Biodiversity Information Management Forum 2013 Report

19 – 20 November 2013

Theme: developing a shared national vision and implementation plan for South Africa's biodiversity information systems

SANBI's Biodiversity Advisor
http://www.biodiversityadvisor.org.za

Table of Contents

List of Acronyms **3**
EXECUTIVE SUMMARY **4**
PURPOSE OF THE WORKSHOP **5**
VISION **6**
PRIORITY WORK AREAS **6**
PRESENTATION SESSIONS **6**
Setting the scene 6
February International Information Architecture Meeting 6
PLENARY SESSIONS **7**
Baseline architecture 7
Causes of fragmentation 7
Developing priorities 7
GROUP DISCUSSIONS **9**
Priority work area 1: Building awareness of information resources in the biodiversity informatics community 9
Priority work area 2: Consolidating and implementing data management standards and policies 10
Priority work area 3: Resolving taxonomic impediments 12
Priority work area 4: Understanding end-user needs 14
Appendix 1: Workshop Programme **15**
Appendix 2: Workshop participant list **16**
Appendix 3: Participlan notes on Baseline architecture **18**
Appendix 4: Group discussions on integration issues **20**

List of Acronyms

ADU	Animal Demography Unit
ARC	Agricultural Research Council
BCIS	Biodiversity Conservation Information System
BGIS	Biodiversity Geographic Information Systems
BHL	Biodiversity Heritage Library
BL-SA	Birdlife South Africa
BIMF	Biodiversity Information Management Forum
BRAHMS	Botanical Record and Herbarium Management System
CODATA	Committee on Data for Science and Technology
DEA	Department of Environmental Affairs
DST	Department of Science and Technology
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
EOL	Encyclopaedia of Life
EWT	Endangered Wildlife Trust
GBIF	Global Biodiversity Information Facility
GEOBON	Group on Earth Observations Biodiversity Observation Network
IBA	Important Bird Areas
iBOL	International Barcode of Life Project
IUCN	International Union for Conservation of Nature
KZN	KwaZulu-Natal
NBSAP	National Biodiversity Strategy and Action Plans
NGO	Non-Governmental Organisation
POSA	Plants of southern Africa
RDF	Resource Description Framework
SABAP	South African Bird Atlas Project
SABIF	South African Biodiversity Information Facility
SANParks	South African National Parks
SANReN	South African National Research Network
SIBIS	SANBI Integrated Biodiversity Information System
SAEON	South African Environmental Observation Network
SANBI	South African National Biodiversity Institute
URI	Uniform Resource Identifier
WWF	World Wildlife Fund

EXECUTIVE SUMMARY

The vision developed by the 2013 Biodiversity Information Management Forum (BIMF) is *to provide access to integrated South African biodiversity information.*

The 2013 BIMF identified the following priorities that will contribute significantly to achieving this vision:

- Building awareness of information resources in the biodiversity informatics community;
- Consolidating and implementing data management standards and policies;
- Resolving taxonomic impediments;
- Understanding end-user needs.

The National Environmental Management: Biodiversity Act of 2004 established the SANBI with the mandate to play a leading role in South Africa's national commitment to biodiversity management. According to the Act, the Institute must (among other things) collect, generate, process, coordinate and disseminate information about biodiversity and establish and maintain databases in this regard. This places information management at the core of SANBI's mandate. SANBI performs this function from information and knowledge generated within the institute and its partner organisations. The data and information is used to support research, planning, decision-making, policy formulation and monitoring the status and trends in biodiversity.

SANBI has made significant investments in developing large biological information resources and assembling this information into accessible databases. A range of systems, tools and policies have been developed in response to identified needs over time. These systems provide valuable data, information and tools, but do not capitalise on the potential knowledge that can be generated through effective system integration.

In February 2013, SANBI hosted a five day workshop, with international organisations and countries, to learn from their experiences in designing innovative biodiversity information systems. Represented at the workshop were counties such as Brazil, Mexico, Australia, Colombia, Denmark, Costa Rica, United Kingdom, United States of America, and international organisations such as the Global Biodiversity Information Facility (GBIF) and the Biodiversity Heritage Library (BHL). The workshop emphasised the importance of partner organisations, which will contribute to, and benefit from the system, to be consulted throughout the process.

SANBI structured the 2013 Biodiversity Information Management Forum to take forward the recommendations of the February international workshop and to work with partners to develop a shared vision and framework.

The outcome of this workshop gives guidance to priorities and process around the development of an integrated national biodiversity information system.

PURPOSE OF THE WORKSHOP

This two day workshop focused on developing a shared vision for a national biodiversity information system that will serve South Africa's needs. Partner organisations were invited to nominate a representative with a high level of data management experience to attend the workshop. Participant numbers were restricted to facilitate intensive participatory discussions. A standard workshop process was followed which comprised a series of group discussions and plenary sessions. The process employed to gather the information was Participlan™ – a visual mapping tool that encourages participation.

Plenary sessions enabled the groups to present the results of their discussions and obtain the input of all participants, resulting in additional debate and insight. A briefing document, programme (see Appendix 1) and supporting documentation was made available a week prior to the workshop, affording participants the opportunity to become familiar with the content requirements and current SANBI architecture.

Thirty-four people attended the workshop, representing experts from governmental organisations, national and provincial government, museums, conservation Non-Government Organisations (NGO's), academic institutions, parastatal organisations and research facilities. See Appendix 2 for a list of participants and organisations represented at the workshop.

The purpose of the workshop was to:

- Develop a shared national vision of a biodiversity information system for South Africa through understanding partner organisations' biodiversity informatics needs;
- Determine priorities and investigate ways to mitigate limitations;
- Evaluate the achievements and identify the structural and content gaps within SANBI's current biodiversity information systems;
- Share lessons from international partners;
- Develop an implementation framework;
- Establish roles and responsibilities of partners; and
- Agree on governance and communication.

Participants articulated the following expectations of the workshop:

1. To expand the collaborative networks and enable better integration between systems and institutions;
2. Develop a common system to contribute to and access data from;
3. Ensure all biological information is made available with content standards for biodiversity datasets;
4. Find ways to leverage investments in systems and capacity, so as to achieve more;
5. Maximise the value of data in the national vision;
6. Ensure data, for decision-making, is mobilised in the most effective way (national planning and policy development);
7. To collectively articulate a vision and way forward for biodiversity information management in South Africa with defined roles and responsibilities; and
8. To identify and develop new collaborative opportunities.

VISION

Workshop participants developed a national vision of a biodiversity information system for South Africa:

"to provide access to integrated South African biodiversity information"

PRIORITY WORK AREAS

Priority work areas were identified through engagement with partner organisations at the workshop so providing a framework for implementation. The priorities listed below comprise only some of the initiatives required to improve the provision of biodiversity data to meet national needs. It is important to note that this integrated system is a national approach, and full credit and acknowledgement must be given to the data owners. The priority work areas identified through engagement with national partner organisations in realising the vision include:

1. Building awareness of information resources in the biodiversity informatics community
2. Consolidating and implementing data management standards and policies
3. Resolving taxonomic impediments
4. Understanding end-user needs

PRESENTATION SESSIONS

Setting the scene

Selwyn Willoughby, SANBI

Selwyn Willoughby provided an overview of the themes and achievements resulting from past BIMF's, with the first National Biodiversity Information Management Workshop held in November 2007. Achievements include an established community of practice within biodiversity informatics (data provider or user), an annual growth of participants including international participation, political and funding commitment (national and international) from the minister of environmental affairs in support of information management, capacity building through academic programmes and the development of curricula for this field of study with a network of academic institutions. SANBI has hosted numerous training events. The 2009 forum initiated a process of analysing job roles in biodiversity information in collaboration with Green-Matter, working towards the increase of appropriately skilled graduates. Although geospatial data standards exist, a legal review of national policy on biodiversity data standards is needed. Existing information management infrastructure was highlighted and the relevance in national development plan.

February International Information Architecture Meeting

Brenda Daly, SANBI

Brenda Daly presented a summary of the outcomes, recommendations and key components from an international Information Architecture Workshop held in February in 2013. SANBI recognises the success of initiatives from similar organisations and countries, and the purpose of the workshop was to draw on

international experience in designing an innovative biodiversity information architecture which will enable SANBI to revise its schema and plan, to systematically implement a responsive new system.

Key recommendations included:

- Ensure partners are on-board from inception, and ensure good communication throughout the process;
- Avoid duplication;
- Use an incremental architecture;
- User open source software and collaborate on software development;
- Ensure that the programme is sustainable; and
- Inclusive governance.

Presentation slides are available for download on the Biodiversity Advisor.

PLENARY SESSIONS

Baseline architecture

Small group discussions followed by plenary sessions identified, see Appendix 3 for the full participlan record:

- the systems that are currently in place;
- the content that is available through those systems;
- the geographic scope of the content;
- participation in the generation of data;
- management of data regarding sensitivity and standards;
- infrastructure;
- areas of concern;
- issues to be resolved.

Causes of fragmentation

Overarching causes of fragmentation that were identified in the plenary out of the group discussions (see Appendix 4) were the following:

- Information management is not part of corporate priorities and falls across departments
- There is a lack of leadership, capacity and resources
- Financial constraints
- Lack of principles, procedures and policies
- Issues around transparency, accountability and ownership
- Overly complicated systems
- No incentives to digitise data
- Fear of discontinuity (for time series data)
- No thought of sustaining of systems

Developing priorities

The group went through a process of looking at success stories, the elements that enable success, and the requirements of an integrated approach. Out of this process categories were developed and each participant voted to establish the priorities in developing an integrated approach.

The priorities and voting outcomes are listed below.

Priority	**Number of votes**
Lack of awareness within the biodiversity informatics community (e.g. unaware of Southern African Bird Atlas Project (SABAP2) and Biodiversity Geographic Information Systems (BGIS)	16
How can data management standards and inter-institutional collaboration be fostered through policies and procedures?	12
Fixing of taxonomic mix in datasets slows integration/ Taxonomic backbone/service	11
Lack of understanding of who the end-users are, and their biodiversity information needs	9
Lack of capacity and resources	7
Technical constraints (bandwidth etc.)	5
Overly complicated systems	5
Different government departments fund collections, which is a challenge for good information management	4
Lack of awareness and communication on progress with data publishing (between data providers and service providers)	3
Unclear roles and responsibilities, lack of accountability	2
Rapidly changing technology	2
Financial constraints	2
Lack of documentation for systems developed	1
No incentives to digitize data	
Lack of visibility, transparency and accountability to the public	
Taxonomic code should be adopted to resolve taxonomic issues	
Addressing data ownership	
Lack of uniform standards	

The top four priority areas were established as working groups with lead members as indicated below.

1. Building awareness of information resources in the biodiversity informatics community (Sediqa Khatieb (lead), Les Underhill, Robin Lyle, Lebohang Majara, Sherwyn Mack, Victoria Goodall and Fhatani Ranwashe);

2. Consolidating and implementing data management standards and policies (Wim Hugo (lead), Ray Schaller, Nicolene Fourie, Fahiema Daniels, Lizanne Roxburgh, Fatima Parker-Allie and Russell Galt);

3. Resolving taxonomic impediments (Williem Coetzer and Michael Brooks (lead) Andrew Turner, Marianne le Roux, Burgert Muller, Ernst Retief, Mariette Marais, Riana Jacobs and Rene Navarro); and

4. Understanding end-user needs (Harriet Davies-Mostert (lead), Albert Ackhurst, Fatima Parker-Allie, Hamish Robertson, Lebohang Majara and Michael Brooks).

GROUP DISCUSSIONS

Small groups discussed problem statements, solutions and key actions relevant to the top 4 Priority Work Areas.

Priority work area 1: Building awareness of information resources in the biodiversity informatics community

Problem statement: There is a lack of awareness within the biodiversity informatics community. For example, there were people at this workshop who were unaware of SABAP2 and unaware of the BGIS website!	
Solution 1: Communication is a specialised skill and there needs be a dedicated person. There is a need for someone who can easily translate scientific information into layman's terms.	1.1. *Key action:* SANBI (and other organisations) should recruit an individual whose sole responsibility is communications. This person needs to promote biodiversity information resources available. Some of the avenues for doing this are through conferences, workshops, social media, newsletters, websites, and other media.
	1.2. *Key action:* Engage with organisations that have been successful in promoting their biodiversity projects. For example, we could learn from the strategies used by WWF to promote "stop rhino poaching." Set up a workshop with experts in the field where case studies are presented.
	1.3. *Key action:* Create a list of the URLs of biodiversity websites and describe the functionality that is available on each website. Include each organisations logo.
	1.4. *Key action:* Offer free training and education on biodiversity resources. There is a need for access to venues to do this. Target for this training is all user groups. For example, EIA consultants and government officials (Department of Environmental Affairs (DEA), Department of Water Affairs (DWA), Department of Science and Technology (DST), academics and postgraduate students, provincial and even municipal level). Engage with academics to make awareness of biodiversity resources as part of the curriculum.
	1.5. *Key action:* Don't promote promises but promote what can be achieved.

Problem statement: Lack of communication on progress with data publishing. There is a lack of communication between the data providers and service providers regarding the progress of a project; for example, when there is a delay between receiving data and publishing it.	
Solution 1: Report to data providers on progress with data uploads.	1.6. *Key action:* Before project commences, data providers and service providers should come to an agreement on how often they communicate and what platform they use for that communication.
	1.7. *Key action:* Terms and agreements should state that if service providers do not meet set deadlines they should report back to data providers on delays and problems.

Priority work area 2: Consolidating and implementing data management standards and policies

The development and implementation of national biodiversity data standards is vital to integrating biodiversity data in South Africa. The sharing of the data needs to take place within a framework of due attribution and it needs to be acknowledged that the technology will change and change often.

Problem statement: There are multiple data standards or lack of uniform standards.	
Solution 1: Legislated compliance to a data standards policy developed by SANBI (the policy will be dynamic and open to revision).	2.1. *Key action:* Engage with the DEA on initiating the process.
	2.2. *Key action:* Obtain legal opinion on initiating biodiversity standards for the country.
Solution 2: Submission format needs to comply with policy driven standards.	2.3. *Key action:* Investigate and get stakeholder buy-in related to the best standards to use.
	2.4. *Key action:* Compile (e.g. geo-guidelines) and document standards when not available.

Problem statement: Addressing data ownership (no recognition)	
Solution 1: Data ownership needs to be clear in the research contract in jointly funded projects (public / private partnerships).	2.5. *Key action:* Develop a template that will ensure data ownership is clearly articulated.
Solution 2: Enable data generated by government funded project needs to be publically available.	2.6. *Key action:* Setup the enabling infrastructure.
	2.7. *Key action:* Links to communication and awareness.

Problem statement: Rapidly changing technology	
Solution 1: Ensure the institutions Application Programming Interface (API's) are kept constant.	2.8. *Key action:* Ensure a stable backend
	2.9. *Key action:* Develop an API for the import and export of data by data partners.

Problem statement: There is a lack of documentation for systems developed	
Solution 1: Document the system during development	2.10. *Key action:* Ensure that the time is spent on compiling documentation or spend the money to get it done afterwards.

Problem statement: Technical constraints (bandwidth, bandwidth speed, institutional costs)	
Solution 1: Develop a Data Hosting Centre	2.11. *Key action:* Assess what hosting requirements are needed
Solution 2: Create partnerships with the Centre for Higher Computing	2.12. *Key action:* Investigate the role that the Centre for Higher Computing can play in supporting the vision for South Africa.

Problem statement: Overly complicated system	
Solution 1: A modular dynamic system and not a system that fits all.	2.13. *Key action:* Develop a User Interface
	2.14. *Key action:* Develop templates and tools (e.g. mapping Excel Spreadsheet fields)
	2.15. *Key action:* Extraction layers written by the data provider
	2.16. *Key action:* Review data structures (single line reference, one to many relationships,

	geodatasets)

Problem statement: How can data management standards and inter-institutional collaboration be fostered through policies and procedures?	
Solution 1: Enhance capacity and awareness	2.17. *Key action:* Increase government capacity by engaging in forums like 'Working for Data'.
	2.18. *Key action:* Work with universities to ensure that biodiversity data management is a compulsory part of environmental science honours courses.
	2.19. *Key action:* Ensure that biodiversity data priorities are appropriately considered in the National Biodiversity Strategies and Action Plans (NBSAP).
Solution 2: Identify and emulate successful existing policies and procedures	2.20. *Key action:* Examine how other governments, sectors and institutions are effectively dealing with data.
	2.21. *Key action:* Compile existing standards, guidelines and best practices e.g. Biodiversity Conservation Information System (BCIS) guidelines, Group on Earth Observations Biodiversity Observation Network (GEOBON) data management standards, Committee on Data for Science and Technology (CODATA) license templates, creative commons licences, Future Earth's World Committee on Data Policy, etc.
	2.22. Key action: Develop protocols for Citizen Science initiatives, with a view to reducing the error margins of data collected.
Solution 3: Improve recognition and incentives for adopting unified standards	*2.23. Key action*: Develop policies for citation and attribution that strengthen recognition of data publishers
	2.24. Key action: Adopt and promote the forthcoming outcomes of the Research Data Alliance Task Group on Data Citation and Publication
Solution 4: Legislate biodiversity standards	*2.25. Key action*: Provide inputs to the Policy Advisory Note being prepared by DST for Cabinet, to ensure that the voice of the biodiversity community is heard.
Solution 5: Create contractual obligations for biodiversity data management	*2.26. Key action*: Encourage donor agencies to make full payment to beneficiaries dependent on compliance with standards.

Priority work area 3: Resolving taxonomic impediments

A recommendation from the Information Architecture Workshop held in February 2013 was to establish a taxonomic backbone (taxonomic concepts) for species and ecosystems for the country. At SANBI, taxonomic concepts follow the latest publications and if there is disagreement there is the option to counter publish. It was agreed there are a number of taxon classes and each class needs a group of taxonomic experts that can update the list. It is important to keep up-to-date with the literature of the region and link into international databases. There will be ongoing effort to keep these checklists up-to-date.

From a systems point of view this should be a single service irrespective of how it is compiled through various contributions (taxonomic reference and/or international databases). Taxa references and classification should work according to the principles of Linking Open Data (Resource Description Framework (RDF) content format and dereferencing Uniform Resource Identifier (URIs)) so that data does not change when reclassified taxonomically. Digital object identifier should remain the same even though the name or classification changes. Participants agreed that a complete synonymy of all species is an impossible task and it is important to hold old names that are relevant to the data.

Problem statement: Fixing of the taxonomic mix in datasets slows integration (cost and time) an example GBIF	
Solution 1: Use metadata	3.1 *Key action:* Improve detail on guidelines related to data utilisation
Solution 2: Taxonomic server that addresses the way to use a number of taxonomic impediments. Create an aggregated service that will link to all other authoritative taxonomic databases. Centralised website held by SANBI. Remark: GBIF does have an authoritative backbone that can be used.	3.2 *Key action:* Create an aggregated service that will link to all other authoritative taxonomic database
Solution 3: Generate checklists for taxa and determine who updates these lists. For updating the backbone use the checklist generated by the scientists (checklist and the South African Biodiversity Information Facility (SABIF) needs to standardised so that there is only one process).	*3.3 Key action:* Interconnectivity amongst different SANBI portals of data entry.
Solution 4: Provide background / guidelines on what classification is being followed (includes information on deviation and changes).	3.4 *Key action:* Improve details on guidelines

Problem statement: Taxonomic code should be adapted to resolve taxonomic issues.	
Solution 1: Communication between data users isn't always clear; therefore better communication between role players is needed.	3.5 *Key action:* better communication via workshops and forums.
Solution 2: What is causing impediments and problems in the data? For example, historical data versus new names. Taxonomic experts (inventory of taxonomists) need precise guidelines.	3.6 *Key action:* Build capacity (align with other groups priorities)
Solution 3: Moving away from spreadsheet towards relational database (remove typing errors).	*3.7 Key action:* To obtain institutional buy-in and commitment for the shift toward relational databases, and build and strengthen collaboration.
Solution 4: Training is important	*3.8* Taxonomic and Information Management

	and standards workshops (practical).
Solution 5: Verification by taxonomists. Take responsibility and increased capacity within taxonomy.	*3.9* Effectively communicating the purpose of collections

Priority work area 4: Understanding end-user needs

It is important to understand people's information-seeking behaviour and preferences, to mould services and resources to conform to these patterns, and in this way better serve the users' needs.

<table>
<tr><td colspan="2">Problem statement: There is a lack of understanding of who the end-users are and what their biodiversity information needs are?
a. Who are the end users?
b. What do they want to do with the information?
c. What is the impact of the information?
d. Who is responsible for providing that information (speaks to the mandate)?

A set of users exists - conservation managers, scientists, academics, students, developers, private sectors, political leaders, magistrates, law enforcers, educators, citizen scientists, members of the public, etc.</td></tr>
<tr><td>Solution 1: Develop a scoping exercise</td><td>4.1 Key action: Do a scoping exercise with a series of different user groups to understand who is using biodiversity data and what data they require for specific purposes.</td></tr>
<tr><td>Solution 2: Do a series of hypothetical scenarios with community groups to identify who is using the data and if not, why not. What are the benefits for the different user groups? A needs analysis can be done here.</td><td>4.2 Key action: Determine what are the uses of the data, relevance for purpose and how can it best be accessed, ensure focus groups are targeted, this scoping will inform the system and app/s.</td></tr>
<tr><td>Solution 3: Accessibility is critical. A website and search interface (one page interface- that can provide a diagnostic interface) that is easy to use and very relevant for specific purposes, e.g. decision makers. Define a system that gets through to a large user base.</td><td>4.3 Key action: Develop a system through which it is easy to access data from and easy to contribute data into.</td></tr>
<tr><td>Solution 4: Meaningful information (quality). Including primary data and information (narrative), this must be reliable, attention to summary content.</td><td>4.4 Key action: Build content development (narrative of species information) into fund-raising. This may need to be prioritise based on the use of species e.g. ecosystem services?</td></tr>
<tr><td>Solution 5: Catering for citizen scientist is important</td><td>4.5 Key action: No action item</td></tr>
<tr><td>Solution 6: Location based app – go to a site where we can see pictures of species or other data that we can easily visualise to support decision makers e.g. in EIA or development purposes.</td><td>4.6 Key action: Development of apps as an outcome of the scoping exercise, for decision makers to easily visualise data or other purposes.</td></tr>
<tr><td>Solution 7: Images and multimedia is becoming increasingly important.</td><td>4.7 Key action: Ensure the optimal use images and multimedia.</td></tr>
<tr><td>Solution 8: Find ways to market the data and marketing our products is critical.</td><td>4.8 Key action: Increase marketing expertise in our work. Increase our use of experts relating to marketing objectives</td></tr>
</table>

Appendix 1: Workshop Programme

Biodiversity Information Management Forum

19 and 20 November 2013
Strelitzia Hall, Walter Sisulu National Botanical Garden

Tuesday 19 November	
08h30	Registration and tea
09h00	Setting the scene
09h30	Introductions and expectations
10h00	February international information architecture workshop report
10h30	*Tea*
11h00	Baseline architecture – SANBI and partners
13h00	*Lunch*
14h00	Developing our shared vision for South Africa's biodiversity information systems
15h30	*Tea*
16h00	Developing our shared vision for South Africa's biodiversity information systems
17h30	Close
18h00	Dinner

Wednesday 20 November	
09h00	Revisiting Day 1
09h30	Priorities, Implementation, timeframes and resources
11h00	*Tea*
11h30	Roles and responsibilities
13h00	*Lunch*
14h00	Governance and communication
15h00	Parallel implementation strategy
15h30	*Tea*
16h00	Summary of key outcomes
16h30	Close

Appendix 2: Workshop participant list

NAME	EMAIL	ORGANISATION	POSITION
Albert Ackhurst	Albert@westerncape.gov.za	Department of Environmental Affairs and Development Planning (DEADP): Western Cape Government	Control Environmental Officer: Biodiversity
Andrew Turner	aaturner@capenature.co.za	Cape Nature	Knowledge Manager and Acting Senior Manager Scientific Services
Anne-Lise Fourie	A.Fourie@sanbi.org.za	SANBI	Assistant Director: Library services
Brenda Daly	B.Daly@sanbi.org.za	SANBI	Information Systems Manager
Burgert Muller	bmuller@nmsa.org.za	KZN Museum	Curator: Department of Natural Sciences
Ernst Retief	ernst.retief@birdlife.org.za	BirdLife South Africa	Data Manager
Fahiema Daniels	F.Daniels@sanbi.org.za	SANBI	Biodiversity Planner
Fatima Parker-Allie	F.Parker@sanbi.org.za	SANBI	SABIF Node Manager
Fhatani Ranwashe	F.Ranwashe@sanbi.org.za	SANBI	Groen Sebenza Intern: BGIS Technician
Gloria Cupido	G.Cupido@sanbi.org.za	SANBI	Control Provision Admin Clerk
Hamish Robertson	hrobertson@iziko.org.za	Iziko Museum	Director: Natural History Collections
Harriet Davies-Mostert	harrietd@ewt.org.za	Endangered Wildlife Trust	Head of Conservation Science
Lebohang Majara	L.Majara2@sanbi.org.za	SANBI	Groen Sebenza Intern: Communication
Les Underhill	les.underhill@uct.ac.za	Animal Demography Unit	Director
Lizanne Roxburgh	lizanner@ewt.org.za	Endangered Wildlife Trust	Biodiversity Information Specialist
Marianne le Roux	M.LeRoux@sanbi.org.za	SANBI	eFlora Coordinator
Mariette Marais	MaraisM@arc.agric.za	Agricultural Research Council	Senior Researcher (Plant taxonomist)
Michael Brooks	michael.brooks@uct.ac.za	Animal Demography Unit	Senior IT Technician
Namhla Mbona	n.mbona@sanbi.org.za	SANBI	Freshwater Biodiversity Planner
Nicolene Fourie	NFourie@environment.gov.za	Department of Environmental Affairs	Chief GIS Specialist: GIS Operations Manager
Paula Hathorn	P.Hathorn@sanbi.org.za	SANBI	Learning Network Manager
Ray Schaller	Rschaller@nwpg.gov.za	Department: Economic Development, Environment, Conservation and Tourism (DEDECT) North West Provincial	Conservation Planner

		Government	
Rene Navarro	rene.navarro@uct.ac.za	Animal Demography Unit	IT Manager and Specialist Programmer
Riana Jacobs	JacobsR@arc.agric.za	Agricultural Research Council	Project Manager: Mycological Culture Collections
Robin Lyle	LyleR@arc.agric.za	Agricultural Research Council	Senior Research Technician (Arachnids)
Ros Urban	UrbanR@arc.agric.za	Agricultural Research Council	Insects Collections Manager
Russell Galt	R.Galt@sanbi.org.za	SANBI	Project Coordinator
Sediqa Khatieb	S.Khatieb@sanbi.org.za	SANBI	GIS Manager
Selwyn Willoughby	S.Willoughby@sanbi.org.za	SANBI	Director: Biodiversity Information Management
Sherwyn Mack	Sherwyn.Mack@ecpta.co.za	Eastern Cape Parks and Tourism Agency	Biodiversity Data Manager
Victoria Goodall	Victoria@saeon.ac.za	South African Environmental Observation Network	
Willem Coetzer	W.Coetzer@saiab.ac.za	South African Institute for Aquatic Biodiversity	Biodiversity Information Manager
Wim Hugo	wim@saeon.ac.za	South African Environmental Observation Network	Chief Data and Information Managing Officer

LIST OF INVITEES UNABLE TO ATTEND

Invitee	**Institution**
Tanya Abrahamse	SANBI
Carmel Mbizvo	SANBI
John Donaldson	SANBI
Boyd Escott	Ezemvelo KZN Wildlife
Jeff Chen	Centre for High Performance Computing (CSIR)
Martin Cocks	University of the Western Cape

Appendix 3: Participlan notes on Baseline architecture

The group went through a brainstorming process to establish the systems and content of biodiversity online resources currently available. This was not an effort to develop a comprehensive and conclusive list, but rather to provide a baseline to frame the discussion for the remainder of the workshop. The process gave participants a sense of the wide number of online biodiversity resources available, and the lack of integration or relationship between those resources.

The lists below are verbatim from the brainstorming process.

Systems

- SANBI: South African Biodiversity Information Facility (SABIF):SIBIS
- SANBI: BGIS
- SANBI: Plants of southern Africa (POSA)
- SANBI: Botanical Record and Herbarium Management System (BRAHMS)
- GBIF: International Publishing Toolkit (data publishing by organisation)
- BHL
- iSpot (citizen science)
- SANBI: EIA
- SANBI: Biodiversity Advisor
- SANBI: Red List website
- Turbo veg
- Encyclopaedia of Life (EOL); International Barcode of Life Project (IBOL)
- Fire data system
- South African Environmental Observation Network (SAEON): metadata system
- SAEON: Observation system
- SAEON: Online capturing data environment.
- SAEON: Ocean and off-shore data
- SAEON and SANParks: Metacat system
- Endangered Wildlife Trust (EWT): Mobile app. Road watch
- IZIKO: Wasp web
- IZIKO: Fig web
- IZIKO: Biodiversity Explorer
- IZIKO: has approximately 30 databases integrated into Specify
- Quantum, DIVA, Macaw, Specify, Access, MySQL, ESRI, Excel, Shape files, ABBY, Databases
- Animal Demography Unit: virtual museums; atlases, bird ringing, citizen science
- IUCN conservation assessment

Participation

- Animal Demography Unit: huge citizen science communication
- BirdLife SA: mobilising citizen science community
- BirdLife SA: manages bird list for SA- publish checklist of Birds of SA in March
- EWT: data on people's perception on conservation

Data management

- Data sensitivity- are we too sensitive about data
- How do we promote responsible/appropriate use of data
- We should ensure international standards
- SAEON: has a manifesto on data sharing
- DEA: all spatial data should be logged with National Spatial Information Framework

Content

- SAEON: Ocean and off shore data
- Research projects - to extend climate and stream flow data
- Species, specimen and maps - multi-media
- Standalone databases
- Literature
- Plants, vertebrates, and invertebrates
- Fire data
- Primary biodiversity data
- Animal Demography Unit (ADU) List data, SABAP, images, sound
- ADU: Birds +/- 18 million, SAFRI Reptiles, frogs, and more
- EWT: threatened bird species data
- BirdLife SA: shape files for all 124 Important Bird Areas (IBA)
- ADU: Radar and Ladar data
- ARC: Fungi (60 K) 10% is sequence data
- ARC: Nematodes (300K records)
- ARC: Spiders: SANSA, Insect database
- SAEON: Spatial, sensor, weather, and structure data (meta)
- SAEON: Climate and remote sensor data
- DEA: +/- 1000 spatial datasets, Protected Area data.

Geographical Scope

- Africa wide for some datasets, limited scope for others
- SANBI: Southern Africa

Infrastructure

- ADU: 7 servers, open source software
- SAEON: 2 Visual servers; 80 TB storage; South African National Research Network (SANReN)?
- 2 Hetzner servers ; 3 VM Servers; SANReN; SANBI

Concerns/Issues

- Lack of information technology and GIS skills which result in poor quality content
- What is our role beyond South Africa?
- High turnover of staff results in reduced institutional memory
- Outsourcing work to consultants
- Keeping up with technology
- Lack of access to software and training

Appendix 4: Group discussions on integration issues

Group 1

Integration issues:

- scientists are reluctant to share data because there is a lack of acknowledgement and so there is no incentive;
- data providers experience bottle necks at SANBI with no follow up, communication or feedback;
- SANBI can't take on all databases and has to prioritise;
- integration is made difficult by use of different data formats and systems and lack of standards;
- data management policies are not in place which results in inconsistences;
- poor initial design of systems means they are unable to respond to growing requirements;
- systems aren't used because they are too complex and are not sufficiently marketed;
- systems are developed by individuals with inadequate documentation, creating dependence on the individual and a lack of sustainability;
- there is no clear policy on how development should be done, it is often left to the IT person;
- there is a lack of leadership and capacity in biodiversity information management;
- biodiversity information needs to be part of the bigger picture, with a common vision, clear policies, clear roles and responsibilities and innovative winning products;
- Legislation should be in place to support integration.

Group 2

Issues with sharing data include the following:

- acknowledgement;
- security concerns;
- bandwidth;
- money is being made out of the data;
- data is not 100% accurate;
- contracts and paperwork are time consuming and difficult (the energy sector has an energy sharing forum and all participants subscribe to the same agreement);
- lack of coherent policy and licences. Guidelines are required for interoperability;
- lack of capacity and resources;
- lack of integrated data within institutions e.g. in the Department of Water Affairs none of the attribute data is linked to the spatial data;
- taxonomic mismatches;
- should be aligned to international and national targets to ensure relevance;
- data sharing works when the integration is quite loose and supports a specific need e.g. BGIS;
- government funded institutions are required to make information available.

Group 3

Integration problems:

- there is no operational requirement to integrate data and every organisation has their own mandate and tasks;
- organisations don't know who to collaborate with;
- there are practical problems such as
    - financial constraints
    - personality clashes
    - technology
    - lack of proper channels to know what is available and where
- people don't share their data because they are afraid it will be misinterpreted.
- technological advancement is fast and it is hard to keep up;
- software is expensive;
- there are a lack of skills to use the available technological tools;
- there is a general lack of skills and capacity to work with data management;
- lack of staff e.g. specimens pile up because it is not in anyone's job description to capture them.

Solutions could be to:

- Set data collecting guidelines
- Set up formats in data collecting forms