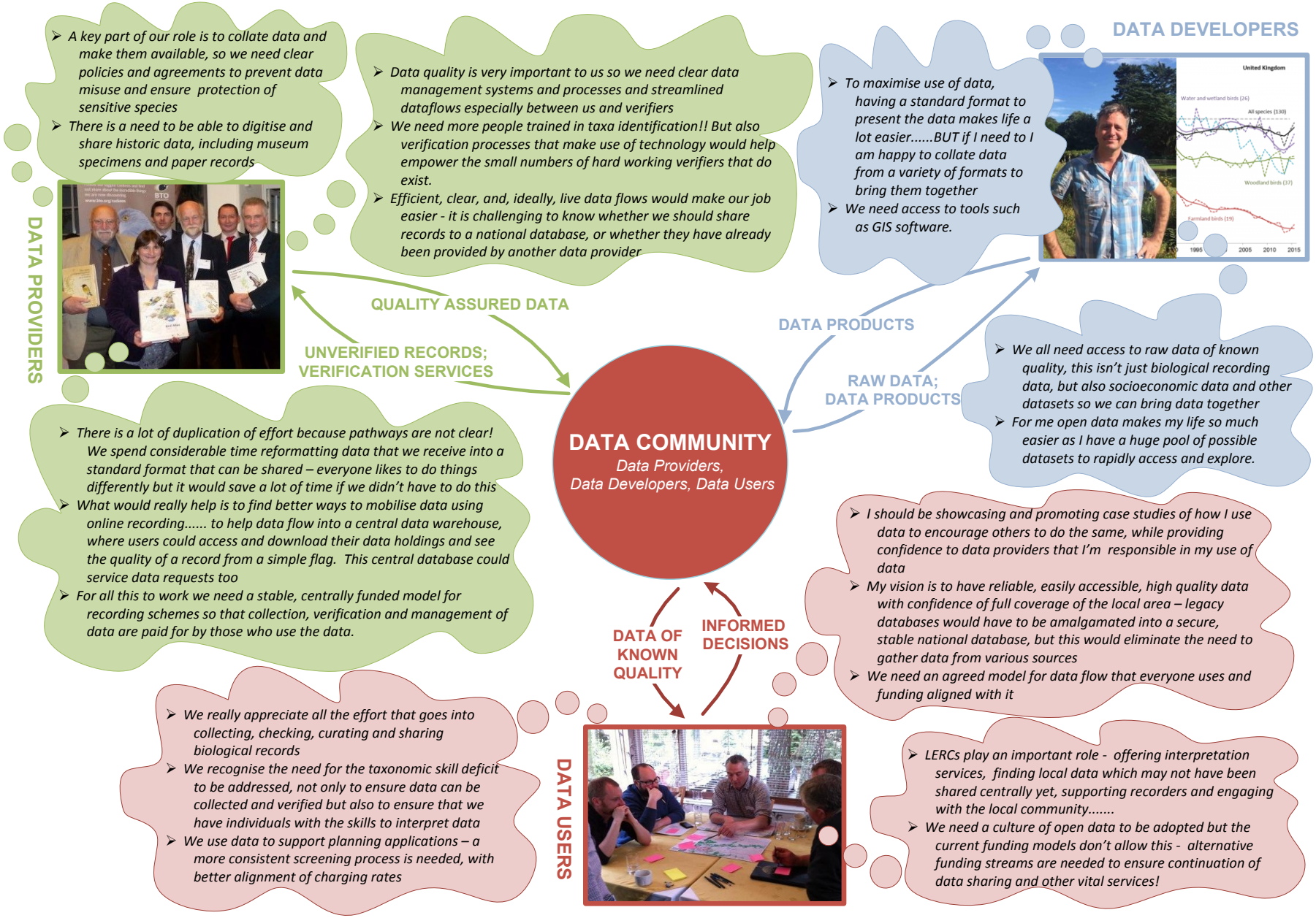
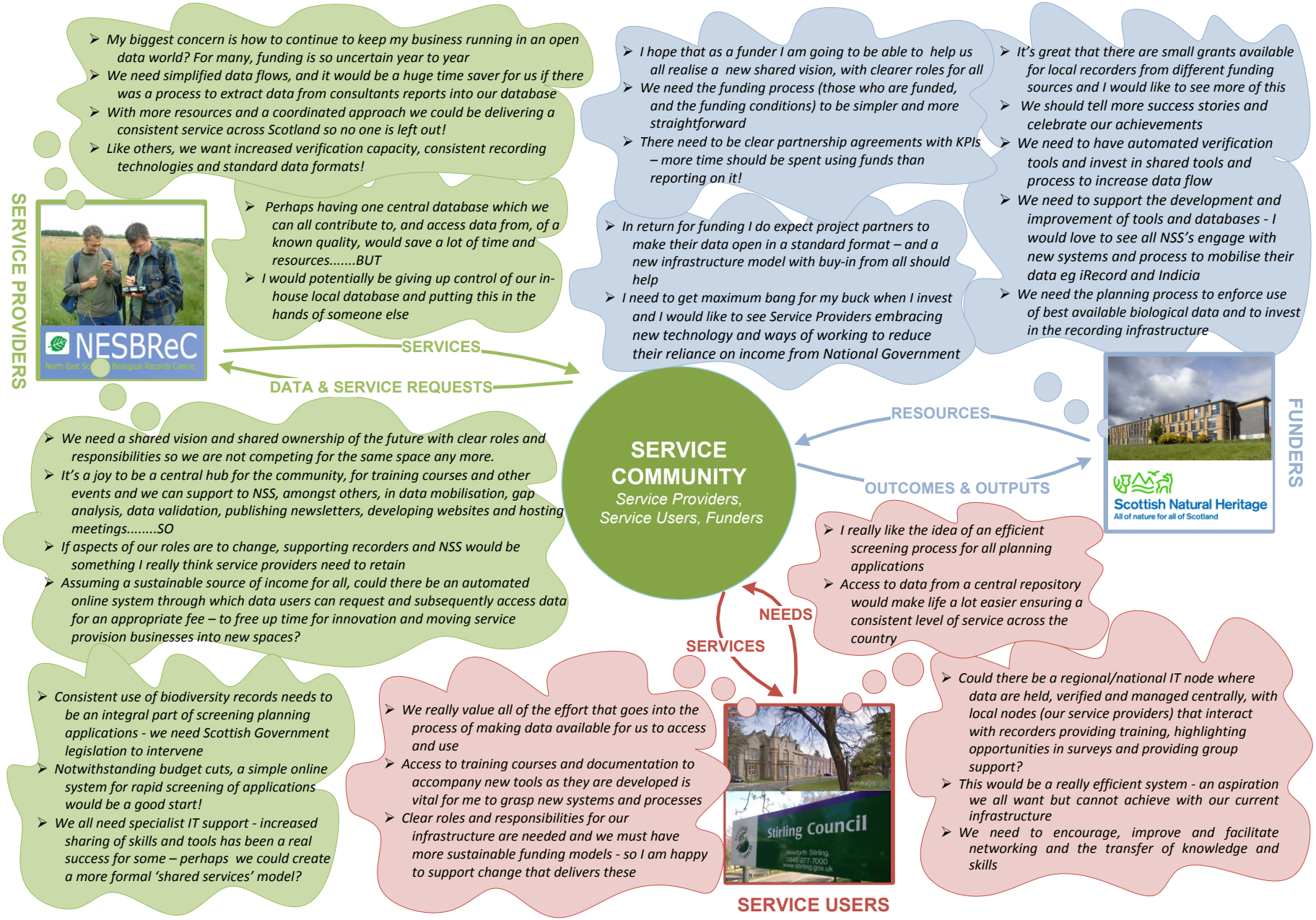


***Figure 4:*** *Service Community Perspectives*



### *ii. Responsibilities by role*

In terms of the range of roles undertaken by each stakeholder group (**Table 5**), there is a high level of overlap between roles and responsibilities and where overlap occurs there is often duplication of effort and tasks. However, there is a lack of consistency within roles across the sectors, with a range of processes and systems being used.

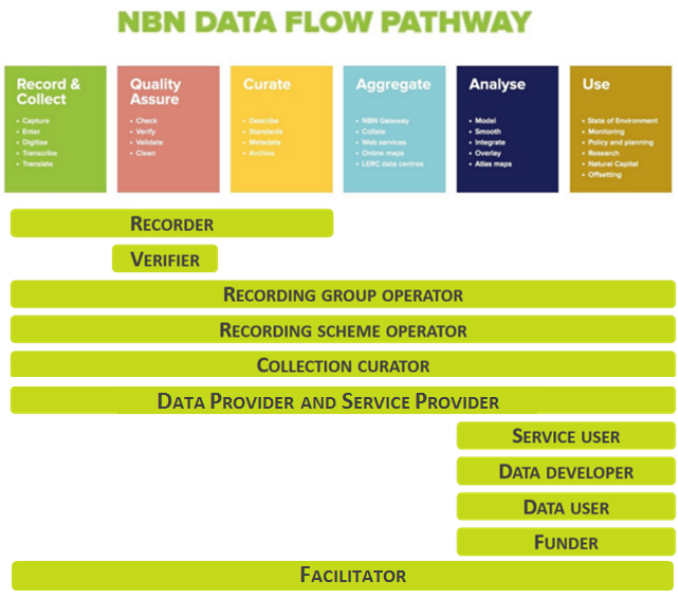
Multiple organisations and multiple sectors have responsibility for multiple roles, with no single common point of governance across any one role or stakeholder group.

***Table 5:*** *Analysis of roles by stakeholder category*

| Stakeholder | Academia | Commercial | LERC | Local Government | Museum | National Data Centre | National Government | National Park | National Scheme | NGO | Recording Group |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Recorder | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Verifier | ✓ | | ✓ | ✓ | | | | | ✓ | ✓ | ✓ |
| Recording Group Operator | | | | | ✓ | | | | ✓ | | ✓ |
| Recording Scheme Operator | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Collection Curator | | | | ✓ | | ✓ | | | | | |
| Service Provider | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Service User | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Data Developer | ✓ | | | ✓ | | ✓ | ✓ | | | ✓ | |
| Data Provider | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Data User | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Funder | | | ✓ | ✓ | | | ✓ | | ✓ | | ✓ |

Roles were mapped against the NBN data flow pathway (**Figure 5**). Again this shows the high level of overlap of roles and responsibilities across the Network.

***Figure 5:*** *Analysis of roles by NBN Data Flow Pathway stage*



### *iii. Problems/Issues*

Issues varied between individuals within a stakeholder group or role. The following is a summary of the key issues discussed throughout the course of the interviews, broken down by the NBN Data Flow Pathway stages:

***Issues with recording and collecting***

The plethora of recording and mapping apps and online tools and inconsistent data flows makes it difficult to know which apps should be used. Many of these tools are not interoperable and so data may need to be entered in multiple locations. Access to document and training for new tools is often not available, or difficult to find. There is a clear need for new recruitment of recorders for succession planning to ensure that taxon skills continue to develop. However funding is required to be able to run training and mentoring schemes and there is little funding available for this. Some recorders do not know if their personal data collections are being used effectively in decision making and recorders do not necessarily feel that they are recognised publicly by politicians and strategists. There is a disconnect between the data being collected and knowing how these data are used.

***Issues with quality assurance***

There is a lack of verification capacity, and a comprehensive verification network does not exist. Extensive time is spent undertaking both validation and verification tasks, and it was discussed that there is not enough automation of these tasks though the technology exists to develop algorithms to match recorder ID skills to records. The lack of a consistent and streamlined two-way process for verification that makes the best use of technology is a concern for many. Not all records are accompanied with a photograph which makes verification difficult, and the lack of novel approaches to use photographs for ID purposes results in some records never being verified, and recorder motivation being hampered due to a dependence on features which are often very difficult to photograph. There is a concern that if we ask too much of recorders (most of whom are volunteers) that they will ultimately stop contributing data to the wider community.

***Issues with curating***

There are too many formats for data exchange and formatting data is taking considerable time and effort. There are concerns that if people ask for data to be sent in a standard format, that data will not be shared. There is not an efficient process to mobilise historic data, including museum collections, and make these data available. Curators are continuing to accept, curate and maintain donations of collections from recorders in the biological community on a very limited budget.

***Issues with aggregating***

A lack of funding hampers the ability to format and cleanse data so that they can be shared more centrally and historical barriers to data sharing still exist which further affect the rate and quantity of data that are shared. There is a need for more interoperable technical systems to reduce manual data handling. There is incomplete and inconsistent local service provider coverage across Scotland and providers lack clear sustainable roles and responsibilities. The lack of a trusted central database that has the buy in of all was raised frequently and it was clear that the current suite of databases used across the network is maintained to varying levels. Not all databases are integrated with online servers/backed up leading to a risk of data loss. As genetic sequencing techniques have continued to develop, it is apparent that the current data systems have not been developing at a rate to be able to efficiently handle these data alongside more 'conventional' records. Much of the infrastructure depends on Recorder6 and the uncertainty of its future is a concern for many.

***Issues with analysing and using***

It is difficult to know if all the data available have been accessed as data are currently dispersed across many different databases. Not all records in the infrastructure have a clear indication of data quality which affects the confident use of data. Data users often need to obtain multiple permissions before they can access and use data which discourages data use. Positive case studies on data use are not being showcased enough. The lack of a consistent system for screening planning applications was raised regularly, and the issues surrounding the lack of ecologists within local authorities to interpret ecological data was discussed during many interviews. It is felt that the value and significance of biodiversity data in decision making is not recognised enough and so these data are not used to their full potential in the decision making process.

There were concerns that inconsistent charges for data searches, and the lack of a consistent system for submitting data requests was also contributing to the irregularity of data being used within the planning system. There was a general feeling that organisations should be focussing on generating income from adding value to data through analysis and presentation rather than relying on charging for their time to extract data from a database. There is not a centrally agreed standard on openness and so moving towards a more open data position, while maintain relationships is a challenge.

## 4. Vision of the future

Although all interviewees were able to easily articulate their role and current situation, most interviewees found it more difficult to propose a vision for the future. Relatively few ideas were put forward and so we have instead distilled requirements from across the interview transcripts (**Appendix 2**). These distilled requirements, classified by the various roles of each interviewee, enabled us to consider the improvements needed, which taken together form a vision of the future for each role (**Table 6**). So that we could compare the findings of the interviews with the findings of the SBIF Review Questionnaire, we also classified each distilled requirement by the broad themes used to classify ideas for improvements in the questionnaire. This facilitated calculation of the proportion of requirements that related to each broad theme for each role (**Table 7**).

***Table 6:*** *Vision of the future by role*

| ROLE | IN FUTURE… |
|---|---|
| RECORDERS | Simple and transparent data flows into a stable central database, via well designed recording and mapping apps. |
| VERIFIERS | Consistent and streamlined two-way process for verification, with automation where possible and easy means to contact recorders so data flow into a central database. |
| RECORDING SCHEME OPERATORS | Sustainable funding to deliver training and support data management, with simple data flows, with standard data formats. |
| RECORDING GROUP OPERATOR | Sustainable funding to be able to accept and curate specimens and supply data to a central database. |
| COLLECTION CURATOR | Efficient process to be able to mobilise historic data, and accept and curate donations of collections so that these can be digitised and made available via a central database. |
| DATA PROVIDER | Clear and simple data flows, with tools to manage data holdings so that data of known quality are made available in a central database. |
| DATA USER | Clear data flows, with centrally agreed standards on openness so that high quality data are available in a central, well-funded database. |
| DATA DEVELOPER | Easily accessible, reliable high quality data with confidence of full coverage of local area. |
| SERVICE PROVIDER | Consistent system for biodiversity screening of planning applications, and a sustainable funding model to support provision of services, including technical and IT support to national schemes, recorders and data users. |
| SERVICE USER | Sustainable funding model with a well-funded central database with access to attribute rich data of known quality at the core, improving networking and transfer of knowledge. |
| FUNDER | Organisations focusing on generating income from adding value to data and providing more support to the local recording community under a long term sustainable funding model, with increased provision of tools for the recording community to support high quality data flow. |

***Table 7:*** *Percentage of requirements classified by broad theme for each role*

| | Recorder | Verifier | Recording Scheme Operator | Recording Group Operator | Collection Curator | Data Provider | Data User | Data Developer | Service Provider | Service User | Funder | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| An improved national to local data infrastructure | 11.8% | 12.5% | 10.5% | 17.9% | 33.3% | 12.3% | 25.5% | 0.0% | 19.1% | 24.2% | 23.1% | 17.6% |
| Standardisation, consolidation or centralisation | 20.6% | 6.3% | 26.6% | 32.1% | 33.3% | 19.6% | 7.5% | 18.2% | 11.8% | 9.1% | 11.5% | 15.5% |
| Improved data availability | 8.8% | 0.0% | 4.8% | 3.6% | 22.2% | 23.9% | 22.4% | 63.6% | 8.8% | 0.0% | 7.7% | 13.4% |
| Outreach, networking, training and capacity building | 0.0% | 25.0% | 13.7% | 10.7% | 11.1% | 4.3% | 4.3% | 0.0% | 19.5% | 18.2% | 19.2% | 12.0% |
| Clarity on, and improvement of, data flows | 20.6% | 0.0% | 8.9% | 0.0% | 0.0% | 13.0% | 5.6% | 9.1% | 4.0% | 3.0% | 7.7% | 7.1% |
| Other | 8.8% | 0.0% | 7.3% | 0.0% | 0.0% | 1.4% | 5.0% | 9.1% | 9.6% | 15.2% | 0.0% | 6.3% |
| Sufficient sustainable resourcing | 0.0% | 0.0% | 10.5% | 21.4% | 0.0% | 1.4% | 5.0% | 0.0% | 6.3% | 9.1% | 11.5% | 6.1% |
| Use of biodiversity data for decision-making | 0.0% | 0.0% | 1.6% | 0.0% | 0.0% | 2.2% | 4.3% | 0.0% | 11.0% | 6.1% | 7.7% | 5.4% |
| Verification | 0.0% | 50.0% | 9.7% | 3.6% | 0.0% | 4.3% | 3.7% | 0.0% | 1.1% | 9.1% | 0.0% | 4.6% |
| Functionality and ease of use of online tools | 11.8% | 0.0% | 3.2% | 3.6% | 0.0% | 5.1% | 2.5% | 0.0% | 1.8% | 0.0% | 0.0% | 2.9% |
| Open data | 0.0% | 0.0% | 2.4% | 3.6% | 0.0% | 3.6% | 7.5% | 0.0% | 0.4% | 0.0% | 3.8% | 2.7% |
| Access to experts and other resources | 8.8% | 6.3% | 0.8% | 3.6% | 0.0% | 2.2% | 3.1% | 0.0% | 1.5% | 3.0% | 0.0% | 2.2% |
| Full coverage of Scotland | 2.9% | 0.0% | 0.0% | 0.0% | 0.0% | 0.7% | 0.0% | 0.0% | 2.6% | 3.0% | 0.0% | 1.2% |
| Improved data quality | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 5.1% | 1.9% | 0.0% | 0.0% | 0.0% | 0.0% | 1.2% |
| Promotion of the value of biodiveristy data and recording | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 1.9% | 0.0% | 1.8% | 0.0% | 7.7% | 1.2% |
| Recognition and feedback | 5.9% | 0.0% | 0.0% | 0.0% | 0.0% | 0.7% | 0.0% | 0.0% | 0.7% | 0.0% | 0.0% | 0.6% |
| | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| | 34 | 16 | 124 | 27 | 9 | 138 | 161 | 11 | 272 | 33 | 26 | 851 |

## 5. Conclusions (current situation and common themes)

The interview process was enlightening and has provided an opportunity to discuss in detail requirements for the future. It is clear that the recording community is not pulling together in one direction and have mixed feelings about Open Data, the NBN Atlas and the future of certain aspects of the Network. Interviewees feel that there is a lack of technical strategy for the Network as well as a lack of long term sustainable funding. Many LERCs in particular are hand to mouth each year, and rely both on grants and project funding, which may not be available in future years, and charging for their time to extract and provide data for commercial use. There is a lack of standardisation of policies, processes and systems, and centrally available guidance. There is currently no clarity and transparency of data flows, which are complicated and do not encompass all stakeholders. Some National Schemes and Societies, recorders and recording groups struggle with aspects of IT and mapping, including both not having access to the software itself, or not having the necessary skills and time required to fully utilise these software.

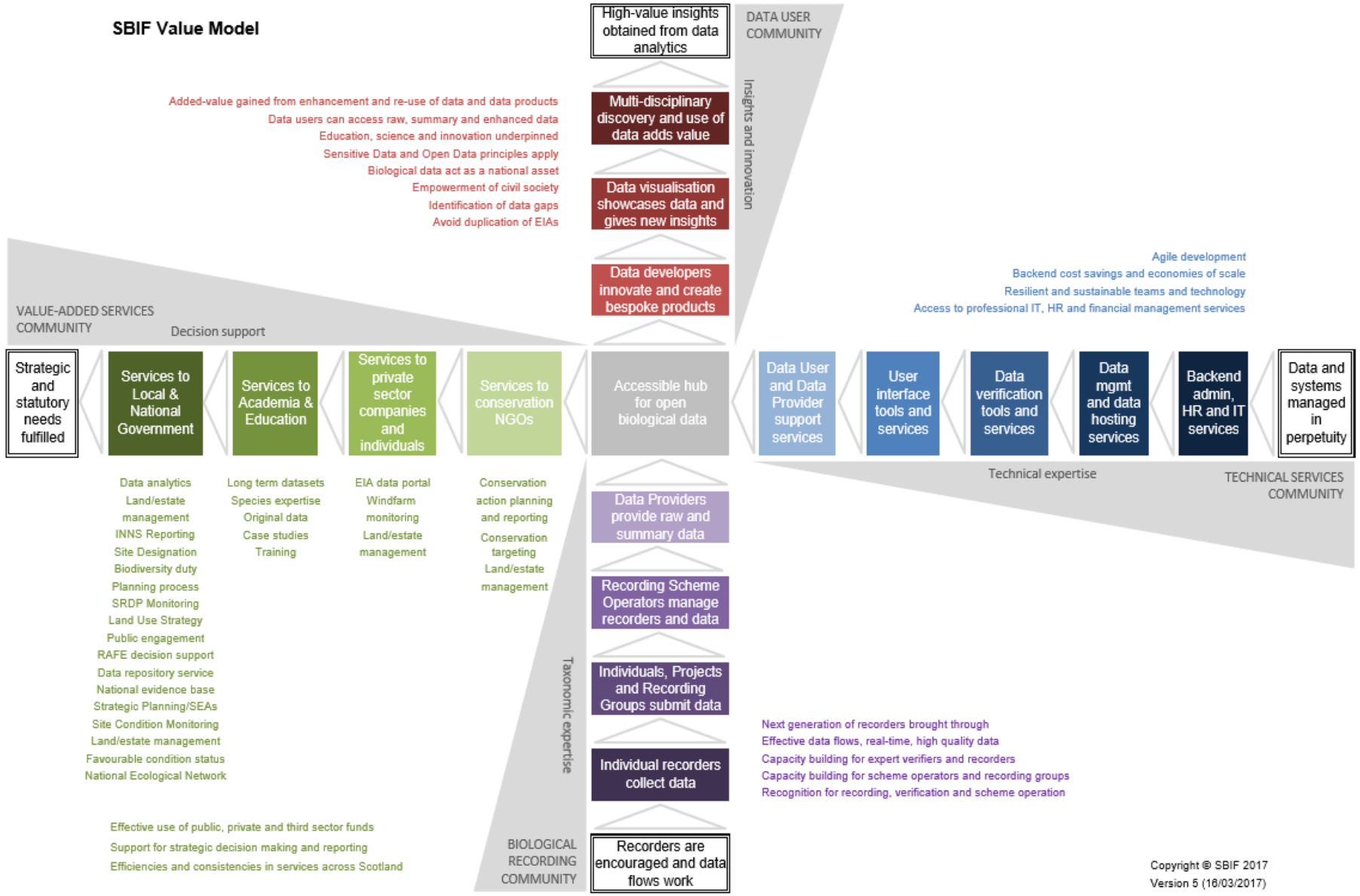
In conclusion, the interviews show that there is recognition that change is needed to establish a more stable infrastructure, within a framework that has strong leadership, and many positive suggestions regarding potential improvements were expressed.

## 6. List of Interviewees

| SECTOR | INTERVIEWEES |
|---|---|
| Academia | Jonathan Silvertown, Edinburgh University<br>Jo Porter, Heriot Watt University<br>David Roy, Centre for Ecology and Hydrology<br>Alan Stewart, Auchenorrhyncha Recording Scheme/Sussex University |
| Commercial | Chris Cathrine, Caledonian Conservation<br>Claire Lacey, CIEEM |
| Local Authority or National Park | Andy Ford, Cairngorm National Park<br>Dafydd Roberts/Caroline Wilson, Snowdonia National Park<br>Louisa Maddison, South Lanarkshire Council<br>Guy Harewood, Stirling Council |
| Local Environmental Records Centre | Tom Hunt, Association of Local Record Centres<br>Sarah Eno, TWIC<br>Lindsay Bamforth, Fife Nature<br>Ron MacDonald/Glenn Roberts, NESBReC<br>Richard Sutcliffe, Glasgow Museum<br>Mark Pollit, SWSEIC<br>Deborah Muscat, CBDC<br>Damian McFerran, Pauline Campbell, CeDAR<br>Mandy Rudd, GIGL<br>Roy Tapping, COFNOD, North Wales |
| Museum | Nick Fraser, National Museum of Scotland<br>John Tweddle/Chris Raper, London Natural History Museum |
| National Data Centre | Jo Judge, NBN<br>Andy Musgrove, BTO |
| National Government | Scot Mathieson, SEPA<br>Roddy Fairlie/Iain MacGowan/Colin McLeod, SNH<br>Chris Cheffings, JNCC<br>Barnaby Letheren, NRW<br>Andy Webb/Oli Grafton/Tim Hill, NE |
| National Scheme | Ian Wallace, Caddisfly Recording Scheme<br>Helen Roy, Ladybird Recording Scheme<br>Keiron Brown, Earthworm Recording Scheme<br>Kevin Walker/Jane Holdsworth, Botanical Society of the British Isles<br>Teresa Frost, Wetland Bird Survey, BTO |
| NGO | Richard Fox, Butterfly Conservation<br>Gill Dowse, Scottish Wildlife Trust<br>Craig Macadam, BugLife |
| Recording Group | Ro Scott, Highland Biological Recording Group<br>Jonathan Willet, BRISC |

NB - each interviewees is only listed against a single sector but may be involved in more than one.

**Appendix 1:** SBIF Value Model



**Appendix 2**: Detailed list of requirements

| REQUIREMENT<br><br>*KEY*<br>*Light blue sharing = frequency of 1-10*<br>*Mid blue shading = frequency of 11-20*<br>*Dark blue shading = frequency of 21-30* | Recorder | Verifier | Recording Scheme Operator | Recording Group Operator | Collection Curator | Data Provider | Data User | Data Developer | Service Provider | Service User | Funder | Count of frequency |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Needs a stable, well-funded, fit for purpose, central database to enter, mobilise, collate, manage, verify, interpret and access attribute rich data of known quality | 4 | 2 | 8 | 2 | 3 | 12 | 29 | 0 | 13 | 5 | 0 | **78** |
| Needs clarity, simplification and transparency of data flows for all stakeholders | 7 | 0 | 11 | 0 | 0 | 18 | 9 | 1 | 11 | 1 | 2 | **60** |
| Needs appropriate, simple, long term, sustainable funding model to support provision of services at multiple scales | 0 | 0 | 13 | 6 | 0 | 2 | 8 | 0 | 17 | 3 | 3 | **52** |
| Needs easily accessible, reliable high quality data with confidence of full coverage of local area | 0 | 0 | 0 | 0 | 0 | 5 | 22 | 6 | 9 | 0 | 0 | **42** |
| Needs a consistent system through which all planning applications which require biodiversity screening are screened with appropriate consistent charges | 0 | 0 | 2 | 0 | 0 | 0 | 7 | 0 | 20 | 2 | 2 | **33** |
| Needs to receive and collate records in a range of formats from a variety of sources | 0 | 0 | 10 | 1 | 0 | 8 | 4 | 1 | 4 | 0 | 0 | **28** |
| Needs centrally agreed openness standards to facilitate a move towards a more open data position while maintaining the relationships and support of volunteer recorders/county recorders | 0 | 0 | 3 | 1 | 0 | 5 | 12 | 0 | 1 | 0 | 1 | **23** |
| Needs to be accessible to recorders and have capacity and resources to provide local support, encouragement and training | 0 | 0 | 0 | 1 | 0 | 0 | 5 | 0 | 15 | 1 | 0 | **22** |
| Needs more consistency and streamlined two-way processes for verification that make best use of technology, with increased verification capacity, and standardised universal verification terms | 0 | 5 | 4 | 0 | 0 | 6 | 4 | 0 | 2 | 0 | 0 | **21** |
| Needs to be able to share records with necessary species group, taxon experts and organisations, and work to break down historical barriers to data sharing | 2 | 0 | 0 | 1 | 0 | 8 | 9 | 0 | 1 | 0 | 0 | **21** |
| Needs a mechanism through which people can submit data requests and subsequently access appropriate data for an appropriate fee (if necessary) | 0 | 0 | 4 | 0 | 0 | 5 | 0 | 1 | 11 | 0 | 0 | **21** |
| Needs organisations to focus on generating income from adding value to data through analysis and presentation, and providing more support to the local recording community | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 14 | 0 | 3 | **21** |
| Need tools to manage data holdings securely in perpetuity (including collecting, curating, cleansing, validating and digitising records from a range of formats and make these available) | 3 | 0 | 2 | 0 | 0 | 10 | 0 | 0 | 5 | 0 | 0 | **20** |
| Needs a robust, supported, biological recording community that works together, with clear data management systems and a single consistent structure and secure infrastructure | 0 | 0 | 3 | 0 | 0 | 5 | 7 | 0 | 5 | 0 | 0 | **20** |
| Needs to encourage recorders to use online recording tools and develop integrated online recording systems | 0 | 0 | 4 | 1 | 0 | 7 | 2 | 0 | 5 | 0 | 0 | **19** |
| Needs comprehensive network of taxon experts available to verify species records | 3 | 1 | 1 | 1 | 0 | 3 | 5 | 0 | 4 | 1 | 0 | **19** |
| Needs to provide technical, and IT support to national schemes, recorders and data users | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 16 | 0 | 0 | **18** |
| Needs to provide tools for the recording community to support high quality data flow | 0 | 0 | 5 | 0 | 0 | 2 | 1 | 0 | 5 | 0 | 5 | **18** |
| Needs to be able to run, and access training and mentoring schemes, including access to documentation for new tools | 0 | 0 | 4 | 1 | 1 | 0 | 0 | 0 | 9 | 2 | 0 | **17** |
| Needs clear data agreements and data policies in place and simple permissions to access and use data | 1 | 0 | 1 | 0 | 0 | 7 | 4 | 0 | 2 | 0 | 2 | **17** |
| Access to GIS software, support and appropriate licences | 1 | 0 | 1 | 0 | 0 | 0 | 6 | 1 | 6 | 2 | 0 | **17** |

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| Needs more automated verification and validation systems and tools, including algorithms to match records to recorder ID skills | 0 | 2 | 4 | 1 | 0 | 0 | 2 | 0 | 1 | 3 | 0 | **13** |
| Needs an efficient process to mobilise historic data, including museum collections, and make these data available | 0 | 0 | 1 | 0 | 2 | 8 | 1 | 0 | 1 | 0 | 0 | **13** |
| Needs to have effective, dynamic governance and be led by achievable outcomes, with time and space to be innovative and receive steer from the biological recording community | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 12 | 0 | 0 | **13** |
| Needs to be able to accept, curate and maintain donations of collections from recorders in biological community, and for collections to continue to be added to for use as reference collections | 4 | 1 | 0 | 2 | 3 | 0 | 0 | 0 | 2 | 0 | 0 | **12** |
| Needs to be able to contact recorders and engage in positive conversation, making the most of available engagement tools | 0 | 3 | 5 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | **11** |
| Needs access to affordable, high quality technical IT expertise and support | 1 | 0 | 4 | 0 | 0 | 1 | 0 | 0 | 5 | 0 | 0 | **11** |
| Needs indication of data quality to be flagged in national database | 0 | 0 | 0 | 0 | 0 | 7 | 3 | 0 | 0 | 0 | 0 | **10** |
| Needs standardised formats for supply of data, and a process to reformat adhoc records | 0 | 0 | 2 | 0 | 0 | 4 | 0 | 1 | 3 | 0 | 0 | **10** |
| Complete, and consistent service provider coverage across Scotland with clear sustainable roles and responsibilities delivering local services | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 7 | 1 | 0 | **10** |
| Needs standardisation of policies, processes and systems, with associated guidance available centrally | 0 | 0 | 6 | 0 | 0 | 3 | 0 | 0 | 1 | 0 | 0 | **10** |
| Needs to encourage, improve and facilitate networking and transfer of knowledge | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 5 | 3 | 0 | **10** |
| Needs clarity of roles and responsibilities within the biological recording infrastructure | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 4 | 1 | 2 | **9** |
| Needs maintenance of stable databases (national and in-house), integrated reliably with online servers | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | **9** |
| Needs to provide support to Local Authorities through SLAs, for example to undertake biodiversity assessments for planning/development purposes | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 7 | 0 | 0 | **8** |
| Needs to produce, and make available data modelling products and outputs, including Atlases, ID books and research outputs | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 3 | 0 | **7** |
| Needs funding to create regional hubs to cover Scotland completely, which feed into a central national hub, with clear priorities for creation of user led added-value services | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 4 | 2 | 0 | **7** |
| Needs to facilitate, and undertake data collection, including structure surveys | 1 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | **6** |
| Needs well designed recording and mapping apps, with suitable data flows for collection of data in field | 4 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | **6** |
| Needs increased recording activity and recruitment of new recorders | 0 | 1 | 3 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | **6** |
| Needs the NBN to act as the national facilitator, supported by members and data users | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 1 | **6** |
| Needs confidence that personal data collections are used in decision making and for recorders to be recognised publicly by politicians and strategists | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 | **5** |
| Needs records to be accompanied with a photograph and novel approaches to be adopted to use photographs for ID purposes | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **5** |
| Needs data use to be showcased and promoted | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 2 | **5** |
| Needs to be able to access and use sensitive species resolution list | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 3 | 0 | 0 | **5** |
| Needs value and significance of biodiversity data in decision making to be recognised more widely | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | **5** |
| Needs interoperable technical systems | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | **3** |
| Needs to be able to collect data in the field using traditional methods (notebook and pen) and digitise these at home | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **2** |
| Needs to be able to provide small grants to local recorders | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | **2** |
| Needs data systems to be able to handle data from DNA samples as genetic sequencing techniques develop | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | **2** |
| Needs a technical strategy for the national network | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | **2** |