Future direction of the UK DNA Working Group

Workshop Report

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UK Centre for Ecology and Hydrology, Lancaster Environment Centre

1. Introduction

The UK Environmental Observation Framework is a partnership of public sector research and operational organisations working to improve coordination of the observational evidence needed to understand and manage our changing natural environment. See www.ukeof.org.uk.

The UK DNA Working Group (here after UKDNAWG) is one of several working groups within UKEOF, see UK DNA Working Group. It provides a forum for government agencies, academics and other stakeholders to discuss priorities and developments in the use of DNA-based environmental monitoring, to facilitate method development, share learning, explore technical challenges, develop collaborative opportunities and leverage research funding. A Steering Committee coordinates and steers the activities on behalf of the wider Working Group, including the planning and organisation of the annual conferences that the group has help every year since 2014.

During the last conference at the Royal Society in London in May 2025, the steering committee carried out a survey of attendees, which was followed by a discussion session on the development of this field and future direction of the UKDNAWG. The workshop on 25th September 2025 brought together members of the Steering Committee with other external contributors to continue and develop this discussion.

2. Setting the scene

Andy Nisbet (Natural England) opened the workshop by welcoming all participants and setting out the aims of the workshop and the programme for the day. The agenda and list of attendees are in Annexes A and B.

The aims of the workshop were:

- To develop our vision for the UKDNA Working Group and the long-term (15 year) outcomes that we aim to achieve.
- To identify medium-term objectives and the activities needed to meet those.
- To develop proposals for better collaboration, influencing and ways of working.

The expected outputs from the workshop were:

- A Workshop Report
- Development of a Theory of Change
- Identification of actions for an Action Plan

Andy provided a short introduction to the development and elements of a Theory of Change.

3. Survey results

Lori Lawson-Handley (UKCEH) presented the results from surveys about the work and development of the UKDNAWG. Annex C has a summary of the responses to the survey carried out during the UKDNAWG 2025 conference.

4. Developing a visions and long-term outcomes

In the next session, three breakout groups looked at developing a vision and long-term outcomes for the working group and our work in this field.

The groups were asked to think about the field of eDNA and DNA based monitoring and detection, their vision for the field in 15 years' time and the outcomes that would support that vision. They were provided with an example vision and outcomes to review, critique and improve.

Vision

Example provided – *By 2040, DNA-based methods are well developed, trusted and routinely used to survey and monitor the natural environment, and provide better evidence for decision making*.

The discussions helped to develop our shared vision and discussion points included:

- *Integration and Regulation* – Groups believed that DNA methods should be incorporated into regulatory and statutory monitoring with clear expectations of what molecular data can and cannot do. Methods should be integrated with other technologies (e.g. real-time monitoring and predictive tools).
- *Standardisation and Flexibility* – Attendees debated whether standardisation is necessary or if flexibility is better, acknowledging uncertainties and limitations. The different approaches by different countries to the Water Framework Directive were cited as an example of using different methods for the same goals.
- *Stakeholder Engagement* – Methods must be usable and interpretable by stakeholders. This depends on end users being technologically literate and informed customers of the technology. Open access data was recognised as important but with risks for some stakeholders.
- *Trust and Futureproofing* – Methods need to be trusted, cost-effective, value for money, and adaptable to environmental and technological changes.
- *Commercial and Market Development* – Our vision needs to enable and support a vibrant commercial sector and nature related markets.
- *Moving Beyond Passive Monitoring* – Use of DNA-based monitoring and evidence must aim for transformative change: using data to design and implement actions and avoid passive data gathering.
- *Cross-Sector Coordination* – Improved coordination between sectors is required to reduce siloed communication, expand scope beyond natural environments to include broader environmental contexts.

Other comments were that we should aim to realise our vision sooner than 2040 and that a vision needs to be shorter and more active than the example provided.

A suggested vision statement from this session was that:

> By 2040 (or potentially 2035), DNA-based methods are well-developed, trusted, routinely used to survey and monitor the natural environment and provide better evidence for decision-making.

Possible shorter vision statements were:

- Trusted, integrated DNA evidence for environmental action.
- DNA-driven insights for environmental transformation.

Long-term outcomes

Examples provided -

- *End users in industry, consultancy, NGOs and the public sector can use DNA-based methods with confidence*
- *Researchers understand the needs of end users, and end users can influence and shape research priorities*
- *Sustainable funding supports the research, development and operational deployment of DNA-based methods*
- *Use of DNA-based methods is supported by necessary infrastructure of reference databases, sample archives, data storage and analytical tools*
- *Data, including species records, are shared as openly as possible following QFAIR principles.*

Discussion points included:

- *Empowered End Users* – End users (industry, consultancy, NGOs, public sector) actively use DNA-based methods with confidence in real-world applications.

- *Research and Standards Alignment* – Researchers understand and respond to end user needs and End users have direct influence on research priorities. Existing standards are reviewed and evolve to align with DNA-based approaches. Promote calibration and validation with flexibility for evolving baselines.

- *Sustainable Funding and Business Case* – Need to develop a strong business case for DNA technologies to attract funding and explore alternative funding mechanisms beyond research councils. Commercial providers can play a role in co-funding and innovation.

- *Infrastructure and Tools* – DNA methods need to be supported by robust infrastructure of reference databases, sample archives, data storage and analytical tools. This requires centralised and integrated systems to support consistency and access.

- *Data Sharing and FAIR Principles* – Agreement that data (including species records) should be shared as openly as possible, following QFAIR principles applied across different methods.

- *Quality Assurance and Harmonisation* – Promote ring testing and proficiency testing. Encourage harmonisation and compatibility between methods.

- *Training and Knowledge Mobilisation* – Need to translate research into practical guidance and training and mobilise knowledge across sectors and skill levels. Use Defra fellowships and other opportunities to support end user engagement.

- *Governance and Policy Influence* – Governing bodies to push standards for research and reporting. UKDNAWG must maintain direct relationships with end users and policy influencers.

5. Specifying medium-term objectives and activities

The breakout groups were then asked to look at medium-term (5 years) objectives for the UKDNAWG and the activities that the group should undertake to achieve those objectives.

Discussion points on 5-year objectives:

- *Strategic Mapping and Integration* – Need a comprehensive understanding of who is doing what across sectors to have an integrated, cross-sectoral and One Health approach.
- *Community Engagement and Awareness* – Greater understanding of DNA methods in the broader community through training, signposting, and resources to support uptake.
- *Operational Rollout of Biodiversity Monitoring* – Embed DNA-based approaches in routine biodiversity monitoring and demonstrate the impact and robustness of methods.
- *Infrastructure Development* – Establish official UK reference databases and biobank/sample archives. Improve UKDNAWG visibility and resource provision.
- *Funding and Policy Influence* – Produce and promote a national strategy for eDNA/DNA in environmental surveillance with a strong business case to unlock funding and sell molecular tools to government and investors.
- *Career Development and Inclusivity* – Annual meetings and events are inclusive, useful for all stakeholders and support for early career professionals.

Discussion points on key activities

- *Collaboration and Outreach* – Join up with other relevant organisations (NGOs, water companies, developers, finance bodies). Consider industry representation in the Steering Committee and engage finance experts (e.g. World Bank) to strengthen a business case.
- *Evidence and Impact* – Commission economic impact assessments (e.g. Natural History Museum digitalisation model). Collate use cases and success stories to demonstrate value.
- *Standards and Readiness* – Develop technical readiness maps and cross-sector standards. Support ring testing and proficiency testing to support harmonisation.
- *Knowledge Mobilisation* – Run focused events and sub-working groups with clear goals and outputs. Produce white papers, guidance documents, and training resources.
- *Digital Presence and Resources* – Update the UKDNAWG website with better signposting and group information. Improve access to archived data, reference collections, and sample repositories.
- *Governance and Strategy* – Update Terms of Reference for the working group and Steering Committee. Establish subgroups to work toward each 5-year objective.

Overall, this session reaffirmed our strong collective ambition to embed DNA-based methods into mainstream practice through coordinated action, innovation, and engagement.

6. Collaboration and partnerships

Lynsey Harper (Natural England) led the session after lunch which began with several short presentations from related groups, projects or partnerships. Each presenter was asked to consider the governance and funding of their project, how it aligned with the UKDNAWG and opportunities to integrate with other initiatives in the future.

David Bass (Cefas) described the Defra Centre of Excellence for DNA-based methods and their strategy (Defra Group DNA Centre of Excellence Strategy 2025-2028). The vision of the DNA CoE is to:

- Realise the potential of genetic technologies to help us understand and manage our changing environment and support improvements in regulatory systems.
- Tackle barriers to change and lead the building of skills, capability and confidence in genetic technologies to nurture the culture required for successful deployment.

It aims to do this through:

- Research to support development of novel technologies and metrics, with wide relevance to Defra Group.
- Improving alignment and consistency of approaches via the harmonisation of methods, and a knowledge hub.
- Ensuring Defra Group infrastructures are fit for purpose to enable effective use of our physical and digital genetic assets, including providing public access where appropriate.

Pete Hollingsworth (Royal Botanic Gardens Edinburgh) presented on 2 projects, the Scottish DNA hub and Biodiversity Genomics Europe.

The Scottish DNA hub is a virtual network of approximately 30 organisations that was established in 2020 to improve the adoption of DNA-based methods for monitoring in Scotland. It does not have direct funding and secretariat support is provided by RBGE. It was noted that an eDNA strategy for Scotland is being developed for the CAMERAs partnership (Co-ordinated Agenda for Marine, Environment and Rural Affairs Science).

Biodiversity Genomics Europe is a European consortium project with 31 partners in 21 countries and €22m of funding until February 2026. A bid for a second phase has been submitted to Horizon Europe. It is building capacity in DNA barcoding and whole genome sequencing and unifying themes covering both. It is led by Naturalis in the Netherlands. It links to related UK initiatives such as the UK Barcode of Life project (see below), Darwin Tree of Life and Bioscan.

Ben Price (Natural History Museum) outlined the work of the UK Barcode of Life project. This has been funded by Defra and Natural England. It recognises that a UK curated reference database is urgently required. Currently, 30-40 % of UK species need reference data. Between two thirds and three quarters of species with public sequence data have taxonomic conflicts. Reference libraries require curation and validation so that we can trust the names attributed to sequences, which is not currently true of most databases.

Florian Leese (University of Duisberg-Essen) described proposals for an eDNA Europe society. He summarised the results of a survey to determine interest in a European Society dedicated to

eDNA and environmental omics. This showed a high level of support for such a society. He also outlined the resources that would be needed to support its establishment.

The subsequent discussion covered the following points:

- *Funding* – Funding was seen as crucial for stimulating, sustaining and catalysing collaborations and partnerships, especially across sectors. UKDNAWG operates on good will and support from its members with some funding for secretariat support from UKEOF through UKCEH.

  There are very different levels of governance and resourcing across groups. It would be helpful to share practical experiences and governance models to understand what can be achieved with the resources available.

- *Join up* – During discussion on a vision for the UKDNAWG, many similar topics came up across organisations and groups. Challenges, problems and ambitions are shared across international and national groups. The UKDNA Working Group already provides a connection between different organisations and projects in the UK. There is an opportunity to develop greater synergy and collaboration.

- *Standardisation and Reproducibility* - An urgent need for standardisation was expressed during the discussion. The 4th eDNA ISO update meeting recently finalised eDNA water sampling and preservation standards. There are two more ISO standards in the pipeline and three more coming. More UK input to this work is required. There is an opportunity for the DNA Centre of Excellence, the UKDNAWG and other partners to support the establishment of ISO standards.

  This has highlighted the need for change in how we record what we are doing, which aligns with the ongoing initiative relating to FAIR eDNA terms. The recent eDNA paper focused on applying FAIR principles indicates the transition to requiring reproducible and open research, which is likely to apply across eDNA work more broadly.

- *Partnership incentives* – The group considered what the 'offer' of the UK DNA Working Group is and what the benefits for institutions are. DNA networks in general can provide access to standard documents, opportunities to influence wider initiatives, and access to newsletters and wider resources. There is an opportunity to partnering with eDNA Europe which would provide links to multi-country projects and partnerships. The UK would benefit from aligning with a broader European scope, and alignment of objectives and practices with European projects would be an excellent catalyst for wider progress within the UK DNA Working Group.

7. Governance and ways of working

Marco Benucci (Fera Science) led the session on governance and ways of working. Rather than splitting the group into discussion tables, the session was organised around four main topics. All participants minus 4 note takers, were allowed to rotate on each topic to contribute to each in a cohesive way.

- *Governance* – Membership of UKEOF has benefits and the group considered whether we are making the most of those and if we could increase synergies with other working groups. The Steering Committee (SC) was discussed with a question on whether it is too

big. A smaller core management group could take on most decision making while continuing with a larger SC. One suggestion was the creation of internal technical working groups. One point raised was that the academic members of the SC have 3-years rotation, while end user members have a permanent seat.

- *Decision making* – Linked to governance and a feeling is that the SC was too big, but the active group was fine. This was the topic with most diverse views among participants. Four separate points were flagged:

    a) Steering committee – If decisions are important, then there should be a voting system in place to engage the wider group outside of the Steering Committee. That could require an AGM, which means it will require formalising membership with a constitution. Reducing the size of the SC could help with the decision making, with agreement on formalising roles and time-bound places.

    b) Decision making – Steering Committee to coordinate task focused subgroups. There wasn't a single suggestion for decision making but rather elements on what to keep in mind, for example a point on whether improving the decision making can lead to an improvement in fundraising?

    c) Communication - How the group communicates withing itself was another point. Use of newsletter can be considered but this would require resources.

    d) Other points – Less money means having less bureaucratic load. While formalisation will lead to an increase in bureaucracy and time and resources, including the frequency of meetings. No matter what is decided, we need to promote change and improve external alignment.

- *Internal synergies* (or how do we work together) – The discussion mentioned summarising and mapping our expertise, so we understand our collecting expertise. A couple of suggestions on this were to create an address book-like approach on the website. This would mean updating the website, looking at similar groups to like the Northern Bioinformatic User Group (NBUG). There was also a point in collating case studies from our group to create potential opportunities to link up. Mapping our current expertise can also help us in identifying the gap we have and working to potentially address those.

- Strategic development – This topic provided more of an opportunity for solidifying some of the discussion from previous sessions. The main points here were the refining of the vision of the group and the development of a strategy document for the group. This should include:

    - Goals and priorities
    - Dynamic working groups
    - Tangible and achievable milestones
    - Links and interactions with other groups
    - Strategic funding
    - Research to policy pipeline
    - Knowledge-sharing between action plan developers

8. Influencing

Lori Lawson-Handley (UKCEH) led the session on influencing with a discussion that considered who the UKDNA WG wanted to influence, why and how we could do this.

The organisations we should engage with included public sector (NERC, UKRI, Defra, Government Office for Science, Government Chief Scientific Advisers and Cabinet Office), Learned Societies (Royal Society, British Ecological Society), Chartered Institute of Ecology and Environmental Management, environmental Non-governmental Organisations, private finance and the Biodiversa+ programme.

The primary purposes of influencing activity are to increase funding for DNA based monitoring and research, and to make the case for this technology to enable growth, modernise monitoring and provide ecological insights for nature recovery. A critical tool for us to that will be a business case and associated economic argument.

9. Close of the workshop and next steps

The actions and next steps from this workshop are:

Topic	Next steps	Owner
Vision and outcomes	Agree vision and objectives for UKDNAWG. Produce Theory of Change.	UKDNAWG Steering Committee
Collaboration and Partnerships	Improve engagement with key partners and projects particularly: • Defra DNA Centre of Excellence • Scottish DNA hub and strategy • ISO standards development • FAIR eDNA initiative • Biodiversity Genomics Europe • UK Barcode of Life • eDNA Europe Society	UKDNAWG Steering Committee and partners
Governance and Ways of Working	Review governance considering: • potential to have a smaller management group and larger steering group • formalising decision making • role of task and finish groups • improving communications • developing case studies	UKDNAWG Steering Committee
Influencing and Strategy	Produce a business case and develop a wider partnership to work on a UK DNA/eDNA Strategy	UKDNAWG, Defra DNA Centre of Excellence, UKCEH

Annex A – Workshop Agenda Aims

- To develop our vision for the UKDNA Working Group and the long-term (15 year) outcomes that we aim to achieve.
- To identify medium-term objectives and the activities we need to meet those.
- To develop proposals for better collaboration, influencing and ways of working.

Outputs

- A Workshop report
- Development of a Theory of Change
- Identification of actions for an Action Plan

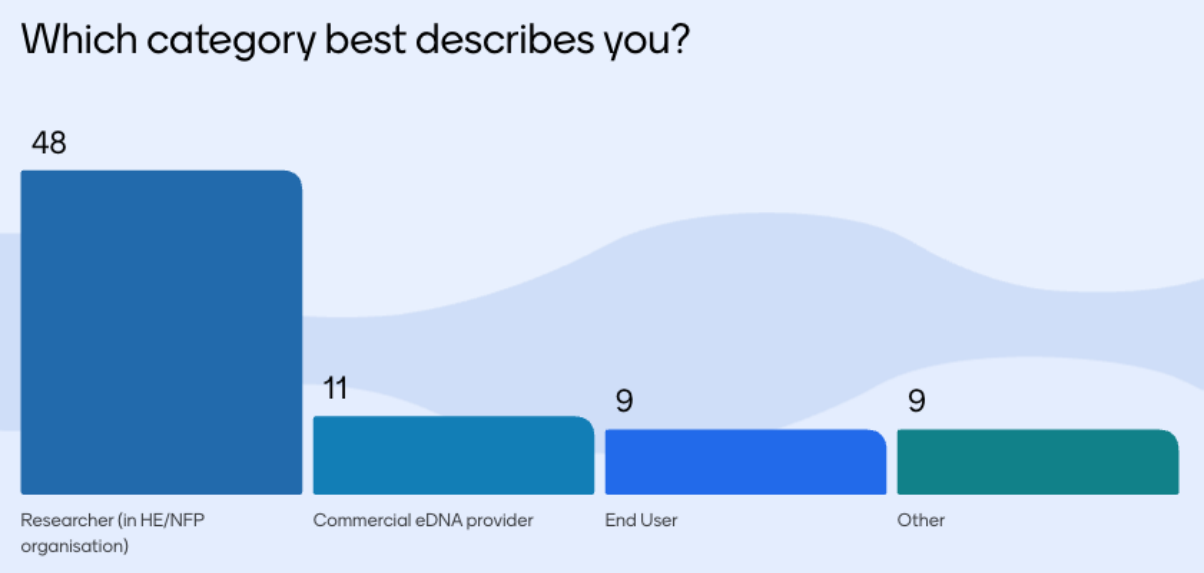
Time	**Session**	**Lead**
10.00	Welcome and introduction to the day	Andy Nisbet
10.20	Icebreaker	Andy Nisbet
11.00	Results of UKDNA WG surveys	Lori Lawson-Handley
11.20	Break	
11.30	Vision and outcomes	Andy Nisbet
12.45	Lunch	
1.30	Collaboration and partnerships	Lynsey Harper and individual presenters
2.15	Governance and ways of working	Marco Benucci
2.45	Influencing	Lori Lawson-Handley
3.15	Review, actions and next steps	Andy Nisbet
3.30	Close	

Annex B – Workshop Attendees

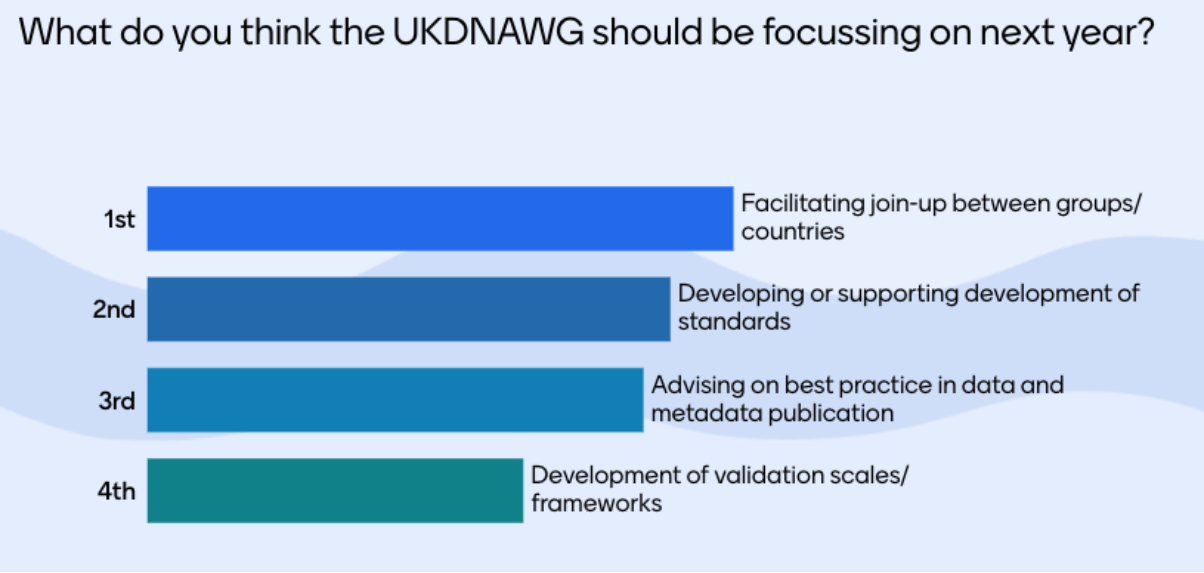
Name	Organisation
Alistair Duguid	Scottish Environmental Protection Agency
Andy Briscoe	NatureMetrics
Andy Nisbet	Natural England
Ben Price	Natural History Museum (online, afternoon)
Dan Read	UK Centre for Ecology and Hydrology
Davd Bass	Centre for Environment, Fisheries and Aquaculture Science and Defra DNA Centre of Excellence
Florian Leese	University of Duisberg-Essen (online, afternoon)
Helen Hipperson	University of Sheffield
Jordan Cuff	Newcastle University
Katie Clark	Natural England
Kerry Walsh	Environment Agency
Kayleigh Thomas	Joint Nature Conservation Committee
Laia Rovina-Craven	Scottish Environmental Protection Agency
Joanne Littlefair	University College London
Lori Lawson-Handley	UK Centre for Ecology and Hydrology
Luke Spadavecchia	Department for Environment, Food and Rural Affairs
Luke Tyler	Natural Resources Wales
Lynsey Harper	Natural England
Marco Benucci	Fera Science
Paul Woodcock	Joint Nature Conservation Committee
Pete Hollingsworth	Royal Botanical Gardens Edinburgh and Biodiversity Genomics Europe
Simon Creer	Bangor University
Tosca Tindall	ECHO
Tristan Hatton-Ellis	Natural Resources Wales (online, afternoon)
Will Goodall Copestake	Royal Botanical Gardens Edinburgh and Biodiversity Genomics Europe

Annex C – Summary of survey responses to UKDNA WG survey May 2025

Type of respondents



UKDNA WG focus



Comments covered:

Scientific and technical development

- Standardisation and operationalisation of eDNA
- Beyond basic presence data

Strategic and policy goals

- National and international collaboration
- Regulatory alignment
- Public good and ethical considerations

Communication & engagement

- End-user focus
- Public and cross-sector engagement
- Communication platforms

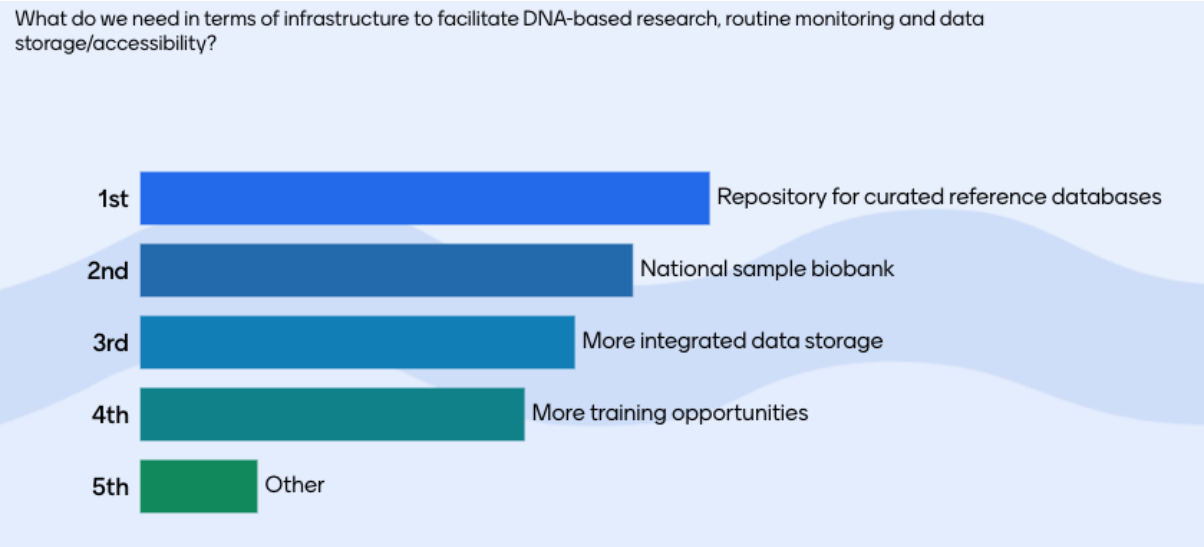
Capacity building and community development

- Early career researcher support
- Workshops and task groups
- Shared learning and integration

Funding and growth opportunities

- Strategic funding
- Focus areas for growth

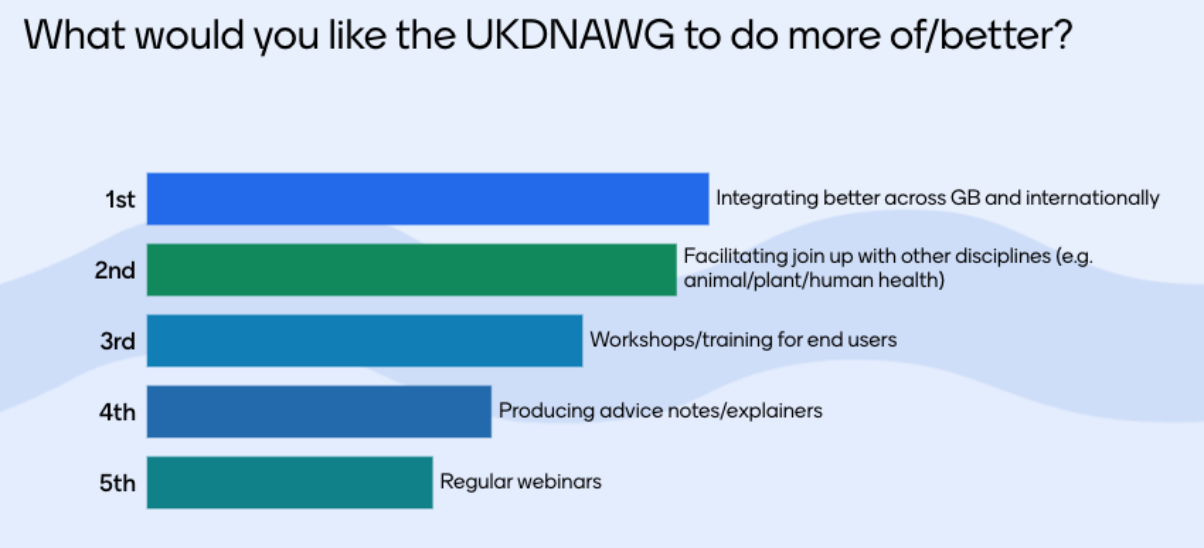
Infrastructure needs



Comments covered

- Data integration and standardisation
- Biobanks and reference libraries
- Funding and coordination
- National frameworks and decision support
- Training and collaboration

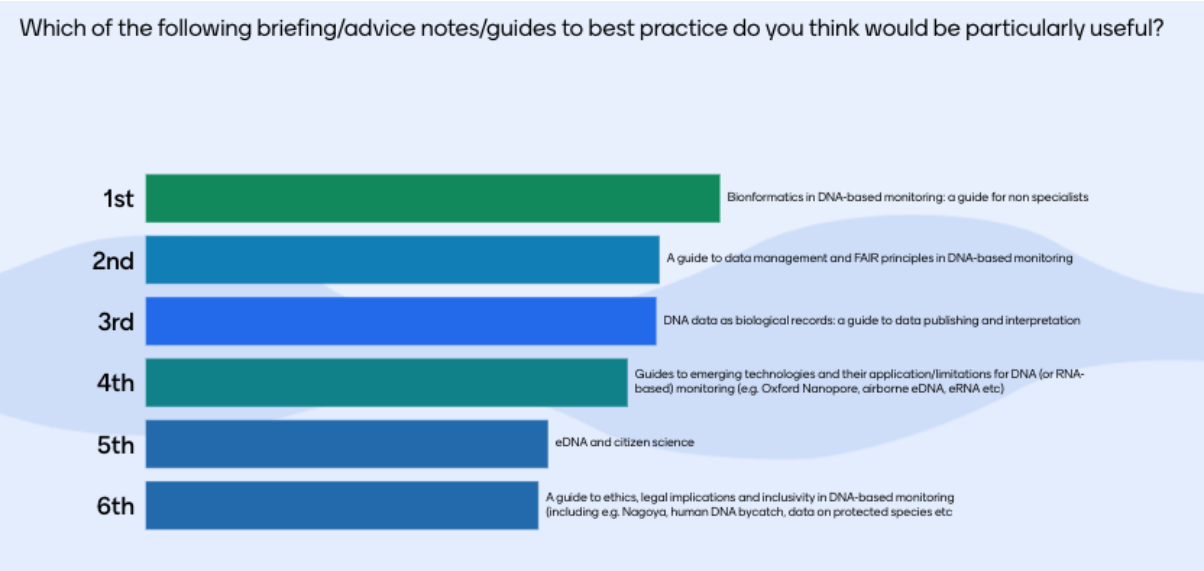
What should the UKDNAWG do more of or better?



Comments covered

- Organisational and strategic development
- Support and engagement
- Capacity building and training
- Equity, Diversity, and Inclusion
- Cross-disciplinary collaboration

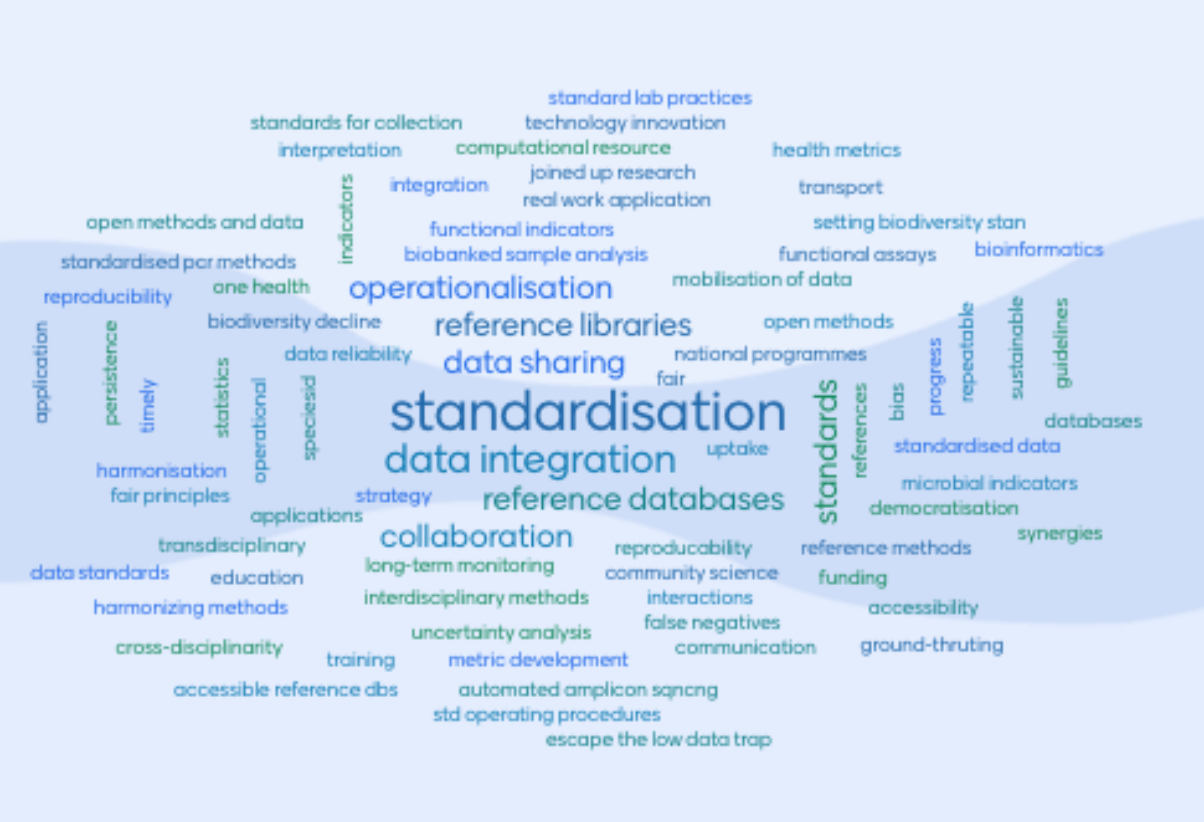
Advice notes and guidance



Summary of comments

- Guidance on statistical analysis of eDNA data
- Ecology of eDNA
- Minimum reporting standards
- Sequencing techniques
- State of eDNA research

Priorities for research in DNA-based monitoring



Key themes:

- Data integration and sharing
- Standardisation of methods and protocols
- Reference databases/libraries
- Reproducibility and FAIR principles
- Technology and computational resources
- Interdisciplinary collaboration
- Operationalisation and real-world application
- Community involvement and open science

Biggest barriers/challenges for eDNA research and operationalisation

Key Themes:

- Funding & Resources
- Data & Standards
- Collaboration
- Technical & Methodological Challenges
- Policy & Real-World Impact