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Swiss Federal Archives SFA

Project Ellipse

Concept for the archiving of official geodata under federal legislation

Concept report

Version 1.3
14.09.2013

Ellipse concept

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Acronyms and abbreviations

Abbreviation	Meaning
AIP	Archival Information Package
AIS	Archive Information System
ArchA	Federal Act of 26 June 1998 on Archiving (Archiving Act), SR 152.1
ArchO	Ordinance of 8 September 1999 to the Federal Act on Archiving (Archiving Ordinance), SR 152.11
FOEN	Swiss Federal Office for the Environment
CAP	Conservation and archiving planning
CS	Classification system
eCH	Swiss Association for eGovernment Standards
eGris	Electronic land information system
DIP	Dissemination Information Package
DIR	Digital Information Repository application
FOJ	Federal Office of Justice
FSDI	Federal Spatial Data Infrastructure
GCG	Coordinating agency for federal geographical information
geo.admin.ch	Swiss Confederation geoportal
geocat.ch	Metadata catalogue for Swiss geodata
GeoIA	Federal Act of 5 October 2007 on Geoinformation (Geoinformation Act), SR 510.62
GeoIO	Ordinance of 21 May 2008 on Geoinformation (Geoinformation Ordinance), SR 510.620
GEVER	Electronic records and process management
GIS	Geographic information system
GM03	Geospatial Metadata 2003 (Swiss metadata model for geodata) (SN 612050; profile of international metadata standard ISO 19115)
GML	Geography Markup Language (data interchange format for geographical features)
INSPIRE	Infrastructure for Spatial Information in the European Community (Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community, which entered into effect on 15 May 2007)
INTERLIS	INTERLIS is a data description language and a transfer format that takes particular account of geodata (GIS data format) and the model-based method. It is used to develop conceptual data models (sometimes also referred to as semantic data models).
ISAD(G)	International Standard Archival Description (General)

Abbreviation	Meaning
KOST	Centre for the Coordination of Permanent Archiving of Electronic Documents
NSDI	National Spatial Data Infrastructure
LA	Long-term availability (Art. 14 GeoIO)
OAIS	Open Archival Information System
OLS	SFA Online Search: a software-independent online search tool for archival metadata
SFOE	Swiss Federal Office of Energy
SIARD	Software Independent Archiving of Relational Databases
SIK-GIS	GIS working group of the Swiss Conference on Information Technology (SIK)
SIP	Submission Information Package
TIFF	Tagged Image File Format (file format for storing image data)
UUID	Universally Unique IDentifier
XML	Extensible Markup Language
XSD	XML Schema Definition

Glossary (concepts)

Concept	Meaning
Appraisal	Process by which the archival value of documents is determined on the basis of reviewable criteria.
Archival Information Package AIP	Archival Information Packages result from SIPs during the process of archiving digital documents. They represent the form of information packages in which digital documents are stored in the digital repository.
Archive	1. Institution or body responsible for appraising, securing and describing archive records and making them available. 2. Archived documents of an organisation. 3. Building or institution that was constructed or established for the purpose of archiving documents.
Archive Information System AIS	Central software in the SFA which manages information concerning analogue and digital archive holdings.
Archiving	Act of transforming administrative records into archive records. Encompasses the registration, appraisal, description, preservation and provision of documents, contributes to a secure basis for law, as well as to continuity and efficiency in administration, and in particular creates the necessary conditions for historical and social research. Unlimited conservation of selected documents.
Archivable	The SFA define the file formats that are regarded as archivable (suitable for archiving). Such formats have to meet the SFA's requirements for the preservation of digital documents.
(Of) archival value	Documents that are defined as having archival value encompass documents of the federal government that are of legal or administrative importance or contain valuable information (i.e. documents that are valuable from a historical, social or cultural point of view).
Archive records	Refers to documents that have been accepted by the SFA for safekeeping, or that are independently archived by other bodies in accordance with the law (Art. 3, para. 2 ArchA).

Concept	Meaning
Authenticity	Documents are authentic if a) they correspond to what they are claimed to be, b) they have been created or transferred by the authority claiming to have created or transferred them, c) they have been created or transferred at the indicated time.
Authority responsible	Authority which, under the law, is responsible for the collection, updating and management of the official geodata (Art. 8 para. 1 GeoIA).
Classification system	Structure that reflects all the tasks of the administrative unit concerned and ensures that documents can be filed according to their administrative context.
Closure period	Access to archive records is regulated by closure periods. Documents that are still subject to a closure period may only be viewed if this has been approved in an official approval procedure. (This does not apply to the submitting authority itself.) Access is regulated by the provisions of Articles 9 to 16 ArchA.
Dissemination Information Package DIP	A DIP is a container for dossiers that are requested by a user via an ordering procedure.
Documents	Documents as defined by the Federal Archiving Act are all recorded information, irrespective of the medium, that is received or produced in the fulfilment of the public duties of the Confederation, as well as all finding aids and supplementary data that are required in order to understand and use this information (Article 3 para. 1, ArchA).
Dossier	This term refers to all documents relating to a specific business matter. A dossier basically corresponds to a business matter. However, by combining similar business matters or dividing dossiers into subdossiers, this basic structure can be adapted to meet the corresponding needs. The compilation of dossiers is carried out on the basis of the classification system.
File archive	Refers primarily to a quantity of files. Within the scope of digital archiving at the SFA, it is used for submissions containing files that are submitted without a classification system in the sense of records management using a GEVER system. However, the files may well be organised using another management system.
Geocoding	Attribution of spatially related reference information to a data set.
Geodata	Spatially related data that are related in time to the dimensions and characteristics of certain spaces and objects and in particular their position, nature, use and legal relationships (Art. 3 para. 1a GeoIA).
Geodata model	See Minimum geodata model.
Geoinformation	Geospatial information obtained through combination of geodata (Art. 3 para. 1b GeoIA).
Geospatial metadata	Formal descriptions of the characteristics of geodata, for example their origin, content, structure, validity, up-to-dateness, accuracy, rights of use, access or methods of processing (Art. 3 para. 1g GeoIA).
Geospatial reference data	(Official) geodata which serves as the geometric basis for other (official) geodata (Art. 3 para. 1f GeoIA).
Historicisation	Recording the type, extent and time of modifications of official geodata (Art. 2b GeoIO).
Integrity	Refers to the properties of documents in terms of complete and unaltered reproduction of their content. (The appearance, structure and form of digital documents can change as the result of preservation measures.)
Metadata	Metadata can be described as “information about primary data” (data about data), since they have a descriptive nature.
Minimum geodata model	Depiction of reality that determines the structure and content of geodata independent of system (Art. 3 para. 1h GeoIA).

Concept	Meaning
	At least one geodata model is allocated to the official geodata (Art. 8 GeoIO). The specialist federal authority responsible prescribes a minimum geodata model in which it stipulates the structure and degree of detail of the content (Art. 9 para. 1 GeoIO).
Long-term availability	Conservation of official geodata in a way that ensures their long-term preservation in terms of quantity and quality; securing official data on the basis of recognised standards and in accordance with the state of the art; periodic export of data into suitable formats, and safekeeping of exported data (Art. 14 GeoIO).
Official geodata	Geodata that are based on a legislative enactment of the Confederation, a canton or a commune (Art. 3 para. 1 let. c GeoIA).
Open Archival Information System OAIS	A reference model approved in accordance with ISO 14721, OAIS describes an archive as an organisation in which people and systems work together to preserve information and make it available to a designated community.
Original documents	In the context of digital archiving, the digital documents submitted by the submitting authorities represent the originals. They are archived in the digital repository in unchanged form, and the originals are retained after preservation measures have been carried out. Thanks to a retraceable migration path, the source of the migrated documents can be traced back to the original at any time.
Pertinence principle	The principle of classifying fonds*) in terms of their subject content or using a subject system. Generally, this involves mixing documents from different registry creators, which may result in the creation and development of fonds of records being lost. *) http://www.bar.admin.ch/archivgut/00944/index.html?lang=en
Provenance principle	A principle for arranging archives that forms the basis for classifying and describing archive records by their origin and the context of their creation.
Primary data	Primary data are data that are created directly by each records creator in association with the corresponding (official) competencies.
Records and process management (GEVER)	Refers to all activities and rules for the planning, steering and control, as well as verification, of business matters. GEVER encompasses the management of documents and dossiers, as well as business-related process management. It secures the effective and efficient business activity of administrative units.
Submission	Refers both to the process by which an authority transfers documents to the SFA, and to the overall volume of documents transferred by an authority during a submission.
Submission Information Package SIP	SIPs are information packages that are submitted to the archive by the submitting authorities. They contain digital documents (primary data and metadata).
Submitting authority	Refers to the authority or organisational unit that submits documents to the SFA. It is often (but not necessarily) identical to the records creator.
Universally Unique IDentifier UUID	This is a special ID that represents a universally unique means of identification. UUIDs comprise 32 hexa-decimal digits that are always constructed in the same way: 5 groups of characters, separated by hyphens (8-4-4-4-12 characters) = 36 characters in all (example: 01234567-89ab-cdef-0123-456789abcdef).
Updating	Ongoing or periodic adaptation of official geodata to changes in the location, dimensions and characteristics of recorded areas and objects (Art. 2a GeoIO).
Usability	Documents are usable if they can be identified, found, displayed and interpreted.

References

Description	Location
SFA website	www.bar.admin.ch
swisstopo website	www.swisstopo.ch
Federal geodata portal	www.geo.admin.ch
Metadata catalogue for Swiss geodata	www.geocat.ch

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Section A – Information about the project

1 About this document

1.1 Purpose

This document contains the concept that was drawn up as part of the Ellipse (archiving of official geodata under federal legislation) project between 2011 and 2013. It records the course and procedures of the project and describes the proposed solutions that were devised. It also presents the plan for the realisation phase starting in 2013.

1.2 Structure and organisation

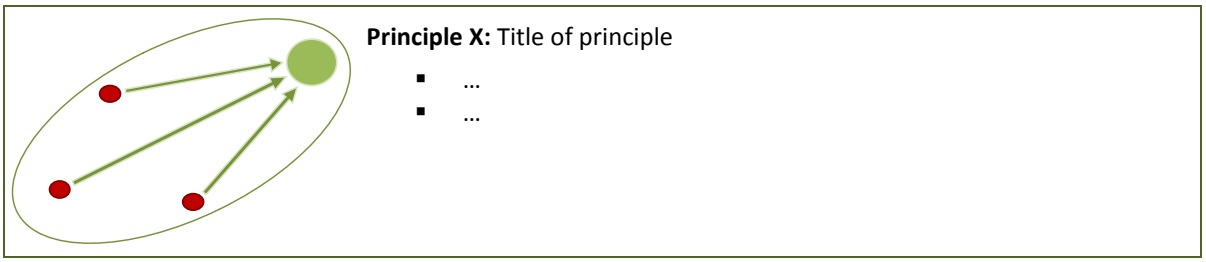
The concept report is divided into four sections:

Section A	Information about the project

This section contains an overview of the project's objectives and organisation as well as the procedures adopted.

Section B	Conception

Section B documents the results of the project. It describes the fundamentals and solutions in both pre-archiving (geodata management, conservation and archiving planning) and archiving (ingest, preservation and use). Each section ends with the statement of a principle[1] and, where appropriate, solutions and requirements derived from the project. To make them easier to locate, these are marked with an icon and identified by a number:



Section C	Planning of the realisation phase

Section C describes the next steps: the realisation phase starting in 2013, including objectives, planning, resources and responsibilities.

[1] For the purposes of the Ellipse project, the principles laid down in the concept are intended to serve as basic principles for realisation.

Section D | Appendix

The Appendix contains documents that are referred to in this concept or are an important component of the project results or associated projects.

2 Information about the project

2.1 Background

Project Ellipse was launched in early 2011, following on directly from the preliminary study on the archiving of geodata carried out in 2009-10.[2] The primary aims of the preliminary study were to establish the scope of the project, build up shared know-how in the areas that were "new" for the geodata and archive communities, and set out initial considerations and definitions related to the archiving of geodata. It also identified relevant issues and problem areas. This formed the basis for a concrete concept project: Project Ellipse. Following on from the preliminary study and carried out during 2011-2012, Ellipse thus constitutes the second stage on the road to realisation, which is scheduled to begin once this concept phase is complete, starting in 2013.

Like the preliminary study, Project Ellipse was carried out as a joint project involving the Swiss Federal Office of Topography (swisstopo) and the Swiss Federal Archives (SFA).

2.2 Objective

The preliminary study already formulated goals for the archiving of official geodata which can be seen as an overarching set of objectives or requirements:

- The solution should be developed for the entire federal administration.
- It should be a well-founded, integral solution for long-term availability and archiving.
- It must permit archived digital geodata to be (subsequently) re-integrated into a geographic information system (GIS). It must enable geoinformation to be restored at a later date.

According to its remit, Project Ellipse – Concept for the archiving of official geodata under federal legislation – is designed to achieve the following goals:

- To define **a procedure for the coordinated ingest of geodata** (scenario). This aims to permit the subsequent restoration/enabling of geoinformation in the archive. The scenario is aligned with the lifecycle of geodata under federal legislation (distinction between long-term availability and archiving) and with the entire archiving process, from appraisal, submission, description and preservation to dissemination of geodata. For an assessment of the parameters (scope and size, time of archiving of the geodata to be archived), the scenario is being reviewed in association with the submitting authorities.
- To define the **procedure for appraising geodata**. This ensures and aligns overall coordination of the appraisal of official geodata. The guidelines are validated as part of pilot appraisals and approved as binding.

[2] Cf. "Archiving of geodata. A joint preliminary study by swisstopo and the Swiss Federal Archives." http://www.bar.admin.ch/themen/00876/00939/index.html?lang=en&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1ad1IZn4Z2qZpnO2Yuq2Z6gpJCDdoN,gmym162epYbg2c_JjKbNoKSn6A-- (27.8.2012).

- To define the **procedure for submission of geodata** to the SFA. This includes both the form of submission and the procedure for creating a submission. Implementation is reviewed as part of a proof of concept.
- To specify the **organisational and technical requirements** for the solution that is to be realised, both **for the SFA** and **for the submitting authorities** (geodata producers), including infrastructure, applications and operational impact. These form the basis for the next step of realisation.

2.3 Organisation

The collaboration between swisstopo and the SFA established during the preliminary study was maintained in Project Ellipse.

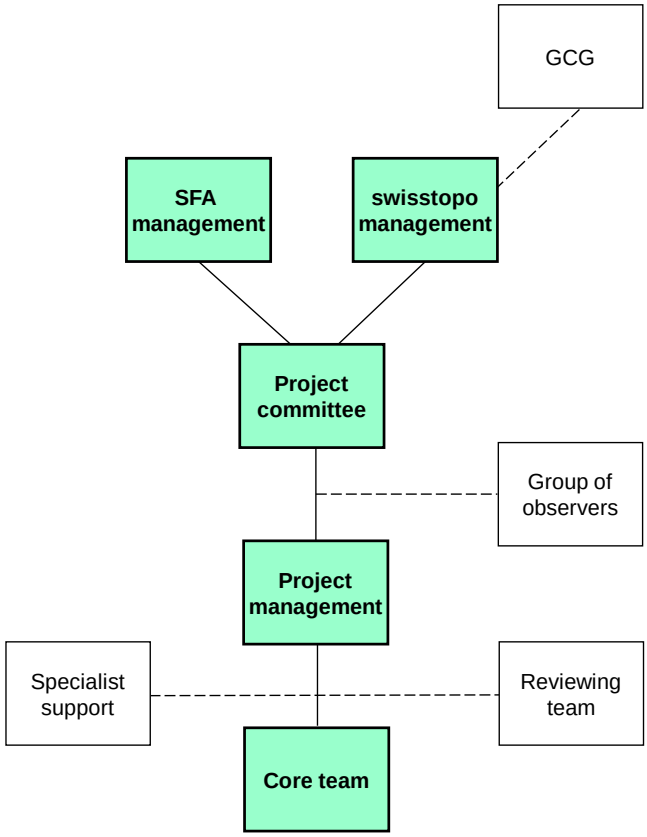


Figure 1: Organisation of Project Ellipse

2.3.1 Commissioning bodies for Project Ellipse

Project Ellipse was jointly commissioned by the management of the SFA and the management of swisstopo. Within the SFA, the commissioning body was represented by Krystyna W. Ohnesorge, while at swisstopo responsibility lay with the management *in corpore*.

2.3.2 swisstopo and SFA Project Ellipse team

The team involved in the preliminary study (Marguérite Bos, Urs Gerber, Helen Gollin, Urs Meyer) formed the basis of the Project Ellipse team. For swisstopo, Martin Schlatter joined the team at the

start of the project, while Johannes Bader provided additional IT expertise at the SFA. During the first six months, Carla Sieber (ingest) joined the core team, while Urs Germann and, later, Peter Fleer and Marco Majoleth assisted with the area of use, creating a broader base for the project within the SFA. At the half-way stage of the project Helen Gollin transferred from the SFA to swisstopo, at which point Barbara Kräuchi joined the SFA project team.
Management of Project Ellipse at the SFA was in the hands of Marguérite Bos until November 2012; she was then succeeded ad interim by Krystyna Ohnesorge who subsequently handed over to Loris D'Incau (itopia AG). Urs Gerber acted as representative at swisstopo throughout the project.

2.3.3 Group of observers

The group of observers set up during the preliminary study was also involved in the project during the concept phase. The inclusion of staff from cantonal GIS offices, representatives of other federal authorities and state (cantonal) archives was a great success, not least because (despite its name) the group did not merely observe but also played an active role and supplied valuable input. The group of observers was most intensely involved in the first year of the project.

Specialist GIS offices			Archives	
Confederation	Cantons	Others	State archives	Others
Hertach Martin SFOE	Egli Christine AGIS	Bischof Sandro WSL	Bartlome Vinzenz Bern State Archive	Büchler Georg KOST
Humbel Rainer SFSO	Günthardt Köbi GIS ZH	Hägeli Martin WSL	Gnädinger Beat Zurich State Archive	
Klingl Tom FOEN	Maag Ueli AGI BE	Haller Ruedi SNP	Iser Isabelle Bern State Archive	
Kube Marlen MeteoSwiss	Schwendener Ueli GIS ZH	Rapp Maja SNP	Ryter Stefan Bern State Archive	
Saula Zagorka FOEN		Schmid Christian SNP	Wyss Reto Graubünden State Archive	
			Wyler Rebekka Zurich State Archive	

Table 1: Project Ellipse group of observers

2.3.4 Pilot authorities involved

At the start of its second year, the project focused on reviewing the solutions proposed by Ellipse together with two pilot authorities: the Federal Office for the Environment (FOEN) and the Federal Office of Energy (SFOE).

The representatives of the FOEN were:

- Tom Klingl, head of the geodata and environmental data management service, deputy head of IT and logistics ILO
- Zagorka Saula, staff member of the specialist geodata and environmental data management authority

- Jürg Schenker, head of data management, Species, Ecosystems, Landscapes Division, department staff

The representatives of the SFOE were:
- Martin Hertach, head of geoinformation
- Rocco Panduri, Supervision of Dams section, dams specialist
- Gérard Thürler, Hydropower Section, technical assistant hydropower, manager of the WASTA database

2.3.5 Coordinating agency for federal geographical information (GCG)

The coordinating agency for federal geographical information (GCG) is not directly involved in the Ellipse project organisation. However, since the GCG is responsible for coordinating geographical information within the federal administration and also strategically manages and steers issues in this area, it is intended that the results of Project Ellipse should also be approved by the GCG as soon as the SFA and swisstopo, as commissioning bodies, have approved the concept themselves

2.4 Concept development process

2.4.1 Approaches adopted

A variety of approaches were used for activities in the individual work packages, depending on the stage the project had reached. Typically, topics were prepared within the core team, where an initial overview and orientation were arrived at before the potential solutions were considered and developed further together with the group of observers. The intensity of exchange differed according to the work package and area concerned.
This was the main procedure used in the first year. The interim report of 16 January 2012 summarised the results at the start of the project's second year. It also formed the basis for reviewing the interim results in conjunction with the pilot authorities. Unresolved areas were then addressed further in workshops, examined in greater detail in accordance with the main thrusts prescribed by the managements of the SFA and swisstopo, and then solutions were developed. Work on the individual topic areas was coordinated ever more closely. From spring 2012 onwards, the findings and solutions were documented directly in the concept report, which is therefore the authoritative reference document for the results of Project Ellipse.

2.4.1.1 Areas

Ellipse involved five work areas, covering the core topics set out below. These are based on the actual process for managing and archiving geodata, but also take account of fundamental issues.

Work area	Core topics
Fundamentals	Organisational fundamentals Technical fundamentals Collaboration between the Confederation and cantons
Planning	Geodata management Conservation and archiving planning, including appraisal
Ingest	Submission process Geo-SIP (submission package) Formats

Work area	Core topics
Preservation	Migration strategy Collaboration between SFA and specialist authorities Acquisition of know-how on the preservation of geodata
Use	Search Display Supply to users

Table 2: Work areas with associated core topics

2.4.1.2 Pilot with specialist authorities

The fact that Project Ellipse is being carried out jointly by the SFA and swisstopo has meant that two important perspectives on the process of archiving are represented in the core project team, with the SFA as the authority responsible for archiving and swisstopo as the producer of a large proportion of federal geospatial reference data. To ensure that the solutions developed in Ellipse take account of the full range of existing federal geodata, it was planned from the start of the concept development phase that other authorities, in particular those with thematic geodata (specialist data) should be involved. In this way, the Ellipse archiving concept was aligned with the varying requirements of different geodata producers.
Two specialist authorities – the FOEN and SFOE – agreed to take part in Ellipse. The collaboration began at the start of 2012 and was conducted within a specified timeframe, in three workshops and two workshops, respectively. The main aim was to review the archiving process and the focal areas of *appraisal, ingest* and *use*, employing real data and situations from the FOEN and SFOE. The collaboration led to findings which proved valuable in developing this concept.

Within the terms of Art. 8 para. 1 GeoIA, the FOEN is the “authority responsible” for collecting, updating and managing 32 official geodata (set out in the Appendix to the GeoIO / official geodata catalogue); it also acts as specialist authority at federal level for 47 official geodata in respect of the cantons and for 11 official geodata in respect of other federal authorities.[3] It is therefore an important representative of the specialist federal authorities both within the federal administration and vis-à-vis the cantons. Moreover, its thematic official geodata cover a broad spectrum in terms of both time and context of creation and use.

Within the terms of Art. 8 para. 1 GeoIA, the SFOE is the “authority responsible” for collecting, updating and managing six official geodata. It is the “specialist authority at federal level” for a further four official geodata, and prescribes the minimum geodata model for the “authority responsible”. The SFOE is already at an advanced stage of developing its minimum geodata models.

Two very different specialist authorities were therefore involved in Ellipse: the FOEN, as the authority responsible for a large number of official geodata; and the SFOE, which in terms of both organisation and the extent of its geodata holdings is one of the smaller authorities in this respect. This was a logical combination in terms of the information value of the two pilots. The fact that the FOEN, as the largest specialist authority in terms of geodata, was able to input its requirements into the archiving concept has ensured that the perspective of the specialist authorities is appropriately represented in the project and that the solution developed is also acceptable to the other specialist authorities. The review involving the SFOE broadened the perspective and ensured that the solution was broader based.

[3] These 11 official geodata are divided up as follows: three each for the DDPS and WSL, two each for the FOT and FOCA, and one for FEDRO

2.4.1.3 User tests

During the pilot, geodata from the FOEN and SFOE were employed to create digital submissions (geo-SIPs). These digital packages were subjected to a user test in two different contexts.

In April 2012 a user test with selected geo-SIPs from the FOEN was carried out by Lukas Mathys of Sigmaplan AG. He approached the task from the perspective of a user of archived geodata receiving a package for use. The aim was to establish more precisely what a user expects of the package, and ensure that a geo-SIP is comprehensible. The test was undertaken on the basis of written prior information on the geo-SIP and associated questions on the procedure. It was documented in writing. In general, the geo-SIP was found to be a practical and sensible construct; additional feedback from the test flowed in particular into the description of the geo-SIP in this concept.

The second geo-SIP user test with data from the FOEN and SFOE, which was carried out by Stefan Flury, GIS specialist and deputy head of the swisstopo GIS centre, on 30 May 2012, had a somewhat different orientation. Its aim was to see, in particular from the perspective of the archive, how a user deals with a geodata package supplied by the SFA when using the data: how does the user load the data into a GIS, what do they see, how can they tell what data they are dealing with, how does the interaction with the geospatial reference data work, and what additional information does the user need to find their way around? Stefan Flury offered to demonstrate his approach to the project team and also provide a live commentary on his impressions. The user test therefore produced findings to assist users, and also highlighted the importance of documentation and geodata models.

2.4.1.4 Sharing experience with other authorities

On 18 November 2011, the Project Ellipse team took part in a workshop with talks and discussions by Marcel Droz and Peter Schär from the geoinformation office of the Canton of Bern. The workshop was organised in the context of ongoing projects at swisstopo (in addition to Ellipse, the global concept for long-term availability and archiving of official geodata of swisstopo and go4geo – construction and expansion of the Federal Spatial Data Infrastructure (FSDI) and support for the National Spatial Data Infrastructure (NSDI)). The presentations dealt with topics including the snapshot concept (at a well-defined point in time the geodata producer creates with all necessary quality tests a snapshot of the geodata set including geometadata, documentation and then releases it for use), geospatial metadata, operational metadata (process metadata), processes and conservation planning.

Following the pilot at the FOEN, on 5 April 2012 Project Ellipse took part in a visit to the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) in Birmensdorf organised by Tom Klingl (FOEN). This involved a presentation and live demonstration of the virtual nature and landscape database DNL, as well as an insight into the WSL's archiving concept and the Swiss National Forest Inventory (NFI).

Both opportunities for exchange supplied valuable information for the treatment of these issues within the project.

2.4.2 Workshops

In addition to working within the project team, Ellipse also made efforts to involve the commissioning managements and a wider audience in its work. The aim was not just to present the current status of activities, but also to hold workshops with participants from the federal administration, the group of observers and other archives to address specific issues, gather their feedback and develop new ideas and solutions.

During the first workshop in 2011, a larger group of invited experts from the geodata and archive communities collated feedback on the first presented results from Ellipse.[4] The emphasis was on long-term availability, the needs of users and dissemination, as well as submission scenarios and archivable formats.

At the half-way stage of the project in January 2012 the project team compiled the Ellipse interim report.[5] This contains an overview of the project and a summary of the current findings. The interim report submitted to the commissioning bodies (the managements of swisstopo and the SFA) results that were important for the strategic orientation of subsequent project activities. The two management teams held workshops (the SFA management on 28 February 2012 and swisstopo management on 6 March 2012) at which they took priority-setting preliminary decisions and decisions on options for subsequent project work on the basis of the information provided.

On 22 June 2012 the project team held a workshop for members of the GCG and geodata officers in the authorities that are not directly represented in the GCG,[6] at which they presented the content of the Ellipse concept. This enabled the authorities that will be involved in the realisation and implementation of geodata archiving as submitting authorities to submit their feedback on the proposed solutions before the concept was finalised, which underscored the importance of inviting other geodata officers as well as the representatives of the GCG. The workshop was well attended and a lively discussion ensued among those present, providing valuable feedback and also highlighting that the work of Ellipse is now widely accepted.

After the GCG workshop, the scope and content of the Ellipse concept was presented to the management of the SFA by the SFA project management at the start of July, enabling the former to gain a picture of the solutions and provide its own input into the development of the concept.

All these workshops served to inform those involved in the archiving process and enabled the project team to gather valuable feedback and obtain priority-setting decisions which ensured that the concept was broadly supported and would be developed to reflect the needs of those involved.

2.4.3 Communication

Project Ellipse devoted considerable effort to informing a wider audience about its work, especially via presentations at colloquia. Suitable platforms for this are already in place at both project partners: the existing cycle of colloquia at swisstopo and events on digital archiving and records management at the SFA.

Ellipse was presented at swisstopo on 11 March 2011 under the title *Die Zukunft bewahren*[7] (“Preserving the Future”). The interim results at the end of 2011 were presented to interested parties on 21 November at the SFA under the title *Halbzeit bei Ellipse* (“Ellipse at the Half-Way Stage”).[8] 23 March

[4] Documentation on the workshop (in German) can be found at http://www.swisstopo.admin.ch/internet/swisstopo/de/home/docu/Kolloquien/110905.htmlhttp:/www.swisstopo.admin.ch/internet/swisstopo/de/home/docu/Kolloquien/110905.html (19.11.2011).
[5] Section B of the interim report was published (in German) both on the SFA website and at swisstopo. http://www.bar.admin.ch/themen/00876/00939/index.html?lang=de&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1acy4Zn4Z2qZpnO2Yuq2Z6gpJCDeH13gGym162epYbg2c_JjKbNoKSn6A-- (10.7.2012).
[6] The circle of participants was expanded to take account of the fact that not all authorities that produce geodata are directly represented in the GCG, but only one or two delegates represent the department.
[7] Documentation on the colloquium (in German and French) can be found at http://www.swisstopo.admin.ch/internet/swisstopo/de/home/docu/Kolloquien/110311.html (17.8.2012).
[8] Documentation on the colloquium (in German) can be found at http://www.bar.admin.ch/aktuell/00568/00702/01027/01543/index.html?lang=de (17.8.2012).

2012 then saw a further colloquium by Ellipse at swisstopo – in what was by now almost becoming a tradition. Entitled *Die Zukunft der Vergangenheit* ("The Future of the Past"), it focused for once not on the work of Project Ellipse but on the experiences of invited guest speaker Peter Sandner, who presented geodata archiving in the Principal Archive of the State of Hesse, Germany. All the colloquia were attended by representatives from outside the specialist field, reflecting the widespread interest in Ellipse.

Ongoing information on the work of Ellipse was provided to the managements of the SFA and swisstopo as well as the GCG by Urs Gerber, swisstopo project manager.

2.5 Exchanges in the context of Ellipse

During the preliminary study and Project Ellipse, efforts were made to expand links to other organisations, working groups and further parties involved in geodata archiving. At the start of the preliminary study, reference projects were identified primarily outside Switzerland, chiefly in the English-speaking world. Here, the project drew mainly on written information and project reports. Today, geodata archiving is very much on the agenda in Switzerland and Europe, and has entered the consciousness of both archives and geodata producers. In Switzerland, there are also numerous interfaces to other activities in the field of geodata from which Project Ellipse has benefited.

Ellipse attaches great importance to exchange and information outside the project, as both transparency and collaboration encourage networked thinking and foster broad acceptance of the results. The following section therefore sketches out the most important contacts.

2.5.1 Standardisation of suitable categories for geodata

Even before Ellipse began, the GCG had identified potential for improvement in the thematic areas on the portal geo.admin.ch. In 2011-2012 the GIS working group of the Swiss Conference on Information Technology (SIK-GIS) examined the issue of *categorisation for geodata*, and drew up draft standard eCH-0166 Geocategories. The eCH-0166 geocategories are shortly to be approved as the valid eCH standard (as of May 2013).[9] The parties from the GCG, SIK-GIS and Ellipse work closely together in this area. Martin Schlatter is a member of both the project team and SIK-GIS and as such is responsible for knowledge transfer.

The importance of standardising categories of geodata was also noted by Ellipse. It touches on geodata archiving at a number of points. Categorisation, for example, could be used to structure the fonds when registering them for appraisal. If the geodata at an authority responsible are not in a specific structure, the categorisation can also serve as a submission and classification structure. In the archive, meanwhile, the categorisation can be incorporated into a thematic search structure.

2.5.2 Collaboration with geocat.ch

To meet the objectives of Ellipse in the specific area of dissemination the use of geocat.ch, the metadata catalogue for Swiss geodata, is envisaged.[10] A number of workshops were conducted with those responsible for geodat.ch to formulate requirements from the perspective of Ellipse and assess the potential and work required for realisation with geocat.ch. These were stepped up in 2012, notably

[9] http://www.ech.ch/vechweb/page?p=dossier&documentNumber=eCH-0166&documentVersion=1.0 (in German and French) (15.5.2013).
[10] On geocat.ch: "Federal offices, cantons, communes and private entreprises record the metadata for their geodata in geocat.ch." From: http://www.geocat.ch/internet/geocat/en/home/about.html (16.7.2012).

in the context of the Master's thesis by Isabelle Lanzrein (swisstopo) as part of her postgraduate studies in archival, library and information science at the University of Bern (see also chapter 2.5.5 Activities with and at (technical) universities). It became apparent that further development was needed in the management of snapshots in geocat.ch, to enable the management of snapshots and archived geodata and their cross-referencing.
These requirements are not just requirements for Ellipse and the archiving of geodata but also a condition for managing geospatial metadata for the geodata in long-term availability.

2.5.3 EuroSDR Working Group on Geographic Data Archiving

Since November 2010, the SFA and swisstopo have been participating in the EuroSDR Working Group on Geographic Data Archiving.[11] This working group is made up of seven countries with eleven active group members representing both government geoinformation authorities and state archives.[12] Five workshops have so far taken place, in Southampton (UK), Munich (Germany), Bern (hosted by the SFA), Ludwigsburg (Germany) and Gävle (Sweden).

At the end of January 2012 the working group issued the complete, expanded version of its *Principles* of geo-archiving as a separate publication. These were also translated into German (with the active involvement of the SFA/swisstopo).[13] The *Principles* were reviewed by various European specialist associations during 2012:

- in the geoinformation world by EuroSDR and Eurogeographics,[14] and
- in the archive world by the European Board of National Archivists (EBNA) / the European Archives Group (EAG).[15]

The *Principles* were presented at the EuroSDR by André Streilein (swisstopo) together with colleagues from the UK, and at EBNA by Andreas Kellerhals (SFA). Feedback on the *Principles* was gathered and evaluated by the EuroSDR Working Group at the workshop on 17-18 January 2013 in Gävle. The finalised document will be sent to the European organisations listed above so that they can approve the *Principles* at their annual general meetings in 2013.

Overall, the Ellipse project team devoted considerable effort to working with the EuroSDR Working Group on Geographic Data Archiving, enabling the findings from the preliminary study and Project Ellipse to be transferred to the European context. Some of the principles formulated by the working group that were documented in the *Principles* paper flowed directly from Ellipse or were at least

[11] EuroSDR (Spatial Data Research) is a not-for-profit organisation linking national mapping and geodata producers (such as swisstopo) and cadastral agencies (such as the Federal Directorate of Cadastral Surveying) with research institutes and universities for the purpose of applied research in spatial data provision, management and delivery. See also:
http://bono.hostireland.com/~eurosdr/start/index.php?option=com_content&task=view&id=18&Itemid=31 (16.7.2012).
[12] The seven countries are Finland, France, Germany, Norway, Sweden, Switzerland and the UK.
[13] The paper is published on the working group's website in both English and German:
http://www.eurosdr.net/archiving/ (17.7.2012).
[14] "a not-for-profit organisation of the European national mapping, land registry and cadastral agencies", http://www.eurogeographics.org/ (17.7.2012).
[15] "European Board of National Archivists (EBNA) is a gathering of the National Archivists (Directors-General) of the National Archives Services of the EU Member States. EBNA convenes twice a year under the chairmanship of the EU Presidency in question." From: http://ebna.eu/about-ebna/ (27.8.2012).
"[…] The EAG, established at the beginning of 2006, comprises experts from all 27 EU Member States as well as from the institutions of the Union". From:
http://ec.europa.eu/transparency/archival_policy/eur_arch_group/index_en.htm (27.8.2012)
"The EAG ensures co-operation and co-ordination on general matters relating to archives and to follow-up the work referred to in the Report on Archives." From: http://archivists.wordpress.com/tag/european-archives-group/ (27.8.2012).

strongly influenced by its findings. The preliminary study is listed in the bibliography of the *Principles* paper as a reference.

Equally, many of the observations made in Switzerland were reviewed and developed further by the European working group. The preliminary study report jointly published by the SFA and swisstopo was used as a "reference document", at least at the start of the joint activities, not least thanks to the availability of translations into French and English. At the meeting in Ludwigsburg, Project Ellipse was presented by Urs Gerber and Marguérite Bos and subsequently discussed in detail. It became clear that Ellipse is regarded as an advanced project in this area and can provide valuable input and experience that is greatly appreciated by other organisations. Additionally, exchange at the European level provides an opportunity to discuss the findings in a broader context and benefit from the knowledge and experience of the group.

2.5.4 Exchange of experience with the Hessisches Hauptstaatsarchiv

The project team used the visit by Dr. Peter Sandner from the Hessisches Hauptstaatsarchiv (Principal Archive of the State of Hesse, Germany) on 23 March 2012 in connection with the colloquium at swisstopo for a detailed exchange of experiences. Both Dr. Sandner's presentation at the colloquium and the subsequent work meeting in a smaller group (project team, group of observers) provided opportunities for in-depth discussions covering a range of areas, including organisation, cooperation and resource planning as well as more specific issues such as formats, practical assistance and various geodata archiving strategies. Both Ellipse project members and the colloquium audience benefited from the opportunity to see their own concerns from the perspective of another archive and another context.

2.5.5 Activities with and at (technical) universities

Two Master's theses were written on issues linked to Project Ellipse:

In her thesis *Geodaten zwischen nachhaltiger Verfügbarkeit und Archiv* ("Geodata between long-term availability and archive") at Chur Technical University (MAS IS), Barbara Kräuchi from the SFA examined the interface between the geodata producer and the archive with regard to stocktaking, appraisal and ingest of geodata. Findings from the SFOE pilot (2.4.1.2 Pilot with specialist authorities) flowed into Ellipse.

In her Master's thesis at the University of Bern (MAS ALIS) on the combination of an archive system and a geospatial metadata catalogue for the purpose of using geodata, with particular reference to the Swiss National Archives SFA and geocat.ch,[16] Isabelle Lanzrein of swisstopo examined ways of linking geocat.ch and the SFA's search services (Online Search, etc.) for Ellipse. The thesis was supervised by Andreas Kellerhals, Director of the SFA. The conclusions of this thesis are documented in 7.1.1 Online Search and geocat.ch.

Project Ellipse was also presented in an article by Anita Locher (doctoral student) and Miquel Termens (titular professor) at the *Departament de Biblioteconomia i Documentació* of the University of Barcelo-

[16] Lanzrein, Isabelle: Die Kombination und Koordination eines Archivinformationssystems und eines Geo-Metadatenkatalogs zur Nutzung von Geodaten am Beispiel des *Schweizerischen BAR* und *geocat.ch* ("The Combination and Coordination of an Archive Information System and a Geospatial Metadata Catalogue for the Purpose of Using Geodata, with particular reference to the *Swiss Federal Archives* and *geocat.ch*"), MAS-ALIS Master's thesis, Bern 2012.

na as a contribution to the *7ª Conferencia Ibérica de Sistemas y Tecnologías de Información in Madrid 2012* as a reference project for the development of geodata archiving.[17]

2.5.6 Cantonal responsibility for official geodata

The project managers of Ellipse (SFA and swisstopo) were invited by Fridolin Wicki, head of the Federal Directorate of Cadastral Surveying) to join a working group dealing with the archiving of cadastral survey geodata**.**[18] This group was set up by the board of the conference of cantonal cadastral surveying offices (KKVA)[19] and constituted on 14 August 2012. The working group's remit is to develop a concept for the archiving and long-term availability of cadastral survey geodata. In particular, it aims to establish how both digital and analogue cantonal cadastral survey geodata are to be archived in future and, it is hoped, establish a basis for the archiving of other cantonal geodata. The group's project mandate lays down the following objectives:

2. Objectives

- The working group is to assess how cadastral survey geodata are to be archived in Switzerland and draw up an archiving concept for this purpose.
- It is to clarify the following points:
  - the potential for the subsequent recovery and evaluation of archived cadastral survey geodata in a GIS;
  - technical issues and problems (formats, models, metadata and data structure, etc.), in documented form;
  - rights of use and exploitation, availability of archived cadastral survey geodata;
  - time of archiving (synchronisation of archiving by cadastral survey and land registry);
  - place of archiving (centrally with the federal administration, decentrally with the cantons, or hybrid solution);
  - arrangements for transferring data to the archiving location;
  - duration of conservation;
  - method and frequency of archiving;
  - arrangements for the deletion and destruction of data;
  - cost/benefit considerations for the archiving of cadastral survey geodata, with particular reference to the impact on the cantons;
  - coordination of archiving of cadastral survey geodata (geospatial reference data) with thematic official geodata under federal legislation (especially where responsibility lies with the cantons);
  - coordination of work with the new SIK-GIS "Study on the long-term availability, archiving and historicisation of geodata (NV_A_H Study)" (working title);
  - archiving of analogue cadastral survey data (PlfdGB,[20] change records and tables, calculation records, etc.)[21]

[17] Locher, Anita E.; Termens Miquel. Exploring alternatives for geodata preservation. Article for the 7ª Conferencia Ibérica de Sistemas y Tecnologías de Información. Madrid, España (20.–23.6.2012). At: http://bd.ub.edu/pub/termens/docs/CISTI-2012-art.pdf (16.7.2012).
[18] The first meeting was arranged on 14 August 2012. The participants were: KKVA (2), state archives (1), IKGEO (1), V+D (2), Project Ellipse (2 project managers).
[19] "The Conference of Cantonal Surveying Offices (KKVA) is an organization without legal personality and includes all cantonal offices for cadastral surveying." http://www.kkva.ch/ (6.9.2013)
[20] PlfdGB = Plan für das Grundbuch (plan for the land register).
[21] From: Project mandate for the archiving of cadastral survey geodata (drawn up by the KKVA working group).

Similar collaboration with the Intercantonal Coordination of Geoinformation IKGEO[22] in the area of archiving of thematic geodata for which the cantons are responsible has been informally discussed, but no concrete steps have yet been taken.[23]

The aim of this exchange between the various bodies and Project Ellipse is to enable them to benefit from the work already done and considerations addressed in the project and to develop ideas for further work in the respective areas. This collaboration can advance exchange between the federal and cantonal levels.

2.5.7 Electronic land information system eGris

A further project with links to Ellipse is eGris. Headed by the Federal Office of Justice (FOJ), this project is developing a system for the long-term securing of land registry data.[24] Data are collected and prepared by the FOJ, and it has been agreed that the SFA will be responsible for conserving the land registry data. The cantons' contact for the development of this offering is the FOJ.
A stocktake involving eGris and the SFA on conservation and the SFA's requirements in this area took place in mid-March 2012. A further meeting between the two was agreed, in order to embark on actual implementation (pilot submission of the land registry data to be conserved).

[22] "Intercantonal Coordination in Geoinformation, IKGEO for short, is the body established by the Swiss Conference of Construction, Planning and Environment Directors (BPUK) to secure intercantonal coordination in geoinformation and the collaboration of the cantons in the National Spatial Data Infrastructure. It brings together the cantonal specialist associations from the areas of forestry, geoinformation, the land registry, agriculture, spatial planning, the environment, transport and cadastral surveying so as to secure the joint and coherent representation of the interests of the cantons in geoinformation." http://www.ikgeo.ch (4.7.2012).
[23] Verbal request at an Ellipse presentation during the IKGEO workshop on 6 June 2012.
[24] On eGris see also the land registry portal (in German and French):
http://www.cadastre.ch/internet/gb/de/home/egris/laufende_arbeiten.html (27.8.2012).

Section B – Concept

Section B of this document contains the actual concept for archiving official geodata under federal legislation. Chapter 3.1 looks at the area of application in detail. It documents the results of the project team's work, building specifically on the 2010 preliminary study[25] and the 2012 interim report.[26] The concept presents the considerations that underlay solution development and thus supplies arguments for the proposed solutions that can be reconstructed at a later date. Finally, the concept details the organisational and technical implications for geodata producers (authorities responsible under Art. 8 para. 1 GeoIA) and the SFA.

Section B is structured in accordance with the geodata life cycle

- from conservation and archiving planning (CAP),
- via submission/ingest to/by the archive,
- and preservation in the archive,
- to access to and use of the archived geodata.

This structure is shown in the following chart:

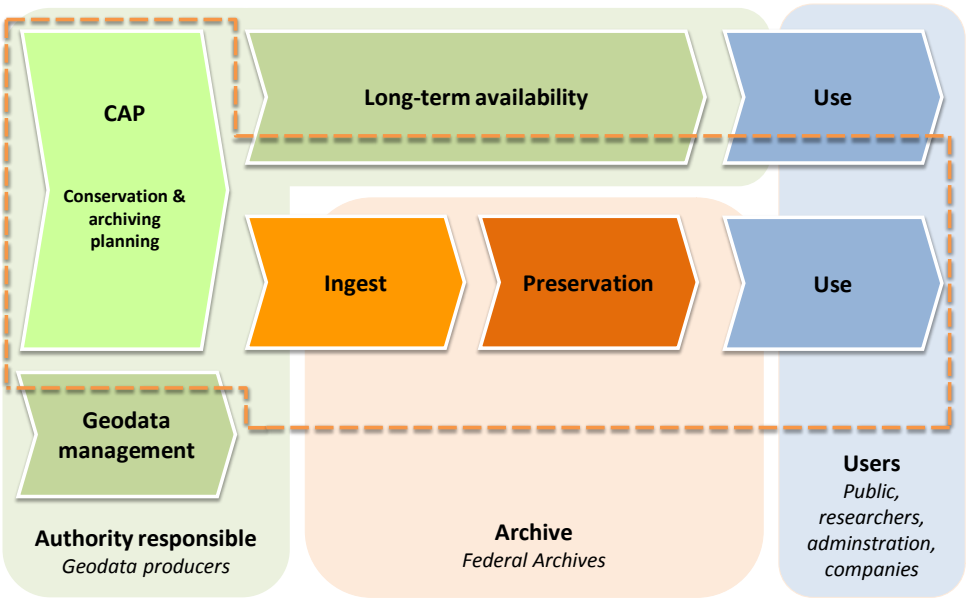


Figure 2: Life cycle of geodata

When reading the information below, it should be borne in mind that the solutions discussed are concepts. The intention is to arrive at an overall solution aligned across the entire life cycle at this conceptual level. The concept phase describes few if any elements in sufficient detail to enable direct operational implementation. The (approved) concept serves as the basis for realisation of the proposed solutions.

[25] Archiving of geodata. A joint preliminary study by swisstopo and the Swiss Federal Archives.
[26] Project Ellipse – Concept for the archiving of official geodata under federal legislation: Interim report, 2012.

3 Basic principles

3.1 Scope of application of the archiving concept

3.1.1 Types of geodata

The project name “Ellipse – Concept for the archiving of official geodata under federal legislation” reflects the original goal of developing a conceptual basis for the archiving of official geodata under federal legislation. This scope in the narrower sense is set out in Art. 2 para. 1 GeoIA.

As the Confederation can only prescribe archiving solutions in its own area, the scope is limited to that of *official geodata of the Confederation*. It is thus restricted to the geodata listed in the appendix to the GeoIO (official geodata catalogue) and for which a federal authority is named in the “authority responsible” column.

During the process of drawing up the concept, it became clear that this interpretation is too restrictive. Geodata producers create a range of other geodata that, although not listed (either explicitly or implicitly) in a law or ordinance, are nevertheless required for the fulfilment of official tasks. Art. 2 para. 2 of the Geoinformation Act addresses this point:

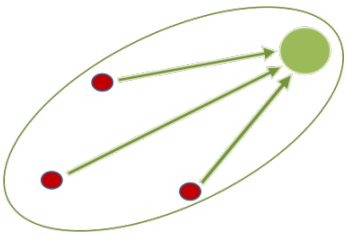
“[2] It [the GeoIA] is valid for other federal geodata provided its use is not regulated by other federal legislation.”[27]

This concept therefore offers solutions that encompass both *official geodata of the Confederation* and *other federal geodata* (as mentioned in Art. 2 para. 2 GeoIA). The latter also includes *processing stages*,[28] where present and of importance.

The archiving of *official geodata under federal legislation where responsibility lies with the cantons* must be regulated by legislation from the cantons themselves (Art. 15 para. 2 GeoIO). Throughout work on the concept, importance was attached to transparent information. With regard to cadastral survey geodata in particular, work on devising the best possible archiving solution was conducted jointly. The SFA are also in the process of discussing forms of cooperation in principle with the cantons for archiving/conservation as a service for third parties in the area of digital archiving.

Although the “Ellipse” concept can explicitly only develop a binding archiving solution for the federal administration, various contacts took place with the cantons, which are themselves responsible for archiving the official geodata under federal legislation that fall within their area of responsibility. It is in the interest of the project and the federal administration to support this collaboration.

[27] Art. 2 para. 2 GeoIA.
[28] See Figure 7: Possible processing stages of geodata sets.

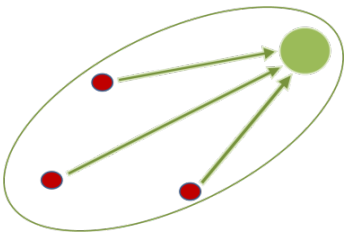


Principle 1: Scope of the "Ellipse" concept

- This concept comprises solutions that apply to both *official geodata of the Confederation* and *other federal geodata* (as mentioned in Art. 2 para. 2 GeoIA).
- The *other geodata* category may also include *processing stages,* where present and of importance.
- Collaboration with the cantons is supported.

3.1.2 Analogue and digital geodata

The concept for the archiving of geodata applies to both digital and analogue geodata.
In principle, a solution for the archiving of *analogue* geodata (e.g. paper maps) has already been developed; this is geared to the SFA's principles and policies for archiving analogue documents.
The proposed solutions therefore concentrate mainly on the archiving of *digital* geodata. If conceptual approaches are not applicable to the archiving of analogue geodata, this is explicitly stated in the chapters concerned.



Principle 2: Scope of the "Ellipse" concept

The concept applies to the archiving of both digital and analogue geodata.

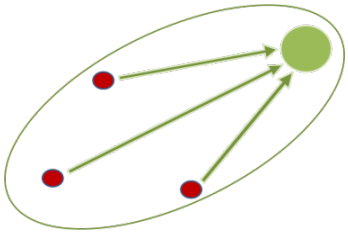
3.2 SFA principles

The SFA already has solutions in place for the archiving of digital documents in general. These are based on the following principles:[29]

- decoupling of the data from specific IT environments (applications, database and operating systems, hardware)open, standardised environments that are as generic as possible
- homogenous storage infrastructure
- reduction of the number of file formats to a few that are archivable
- migration processes (in particular format conversions).

These principles were reviewed in relation to the archiving of geodata as part of Project Ellipse. No reasons were identified for deviating from these principles when archiving geodata.

[29] Digital Archiving Policy, 2009, http://www.bar.admin.ch/dokumentation/00445/00527/index.html?lang=en&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1ad1IZn4Z2qZpnO2Yuq2Z6gpJCDdYB,fmym162epYbg2c_JjKbNoKSn6A-- (4.7.2012).



Principle 3: SFA Digital Archiving Policy

The principles set out in the SFA's *Digital Archiving Policy* are also applied to the archiving of geodata.

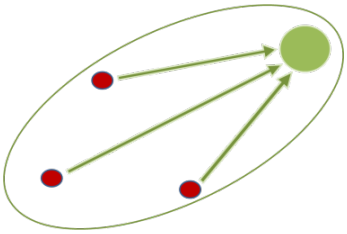
3.3 Principles for the archiving of federal geodata

This concept lays down the following principles:

- Based on the geoinformation legislation that places the task of "Guarantee of availability" (of official geodata of the Confederation) in the hands of the authorities responsible (long-term availability, Art. 14 GeoIO) and the SFA (archiving, Art. 15 GeoIO) respectively, **cooperation** between geodata producers (GCG) in the federal administration and the SFA is to be built up and institutionalised via agreements.
- The **SFA** are included in the **Federal Spatial Data Infrastructure FSDI** as a **partner** (institution) **and** as a **contributor** (archived official geodata under federal legislation). The SFA are members of the coordinating agency for federal geographical information (GCG)[30] where they in particular represent the archive perspective. Additionally, the SFA are permitted to use the same services[31] of the Coordination, Geo-Information and Services Division (COGIS) as other federal authorities.
- The aim of archiving geodata deemed to be of archival value is to document the business practice of the authority responsible but also, and especially, to create **time series and spatial monitoring tasks** (e.g. analysis of changes and developments to landscapes and settlements) over time.
- **Redundant data retention** in long-term availability and archiving at the SFA is to be **avoided**. This is to prevent duplication of infrastructures, reduce costs and deliberately coordinate the task at hand.
- An **uninterrupted process** is to be created between long-term availability and the archive (especially for users): it should make no difference to users whether they can search for and find geodata in long-term availability or in the archive.
- The SFA are to offer **only one technical interface** for the submission of geodata. This will be developed together with the GCG/COGIS for the FSDI geodata warehouse during the realisation of Ellipse. No interfaces specific to authorities are envisaged.

[30] "The coordination of geographical information within the Federal Administration is under the strategic direction and management of the coordinating agency for federal geographical information, GCG." http://www.geo.admin.ch/internet/geoportal/en/home/geoadmin/organisation.html (4.7.2012)
"The tasks of the coordinating agency are as follows: a. coordinating the activities of the federal administration; b. developing federal strategies; c. participating in the development of technical standards; d. operating a centre of competence; e. advising cantonal authorities." From: Internal regulations of the GCG, 29 October 2008, www.geo.admin.ch/internet/geoportal/de/home/geoadmin/organisation.parsysrelated1.7725.downloadList.18559.DownloadFile.tmp/reglementgkg20081029d.pdf (in German) (4.7.2012).

[31] "The Division acts as a specialist geoinformation service, in particular for the federal authorities. On the basis of geoinformation law it offers, in particular, advice and support in cross-disciplinary and super-disciplinary matters." (Complete list of the tasks of COGIS in the Regulations of the coordinating agency for federal geographical information dated 29 October 2008, Art. 14 Tasks of the Division, in German).



Principle 4: Principles of the Ellipse concept

- **Cooperation** between geodata producers / GCG and the SFA is to be built up.
- **The SFA** are **included in the GCG** as a partner/contributor of the **Federal Spatial Data Infrastructure FSDI**.
- **Spatial monitoring tasks** must be guaranteed over time.
- **Redundant data retention** between long-term availability and archiving is to be avoided.
- An **uninterrupted process** (search/find) is to be realised between long-term availability and the archive.

3.4 OAIS – Open Archival Information System

Digital archiving at the SFA is based on the OAIS reference model[32] (see Figure 3).

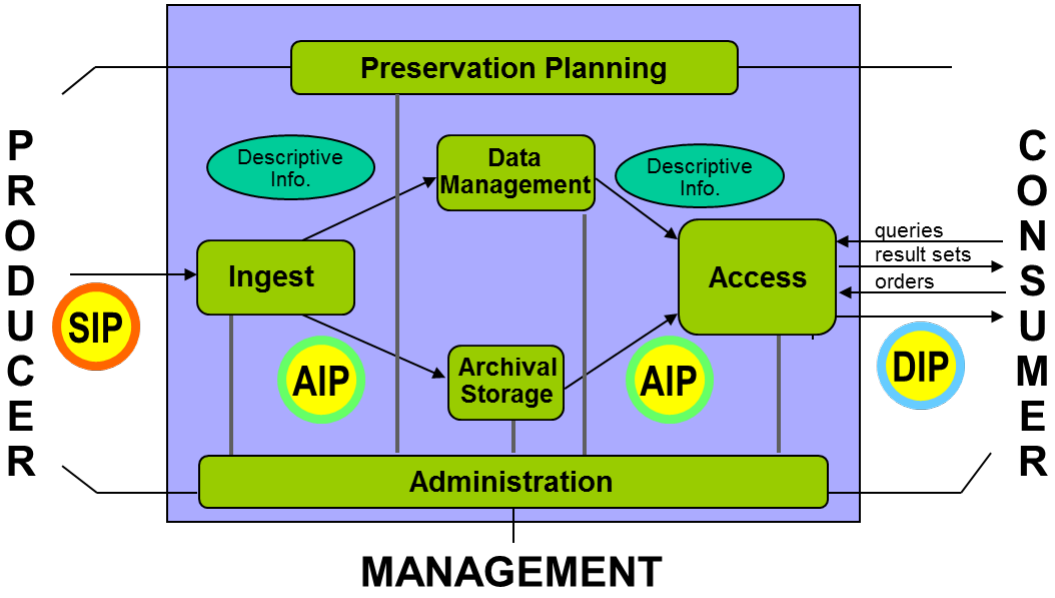
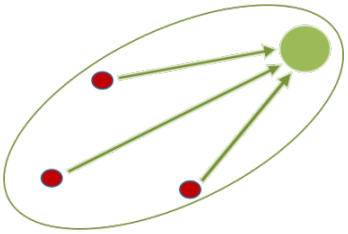


Figure 3: OAIS reference model

OAIS is a generic reference model for the SFA in the entire digital archiving environment, and is used as a directive for implementing a model suited to the situation and specific requirements of the SFA.[33] All digital archiving systems and processes at the SFA are based on this model. The geodata archiving concept was also based on this model.

[32] Open Archival Information System, ISO Standard 147121:2003.
[33] Cf. Digital Archiving Policy, 2009, p. 14, http://www.bar.admin.ch/dokumentation/00445/00527/index.html?lang=en&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1ad1IZn4Z2qZpnO2Yuq2Z6gpJCDdYB,fmym162epYbg2c_JjKbNoKSn6A-- (17.09.2012).



Principle 5: OAIS

The OAIS reference model also serves as a directive for the realisation of geodata archiving. The elements of an archive described in it are to be implemented.

3.5 Formats

Formats play an important role throughout the path described above, from submission to the archive, in the archive itself and through to supply from the archive to users. While archivable formats for text (descriptive and additional documentation) and images (image and graphic raster data) have already been laid down by the SFA, the prime focus of Project Ellipse is on identifying archivable geoformats for vector data.

For long-term availability, current ("customary"), often manufacturer- or GIS-specific formats are used. On submission to the archive, geodata in these formats are converted into archivable formats. Such formats are stable and system-independent, thus guaranteeing their conservation for a very long period. Format migrations must be kept to the minimum necessary, as they can cause losses of information.

When archived geodata are disseminated, they are supplied in archivable formats. This ensures that information submitted to the archive by the geodata-producing authority is supplied to users with as few changes as possible and in accordance with the associated geodata model. Users have the option of undertaking any format conversions they may wish. They are then responsible for any information losses that may occur. Figure 4 below illustrates the process described:

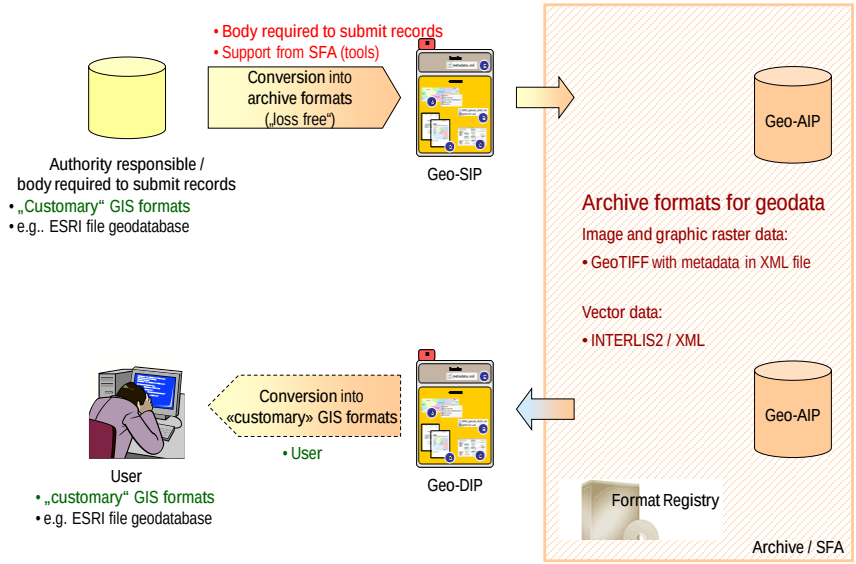


Figure 4: Submission: transfer to archivable formats – dissemination: supply of archivable formats

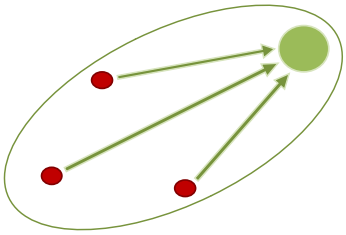
The following chapters of the concept describe in detail the specific aspects associated with formats, and also propose solutions.

3.6 Format registry

To ensure that geoformats can be read again later, the formats must be properly documented. It was noted during the preliminary study that it is not expedient to integrate such documentation into every Submission Information Package (SIP), but that instead a format registry should be used. This procedure is also implemented in all other formats used for digital archiving.

A format registry is a knowledge database that contains all the information about formats required to ensure that content coded in those formats can be interpreted unambiguously, displayed visually, and converted into other formats. It also provides structured information about formats to enable identification and verification.

The management of the SFA has determined that the SFA must take on the task of constructing a format registry as a reference body for Switzerland. The SFA will offer this as a service. PRONOM (a familiar example of such a format registry) is used at the National Archives in the UK, but the processes and options for entering new (geo-)data formats are not simple and are not consolidated globally or across Europe. However, an autonomously operated version of PRONOM could well serve as the basis of a format registry for Switzerland.



Principle 6: Format registry for Switzerland

The SFA will take on the role of a reference body for the construction of a format registry for Switzerland.

The creation of the package structure and implementation of the preservation of geodata are based on this precondition.

3.7 Metadata

Metadata are key information in the long-term conservation of data. Like formats, they play an important role throughout the path described above, from submission to the archive, in the archive itself, through to supplying from the archive to users.
For the purposes of the concept for archiving geodata, a distinction is made between various types of metadata:

- **Geospatial metadata:** Geospatial metadata are governed by Standard SN 612050 (2005-05 edition, Cadastral Surveying and Geoinformation – GM03 Metadata Model – a Swiss Metadata Model for Geodata).[34] Based on this standard, Switzerland offers a recording and search portal (geocat.ch) as part of the e-geo.ch programme as well as a catalogue service for geospatial metadata. Geospatial metadata recording is the task of the authorities responsible (geodata producers). In future, geospatial metadata will be submitted for archiving together with the geodata.
- **Archival metadata:** For archival metadata from digital submissions, the data dictionary of the SIP specification as well as the rules for the description of analogue documents apply. Both sets of

[34] GM03 as per SNV standard: http://www.geocat.ch/internet/geocat/en/home/documentation/gm03.html (16.8.2012).

rules are based on the ISAD(G) standard,[35] which governs archival description. Description in the SFA's Archive Information System (AIS) is carried out in accordance with this standard. Archival metadata must be recorded on submission by the bodies required to offer records. They permit the management and searching of archived documents.

- **Other metadata:** As part of conservation and archiving planning, other metadata, such as the frequency of updates or the form, are recorded (see chapter 4.2.3 Integrating the fonds).

4 Planning

4.1 Geodata management

The SFA have a wide range of aids and rules that enable and assist the management of business documents. Managing geodata, however, is a fundamentally different matter, and so further rules and aids are needed. Nevertheless, the SFA's general considerations and rules are universally valid and so can be adopted. In its guide *Elektronische Geschäftsverwaltung GEVER*[36] ("Electronic records and process management (GEVER)", available in German and French), the SFA set out the most important organisational and legal foundations for the introduction and operation of GEVER. This guide was used to assist in formulating the fundamental considerations for the management of geodata set out below.

It has become apparent that the pre-archive management of geodata is relevant to almost all archiving processes, starting with appraisal, where both an overview of all available geodata and the additional information (metadata) relevant to appraisal are required. Before conservation and archiving planning (see chapter 4.2) can take place, certain requirements relating to the holding and documentation of geodata must be met. In particular, each geodata set must be accompanied by a range of information such as the following:

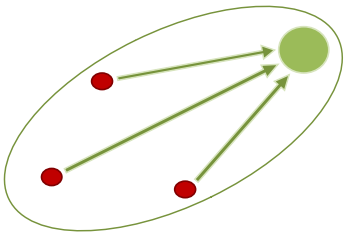
- general information on the geodata set (e.g. title, no., authority responsible)
- information on type of updating (regular – irregular – none) and the update cycle
- information on handling of the time aspect (e.g. are snapshots created or are the geodata held in a historicised database)
- metadata (geospatial metadata, other metadata)
- information on supplying access (which information is made available to which users, how and in what form)
- information on technical aspects (e.g. migrations)

Pre-archive management also plays a role in submission, as the pre-archive structure also influences the way the submission is prepared. To avoid creating a substantial workload, the geodata should be held by the authority responsible in a structure in which they can be subsequently ingested into the archive. During ingest, it is important that all the relevant information needed to understand the geodata to be submitted is contained in the SIP. Primarily, this includes the geospatial metadata, the minimum data model and the associated documentation (see chapter 5.2.5.1). It is vital that this information is recorded before submission, as by that time a large proportion of the knowledge about the geodata will often already have been lost. For this reason, it is very important that this information is recorded

[35] International Standard Archival Description (General).

[36] http://www.bar.admin.ch/dienstleistungen/00882/00954/index.html?lang=de&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1acy4Zn4Z2qZpnO2Yuq2Z6gpJCDdoJ2gGym162epYbg2c_JjKbNoKSn6A-- (28.8.2012).

by the authority responsible when the data are created or come into existence, so as to ensure that geodata can still be used 10 or 100 years later and can be understood without reference to specific individuals.



Principle 7: Management of geodata – metadata

To ensure that the geodata remain comprehensible over an extended period, it is important that the data are well documented and managed in a structured way.

The key aspects of geodata management are:

- geospatial metadata
- minimum geodata model including documentation
- structure for additional information

The recording of geospatial metadata is governed by the GeoIA (Art. 6, paras. 1-2)[37] and described in greater detail in the GeoIO (Art. 17, 18 and 19).[38] The law stipulates that all official geodata are to be described by geospatial metadata, and that these metadata must be made publicly accessible, updated, conserved and archived together with the official geodata.[39] The geospatial metadata for official geodata are published on geocat.ch.[40] In addition to the metadata entry in geocat.ch, however, further and more detailed metadata may be available which the authority responsible has itself recorded for the purpose of description. On submission, it may be a good idea to transfer these additional geospatial metadata as well, in order to ensure the comprehensibility of the data. It is therefore important that this information too is filed and managed in a structured way.

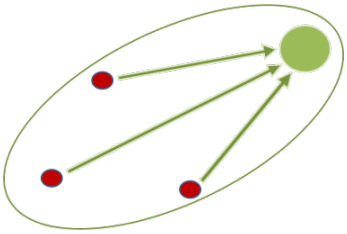
The law (GeoIO)[41] also prescribes the creation of a minimum geodata model, and at least one geodata model is allocated to the official geodata. The coordinating agency for federal geographical information (GCG) has provided aids[42] for this purpose. The aim is to create a harmonised basis for geodata models. Binding minimum requirements have therefore been laid down for the federal authorities.

The documentation which geodata producers draw up for their own purposes (reviewability, etc) and is of central importance for various aspects prior to archiving can also be used for archiving.

This documentation and the “minimum geodata model” are to be adapted, or new versions created, when major changes are made to the data set. Where older geodata sets are involved, consideration

[37] Art. 6, para. 1-2, Federal Act of 5 October 2007 on Geoinformation (Geoinformation Act, GeoIA) (status as at 1 October 2009), SR No.: 510.62, http://www.admin.ch/ch/e/rs/5/510.62.en.pdf (5.6.2012).
[38] Ordinance of 21 May 2008 on Geoinformation (Geoinformation Ordinance, GeoIO) (status as at 1 May 2012), SR No.: 510.620, Art. 18, para. 1, http://www.admin.ch/ch/d/sr/5/510.620.de.pdf (5.6.2012).
[39] Ordinance of 21 May 2008 on Geoinformation (Geoinformation Ordinance, GeoIO) (status as at 1 May 2012), SR No.: 510.620, Art. 18, para. 1, http://www.admin.ch/ch/d/sr/5/510.620.de.pdf (5.6.2012).
[40] Metadata catalogue for Swiss geodata, www.geocat.ch.
[41] Ordinance of 21 May 2008 on Geoinformation (Geoinformation Ordinance, GeoIO) (status as at 1 May 2012), SR No.: 510.620, Art. 8-10, http://www.admin.ch/ch/d/sr/5/510.620.de.pdf (5.6.2012).
[42] Template for model documentation, version 2.0 (German), http://www.geo.admin.ch/internet/geoportal/de/home/topics/geobasedata/models.parsys.75473.downloadList.49267.DownloadFile.tmp/empfehlungenvorlagemodelldokumentation20110912.doc (28.8.2012) and recommendations on geodata modelling, version 2.0 (German): General recommendations on the method of defining “minimum geodata models”, published on 17.1.2012 (in German), http://www.geo.admin.ch/internet/geoportal/de/home/topics/geobasedata/models.parsys.75473.downloadList.28447.DownloadFile.tmp/empfehlungenminimalegeodatenmodelle20120117.pdf (28.8.2012).

should be given to how much effort is justified in order to draw up documentation and a “minimum geodata model” at a later date. This can, for example, depend on the level of use. If a geodata set is still needed constantly, often or for a long time although it is no longer updated, it may be sensible to draw up documentation and a “minimum geodata model” in retrospect. If no “minimum geodata model” is available and none is recorded at a later date, a check should be made to determine whether other documentation on the data sets is available to ensure the comprehensibility of the data.



Principle 8: Management of geodata – documentation

As part of realisation, efforts will be made to find a way in which the documentation created on all geodata and their snapshots can be filed in a historicised form at a central location accessible to the public. The aim is to minimise “incorrect orders” by allowing additional information to be referred to before data are obtained by users, either from long-term availability or from the archive.

There are no direct rules on structuring or the interaction of general records and process management (GEVER) and the administration of the various geodata at an authority responsible. Normally, in connection with the introduction and use of GEVER, a check is made to establish whether the operation of a specialist application alongside GEVER is necessary and whether the application can be integrated into or linked to the GEVER application. The organisational regulations of the authority responsible stipulate what should be managed or filed in GEVER and what in the specialist application. To enable the classification system in the GEVER application to provide an overview of all tasks of the authority responsible, the tasks that are carried out or managed in the specialist application (e.g. a GIS or geodata warehouse) should also be depicted in the classification system. Since geodata cannot be created or edited in a GEVER application, the issue of the need for a separate specialist application (in this case a GIS) does not arise. Consequently, it is only necessary to check how the various applications intermesh or interact.[43] There are four possible variants (see also Figure 5):

[43] Basic idea taken from the questionnaire for analysing specialist applications. This document assists SFA advisors and is an internal aid.

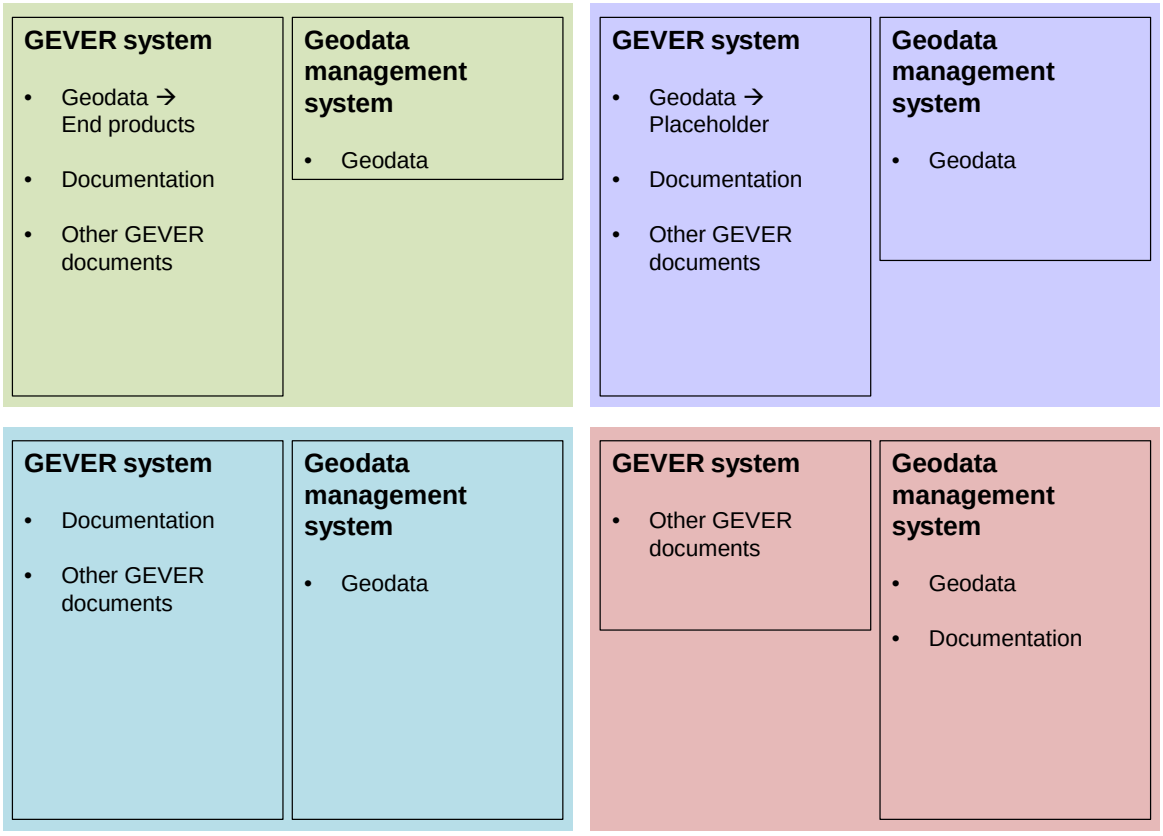


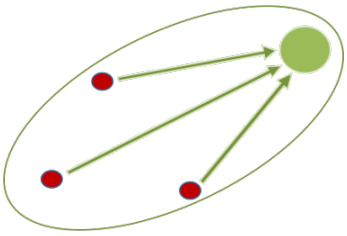
Figure 5: Variants of interaction – GEVER applications and geodata

Variant 1 (top left) involves the geodata themselves (though only the “end products”) being filed in the GEVER application too, for documentation purposes. No further editing of the data is possible in this case; this is done in the separate application for geodata. In this case, the entire documentation on the geodata should be filed in the GEVER application at the same location. This variant is only sensible if the amount of geodata and different snapshots is manageable.

In variant 2 (top right), only a placeholder for the geodata is recorded in the GEVER application. This enables the geodata to be allocated to the business context concerned and linked to the associated documentation, which in this case is also filed in the GEVER application. This variant is sensible if the work involved in transferring the geodata end products concerned to the GEVER application is too great or does not make sense, but the effort needed to record a placeholder is still justifiable.

In variant 3 (bottom left), only the geodata documentation is managed in the GEVER application, because the work involved even in just recording a placeholder for the individual geodata sets is disproportionate. In this case, however, a reference to the geodata management system(s) must be stored in the GEVER application, or alternatively a placeholder.

In variant 4 (bottom right), both the geodata and the documentation are edited and filed in the geodata management system. Only the references to the geodata management systems are stored in the GEVER application.



Principle 9: Management of geodata – GEVER

Depending on the amount and complexity of the geodata of an authority responsible, a decision should be made as to how and where the data concerned are to be managed. It is important that the various systems intermesh or cross-reference each other so that the link to the task concerned can be established. The use of the systems and the locations of data management should be set down in the organisational regulations (OR)[44] of the authority responsible.

4.2 Conservation and archiving planning

What is to happen to the geodata in future, in other words which data are to be available where, for how long, and for what purpose, is a key issue in the management of geodata. There is a legal framework for answering these questions, which distinguishes between *conservation* for a limited time at the authority responsible (long-term availability) and *archiving* for an unlimited time by the SFA. The Geoinformation Ordinance (GeoIO) assigns responsibilities as follows:

Art. 14 Long-term availability

[1] The body stipulated in Article 8 paragraph 1 GeoIA shall conserve official geodata in such a way that their quantity and quality are preserved.

[2] It shall secure the official data in accordance with recognised standards and the state of the art. In particular, it shall export the data periodically into suitable data formats and shall conserve the exported data securely.

[3] The Federal Office of Topography may stipulate the minimum period for management of the official geodata by the body stipulated in Article 8 paragraph 1 GeoIA.

Art. 15 Archiving

[1] Where responsibility pursuant to Article 8 paragraph 1 GeoIA lies with an authority of the federal administration, archiving shall be governed by the Federal Act on Archiving of 26 June 1998[3] and the associated implementing provisions.

[2] Where responsibility lies with the canton, the latter shall stipulate by law the authority responsible for archiving.

[3] The Federal Office of Topography may stipulate the minimum period for conservation.

Art. 7 of the Archiving Act (ArchA) regulates that the archival value of documents must be assessed before archiving. To do this, the bodies required to offer records for safekeeping and the SFA assess which of the documents offered are worth archiving, and which should be destroyed once their conservation period has ended.

[44] Reference to the information architecture of a management location, if available.

Art. 7 Assessment of the archival value and acceptance of documents

[1] The Federal Archives, in cooperation with the bodies designated in Article 1 paragraph 1, shall decide whether documents are of archival value.

[2] Documents that are assessed as being of archival value must be delivered to the Federal Archives by the bodies required to offer their records for safekeeping. Offices not required to offer their records for safekeeping are responsible for their own archiving.

[3] The Federal Archives may temporarily safeguard documents that are assessed as not being of archival value if such safeguarding is required by federal law.

The aim of determining archival value under the ArchA (appraisal) is to select as much as is necessary but as little as possible for archiving. The goal is to concentrate information so as to ensure the efficient use of resources and enable the rational appraisal of diverse archive records. Appraisal also helps to create clarity. The SFA operate a standard method for appraising documents against a catalogue of criteria which is applied equally to all types of documents. The criteria and the two-stage overall appraisal process stipulated in the ArchA can also be applied to geodata. In view of the important interdependencies between the geodata collected by various authorities, the procedure has been supplemented such that, when appraising in accordance with legal and administrative criteria, not only the authority responsible for the data according to the law but also, via the latter, other responsible authorities that are affected, are involved.

The aim of long-term availability is to conserve official geodata for a limited period in such a way that their quantity and quality are maintained and they are available for continuous active use. Online availability should extend not just to the data fonds that are current at a given time but also to defined older snapshots (in the sense of time series). To enable “monitoring”, i.e. documentation of the development of official geodata under federal legislation over time, swisstopo can (in association with the authorities affected) stipulate the minimum period for management of the official geodata by the authority responsible under Article 8 para. 1 GeoIA. Art. 8 GeoIA already prescribes the transfer of official geodata sets to long-term availability, but there is a measure of discretion as regards the selection of other geodata sets and processing stages for long-term availability.

The archive and the authorities responsible must draw up an overarching, coordinated and joint conservation and archiving plan. Appraisal of geodata for time-limited conservation in long-term availability and subsequent archiving, where appropriate, are to be planned and coordinated in advance and not on a case-by-case basis, if questions of appraisal of an individual geodata set are upcoming.

Although the goals and statutory basis of long-term availability and archiving differ, they nevertheless relate to the same documents (in this case geodata) and require detailed reflection on their function, potential use and links, as well as the exploitation of possible synergies. Linking the two decision-making processes together from an organisational point of view is therefore a matter of importance.

4.2.1 Principles of conservation and archiving planning

To maximise the benefit from the potential synergies between the selection of geodata for long-term availability and appraisal for archiving, coordination is advisable on two levels: coupling the two processes together; and applying them to all federal geodata sets. The advantages of this approach are as follows:

- First, linking the prospective appraisal of all federal geodata with regard to long-term availability and archiving enables the two aspects of limited conservation and (unlimited) archiving to be coordinated.
- Second, registration of all geodata on a single occasion creates a shared working basis, which is preferable to individual stocktakes in terms of both the work involved and the information value.
- Third, early planning for long-term availability and archiving enables the various parties involved to input their requirements and interests into the process.
- Fourth, account can be taken of the interdependencies between thematic geodata and geospatial reference data or geodata. As all parties are involved at the same time, the results can be aligned where necessary.
- Fifth, coordination takes account of the fact that the geodata, the vast majority of which are collected decentrally, can be linked to geoinformation in any number of ways. This needs to be borne in mind both in long-term availability and when combining in the archive.
- Sixth, the workload involved at a later stage when geodata are submitted to the archive is significantly reduced.

In addition to efficiency gains, this approach therefore permits a holistic perspective on the issue of what is to happen to the various geodata. If transparency is assured and an overall view is available on this point, geodata can be managed prospectively and their long-term usability secured. Geodata that are no longer needed can be filtered out at an early stage, instead of unnecessarily consuming resources. Finally, planning is a prerequisite for the automation of transfer between geodata-producing authorities and the archive.

At the outset, such planning entails work for all concerned. Once that work has been done, however, only new developments such as an additional geodata set need be taken into account. It also creates transparency for all involved as well as for users.

4.2.2 Implementation of conservation and archiving planning

The appraisal of geodata requires the same basis, whether they are being appraised for long-term availability or for archiving, namely detailed registration of the data to be appraised. This fact is exploited by using a single registration template, which contains fields for both long-term availability and archival value (as with the standard offer form used by the SFA). The template is developed jointly by the geodata-producing authorities and the SFA in order to ensure that it collects all the necessary data, is user-friendly and, where necessary, enables the interdependencies between data to be reconstructed. The template serves to describe the entire geodata fonds of an authority responsible, and to collate and structure the information on the geodata.

Once the fonds have been registered into the classification index, the authorities responsible or bodies required to offer records carry out the work for which they are responsible (see Figure 6). In the “Appraisal” process, they assess (indicating their reasons) which data are to be transferred to long-term availability on the basis of statutory provisions or for other reasons, and which – possibly in conjunction with other data – are (from a legal and administrative point of view; l+a) wholly or partially of archival value or without archival value. The authorities responsible clarify any interdependencies between the geodata with other authorities responsible. Responsibility for the result of the appraisal of archival value on the basis of legal and administrative criteria lies with the body required to offer records.

The SFA receive the index as appraised by the body required to offer records and assess whether the geodata that have been appraised as having partial (including snapshots) or no archival value are of

archival value from a historical or social (h+s) perspective. In line with the principle of “in dubio pro archivo”, all geodata that are assessed either by the body required to offer records or by the SFA as having archival value are archived.

The results of the selection for long-term availability (LA) and archival value (A) are published.

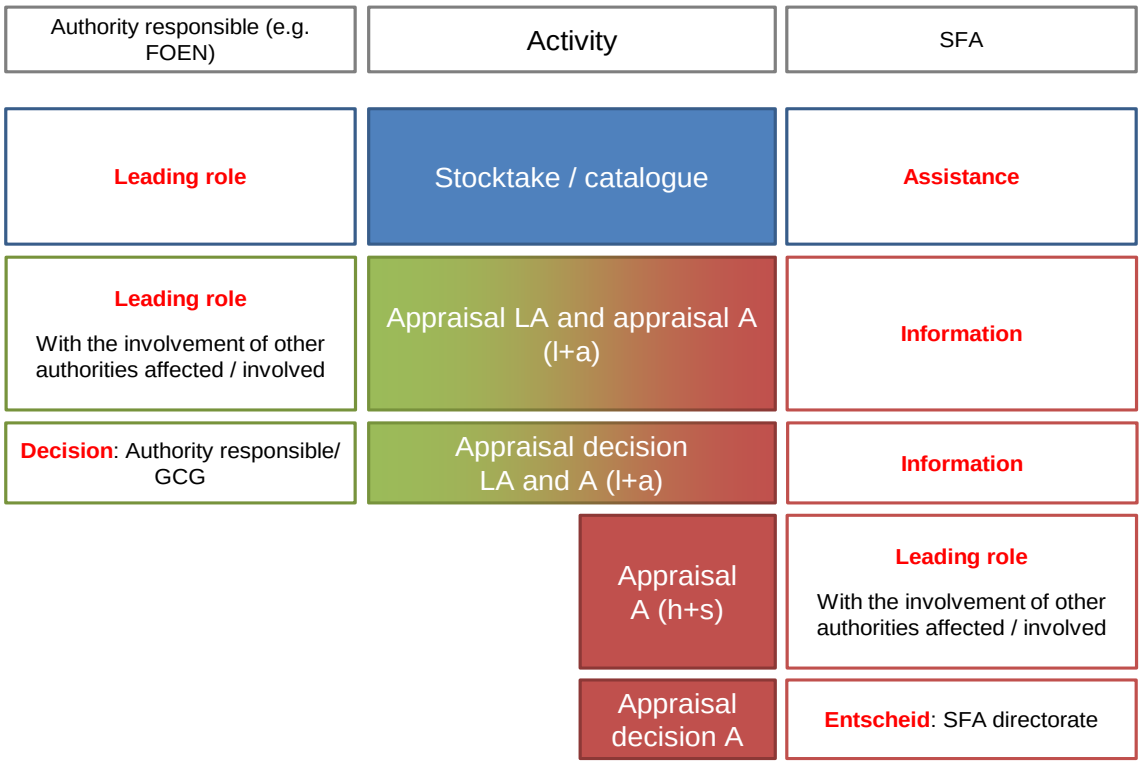


Figure 6: Coordination of LA and A appraisal

4.2.3 Registering the fonds

This process begins with the registration of the fonds together with additional information into a classification index which creates the basis for all subsequent work.

When registering the fonds, the official geodata of the Confederation are registered. The information on these fonds can simply be taken from the Compilation of Official Geodata Sets. In order to establish an appropriate working basis for each authority and to avoid redundancies, only those official geodata sets for which the authority concerned is listed as the “authority responsible” in accordance with Appendix 1 of the GeoIO are registered in the fonds.

Equally, other federal geodata can be included when registering the fonds. The fonds include all geodata sets that are not official geodata sets according to the Compilation of Official Geodata Sets. These may be geodata sets that are created by the authority because there is a need for them but without an explicit remit embodied in legislation They may also be geodata sets that constitute *preliminary stages* or, more generally, *processing stages* of official geodata sets. These *processing stages* may exist in the following forms (Figure 7):

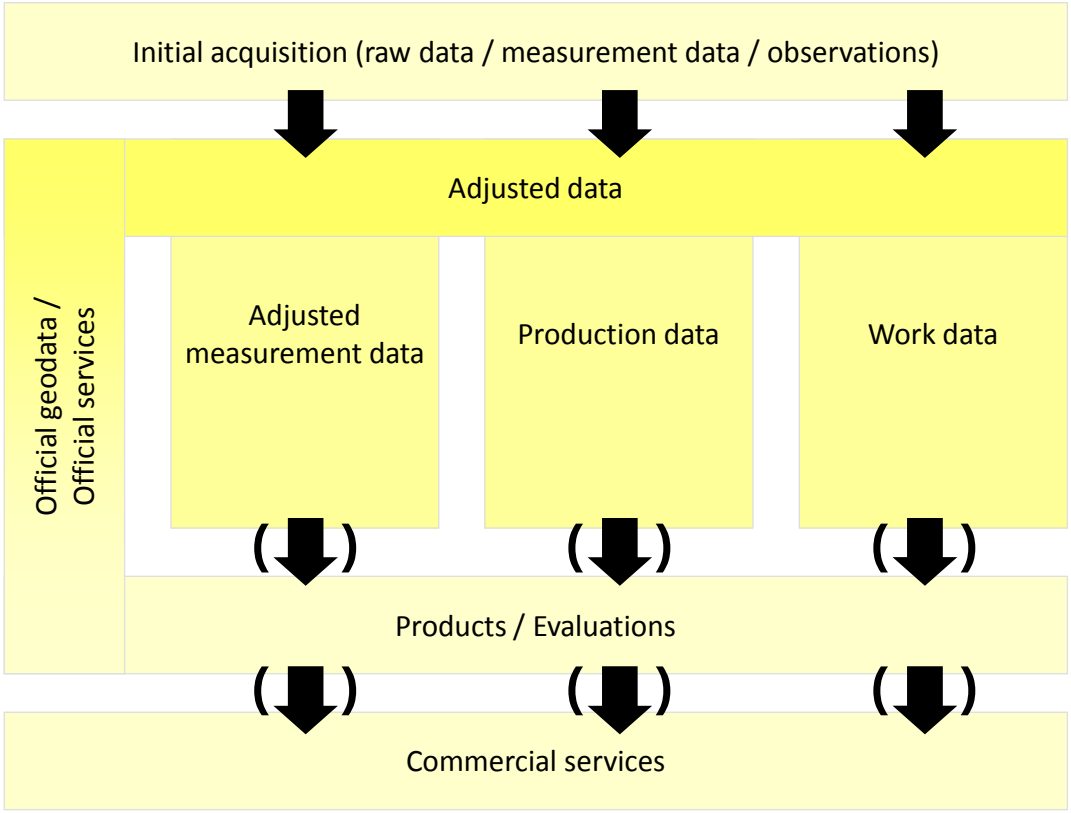


Figure 7: Possible processing stages of geodata sets[45]

There may be processing stages that do not represent the official geodata set itself but are to be conserved in long-term availability or are of archival value. For this reason, it is sensible to register all the processing stages of an official geodata set that have relevant content or can be defined, so that the appraisal can be carried out on this basis. The fonds as registered should contain the following information:

- official geodata sets of the authority responsible as per the Compilation of Official Geodata Sets under federal legislation
- preliminary stages or other processing stages of an official geodata set that are not themselves designated as official geodata sets
- other geodata sets that are produced by the authority responsible and are not listed as official geodata sets in the Compilation.

Once the fonds for each authority responsible (official geodata sets and any other geodata sets including processing stages) has been registered, relevant additional information on the individual elements of the fonds is collated and registered together with the data as an aid to deciding for or against long-term availability / archiving. The index thus consists of the following parts:

[45] One example of an official geodata set involving a number of processing stages is official geodata set “36.1 Digital aerial images / aerial photographs”. In this instance the first processing stage includes the raw data (rawmms) created by the digital cameras during the overflights. The second processing stage is the raw data that have been fed in and cleaned up (raw). These are used to generate L0 data – three-dimensional, geospatially referenced aerial images. The L0 data in turn are used to create the L1 data – the digital aerial images as per the collection – and the L2 data, the orthophotos as per the collection (35.1 SWISSIMAGE).

- list of the fonds of the authority responsible (official geodata sets, other geodata sets and any processing stages)
- metadata from the official geodata catalogue[46] and the Compilation[47]
- metadata with additional information for appraisal (e.g. updating, form)
- metadata on the appraisal for long-term availability
- metadata on the appraisal for archival value

4.2.4 Coordination of appraisal for long-term availability and for archival value

The index described, containing all the geodata registered by the authority responsible together with the relevant additional information, serves as the basis for the selection of data for long-term availability and for determining their archival value. These two appraisal tasks have different goals and are based on different legal foundations. Nevertheless, as already mentioned, it is sensible to link them, because the same responsible individuals have to deal with the same data and make decisions on their medium-term or long-term use.

The linked appraisal processes take place, as described below, in two main phases, during which first the authority responsible and then the SFA process the geodata index (cf. Figure 6).

Phase 1 – Authority responsible (assisted by other authorities): appraisal for long-term availability and appraisal for archival value in accordance with legal and administrative criteria

In the first step, the authority responsible (as per GeoIA/GeoIO) establishes which of the data registered into the index that are within its area of responsibility

a) should be transferred to long-term availability (including conservation period), and which
b) are then, or additionally, to be archived from a legal and administrative perspective.

To take account of the mutual interdependencies of geodata collected and processed by different federal authorities, other federal authorities affected then have the option to amend the selection for long-term availability / appraisal for archival value. The authority responsible has the final say on which geodata are of archival value according to legal and administrative criteria.

When **appraising for long-term availability**, initially all the official geodata sets (including all snapshots) are intended for transfer to long-term availability, as this is required under the GeoIO:

> 6th Section: Guarantee of availability
> **Art. 14** Long-term availability
> [1] The body stipulated in Article 8 paragraph 1 GeoIA shall conserve official geodata in such a way that their quantity and quality are preserved.[48]

In this case only the duration of conservation (conservation period) in long-term availability is defined.

After this, the other geodata sets and processing stages are appraised by the authority responsible with regard to conservation in long-term availability. In the case of the data sets earmarked for long-

[46] Appendix 1 GeoIO.
[47] Compilation of Official geodata Sets, at: http://www.geo.admin.ch/internet/geoportal/de/home/topics/geobasedata/introductionplan.html (in German and French) (15.5.2013).
[48] Art. 14 para. 1 GeoIO.

term availability, the snapshots that are to be transferred to long-term availability are then selected. Then the conservation period is defined.

Once the selection has been made by the authority responsible, the other federal authorities have the option to select additional data sets that the authority responsible did not earmark for long-term availability. For these data sets, the authorities consulted must also specify the snapshots that are to be transferred to long-term availability, and stipulate the conservation periods. The other authorities responsible also have the option to influence the selection of the snapshots and the definition of the conservation periods for the data sets selected by the authority responsible. The plan becomes binding once it has been approved by the GCG.

When **appraising for archival value**, the authority responsible (in the terminology of the ArchA, the "body required to offer its records for safekeeping") assesses which of the data in the index (all official geodata sets, all other geodata sets and all processing stages) are to be archived because, from a legal and administrative perspective, they are sufficiently important to require unlimited conservation. The authority must give reasons for its assessment and specify the snapshots to be archived. As geodata from an authority that are selected for archiving only remain usable if specific geodata from another authority are also archived (example: thematic geodata with geospatial reference data), the appraisal for archival value on the basis of legal and administrative criteria takes place under the aegis of the authority responsible in association with other authorities. The results are finalised by the body required to offer the data appraised, with which responsibility also lies.

Phase 2 – SFA: appraisal for archival value according to historical and social criteria

Once Phase 1 is complete, the SFA receive the index, edited as described, from the authority responsible (body required to offer records). The SFA focus solely on the appraisal for archival value of the data in the index (all official geodata sets, all other geodata sets and all processing stages). The SFA review the ratings for legal and administrative archival value that have already been allocated and may select further data or snapshots (so far rated as not or only partially of archival value) for archiving on the basis of historical and social criteria. If necessary the SFA will also involve the authority responsible or other experts in order to establish the importance of the data and to archive coherent data fonds. The result (appraisal decision) is a complete appraisal of the archival value of all indexed geodata of the authority responsible, with reasons and stating the snapshots, which is approved by both the management of the authority and the directorate of the SFA.

Appraisal result

When the process described above is complete (Figure 6) there are four possible appraisal results: a data set may be selected for conservation in long-term availability and for archiving; for long-term availability only; for archiving only; or for destruction/deletion (see Table 3).

Appraisal decision	Long-term availability	Archiving	Destruction / deletion
Conservation in LA and archiving	X → After periods expire → X		
Conservation in LA only	X → After periods expire → X		
Archiving only		X	
Neither conservation in LA nor archiving			X

Table 3: Possible appraisal decisions

4.2.5 Procedure when appraising archival value and selecting for long-term availability

To ensure completeness, efficiency and comparability, both appraisal for archival value and selection for long-term availability follow a set procedure. The index which is to be drawn up for the geodata, as described above, contains fields that correspond to both procedures and permit the ratings determined by the various actors as well as supplementary information to be recorded.

Appraisal for long-term availability

The appraisal for long-term availability must only be carried out for the other federal geodata, as the law requires all official geodata to be made available long-term, together with all snapshots.

The appraisal of the other geodata is carried out using the *Catalogue of Criteria for the Transfer of Geodata Sets to Long-term Availability* (LA catalogue of criteria, see Appendix 15) drawn up as part of Project Ellipse. The LA catalogue of criteria consists of criteria for legal and economic importance and criteria for administrative importance. Legal and economic importance is determined by the authority responsible. The administrative importance of the data is also determined by the authority responsible, but additionally by other federal authorities if required.

The ratings that can be assigned during the appraisal for transfer of the data sets to long-term availability are:

- A for transfer of the data set to long-term availability
- N for no transfer of the data set to long-term availability

Where an “A” decision is made, in favour of transfer to long-term availability, reasons must be provided on the basis of a criterion from the LA catalogue of criteria. For example, in the case of official geodata that must by law be conserved, the rating “A” for transfer of the data set to long-term availability is assigned, and the reason stated as “GeoIO". Where an “N” rating is given, no reasons are required.

If the authority responsible or the other federal authorities assign an “A” rating, the data set is transferred to long-term availability. The one-time assignment of an “A” rating is sufficient to ensure transfer to long-term availability, so that the second body involved in the appraisal need only appraise the remainder, i.e. those data sets that have not yet been selected for long-term availability.

Once the “A” or “N” ratings have been assigned at geodata set level and the reasons have been recorded, the snapshots of the data set that are to be transferred to long-term availability are selected. This selection is to be made by the authority that made the decision in favour of transfer to long-term availability, in consultation with the authority responsible. The other federal authorities have the option to select other snapshots, i.e. to shorten the intervals (within the options available and in consultation with the authority responsible). In the case of official geodata, because of the legal provisions the selection of snapshots does not occur; instead, the snapshots available are stated.

The final point is to define the conservation period in long-term availability. This is initially done by the authority responsible. The other federal authorities that are involved in the selection for long-term availability can stipulate a conservation period longer than that envisaged by the authority responsible. The Catalogue of Criteria for the Transfer of Geodata Sets to Long-term Availability is used as an aid in determining the conservation period. The following rules of thumb are recommended:

- Frequent demand is deemed to exist if the data set is requested and used at least once a month.
- The conservation period should not normally be longer than 20 years after the data set is created.[49] [50]

In a final selection round, other involved authorities such as the cantons, research, companies and private users can input their needs in terms of long-term availability. Cantons report their needs or requests to the specialist federal authority responsible for them.

The ratings and definitions are recorded in the index. If a data set that is of archival value is only rarely requested, it makes sense to submit it to the SFA before the conservation period expires.

Appraisal for archival value

Under Art. 5 and 6 ArchO, two parties or partners are responsible for deciding which of an authority’s documents are to be archived. One is the body required to offer records. This body would assess, on the basis of the criteria set out in the catalogue of criteria in the overall concept, which of its documents are of archival value owing to their legal and administrative importance, and which are not. It can involve other authorities in the appraisal for archival value. The second partner is the SFA, which assess the documents to determine whether they are of archival value for historical and social reasons.

The following ratings are available as a result of the appraisal:

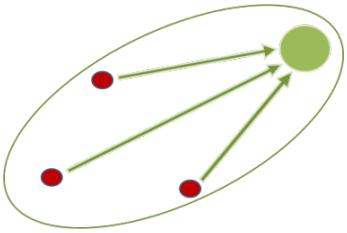
- A (of archival value)
- N (not of archival value)
- S (sampling/selection)

[49] Recommendation based on the policy on the requirement to offer records and submission of documents to the SFA, Art. 3 para. 2.
[50] The conservation period actually fixed by the authority responsible is dictated by the characteristics of the geodata. They include data that are used for time series / observations over an extended period.

The “S” rating represents a partial selection on the basis of a random sample (e.g. 10% of the documents) or qualitative features. In the case of geodata, an “S” is assigned if only part of the data and snapshots are to be archived, rather than the entire data set with all snapshots. Care should be taken to ensure that the archived data remain able to be evaluated and compared spatially, thematically and over time. The information on the selection to be made is entered in the corresponding field in the index.

The appraisal for archival value is undertaken using the catalogue of criteria, which is valid for all types of documents. Both partners explain their decisions in favour of archival value by stating the criterion which has been met. Where an “N” rating is given, no reasons are required. The reasoning ensures that the logic behind the decision can be reconstructed at a later date and facilitates communication between the partners regarding the importance of the documents. Exchange between the various partners is central to ensuring that content and potential uses can be understood and informed decisions made.

In accordance with the principle of *in dubio pro archivo*, all documents (in this case geodata) that have been assessed by at least one of the partners as being of archival value are archived. For this reason the appraisal process can be represented as a filter in which the second partner (SFA) appraises only those documents that have been appraised by the other party (authority) as having no archival value or only partial archival value (e.g. selection of particular snapshots). The result of the appraisal is approved by both parties and recorded as an appraisal decision.



Principle 10: Long-term availability and archival value

The processes for selecting data for long-term availability and for appraising archival value are linked together organisationally. The two processes follow a similar, multi-stage procedure and are based on binding principles (required information, available ratings, catalogue of criteria). The results are recorded in a joint index.

4.2.6 Conclusion of conservation and archiving planning

The result of the entire conservation and archiving planning process is a complete overview of all official geodata sets of the Confederation, all other federal geodata sets, including processing stages, and their complete appraisal with regard to long-term availability and archival value. The index contain all the relevant information, such as the ratings and reasons given for archival value, the conservation period, and the snapshots selected in each case.

The bases and results of the appraisal for long-term availability and the appraisal for archival value are published and made accessible on a central platform, such as geo.admin.ch.

5 Ingest

5.1 Fundamentals of ingest

5.1.1 Overview of specialist applications and rules

Aids and tools for the ingest of digital documents into the SFA are already available, but they will have to be adapted for use with geodata. This chapter looks at these aids and the forthcoming changes. It begins with a brief overview of the aids and tools involved in the ingest process.

Rules

a) Digital Archiving Policy[51]

The policy summarises the current SFA principles on digital archiving and is the basis for internal and external communication. It explains how the SFA deal with the tasks of digital archiving and the solutions they use. In particular, it creates transparency concerning the principles and guidelines that the SFA follow when implementing digital archiving.

b) SIP specification[52]

The specification contains the SFA's requirements for the creation of a Submission Information Package (SIP), the digital information package for submitting digital archive records to the SFA. It stipulates what form a digital submission to the SFA must take, and therefore provides submitting authorities with a specification for internal use and a tool for communication with their service providers and software manufacturers.

The SIP specification includes a data dictionary[53] listing all the metadata envisaged for an SIP. Each metadatum has its own table containing full information about it.

c) SFA principles of description[54]

The SFA principles of description define the hierarchy and description of documents (analogue and digital) ingested by the SFA within the archive tectonics.

Specialist applications

d) Package Handler[55]

Package Handler is an application developed by the SFA for creating, viewing and editing digital packages. It enables submitting authorities to combine primary data into a package that can be transferred to the digital repository. It also registers the metadata necessary to allow the data to managed and searches made in the archive.

e) Archive Information System AIS

The Archive Information System AIS is a central software used by the SFA to manage all fonds. Some of these metadata can also be searched for and ordered by external users, using Online Search.

[51] Cf. Digital Archiving Policy: http://www.bar.admin.ch/themen/00876/index.html?lang=en (14.9.2012).
[52] Cf. SIP specification: http://www.bar.admin.ch/themen/00876/00877/index.html?lang=en (14.9.2012).
[53] Cf. Data Dictionary: http://www.bar.admin.ch/themen/00876/00877/index.html?lang=en (14.9.2012).
[54] SFA internal document, file ref. 511.1-EGBAR.
[55] Cf. http://www.bar.admin.ch/dienstleistungen/00823/01559/index.html?lang=en (14.9.2012).

f) Digital Information Repository DIR

The DIR is the application used to manage digital archive records. It is used for the ingest, preservation and dissemination of digital archive records. SIPs are stored via the DIR as Archival Information Packages (AIPs) on a server structure (Digital Archiving Infrastructure, DAI) from which they are extracted as needed and made available to users as a Dissemination Information Package (DIP).

5.1.2 Submission in accordance with the *Fundament* scenario

Submission of geodata will take place according to the *Fundament*[56] scenario. This dictates that every administrative unit must, wherever possible, only package and submit the geodata for which it is responsible.[57]

The *Fundament* consists of the geospatial reference data which are submitted to the SFA separately from the thematic geodata. Only in cases where it is no longer technically possible to separate the thematic geodata from the reference data (e.g. in digitised maps or thematic geodata integrated by hand into maps) will the geodata continue to be included.

This means that geospatial reference data are not normally contained in the same package as the thematic geodata, but are submitted separately. This procedure prevents the redundant transfer of reference data and permits compliance with the provenance principle (description of all documents in the context of the authority producing the record).

A further argument for this scenario is that it permits free linking, enabling users to combine the thematic geodata with whatever reference data their situation requires. Interdependencies between thematic geodata and reference data must be documented in the metadata. One important indicator is the information about the basis (reference data set) on which a geodata set was recorded or revised. There may also be legal interdependencies. This information is recorded as part of the stocktake of the geodata. The references must function beyond system boundaries (archive, long-term availability), as the geospatial reference data may, for example, still be in long-term availability while the thematic geodata have already been submitted to the archive (see illustration below).

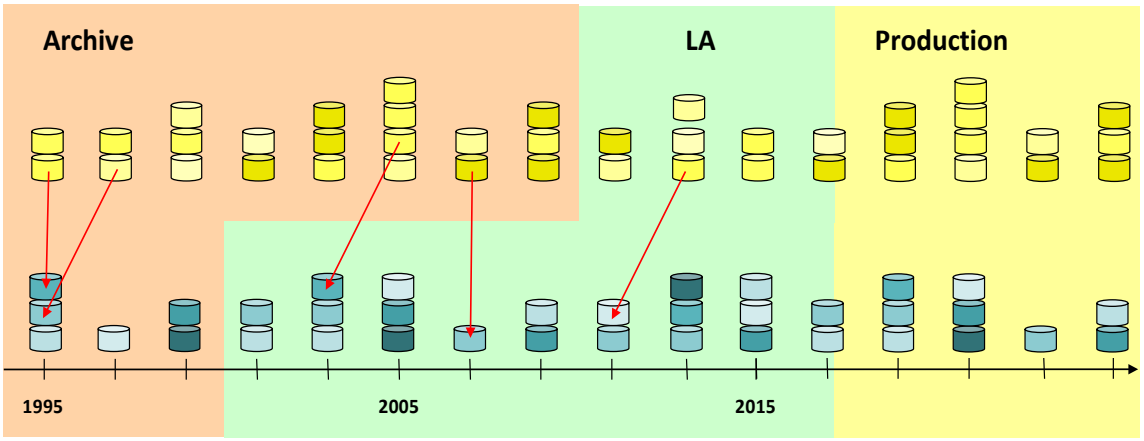
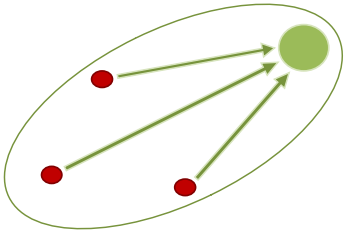


Figure 8: Cross-references beyond system boundaries (yellow: thematic geodata, blue: geospatial reference data)

[56] Cf. “Concept for the archiving of official geodata under federal legislation: Interim report”, chapter 4.1.1.
[57] Authority responsible according to the catalogue of official geodata under federal legislation (SR 510.62, *Appendix 1*).

As the thematic geodata are submitted separately from the geospatial reference data, the link between the two data types is no longer directly visible.



Principle 11: Cross-references in the geo-SIP

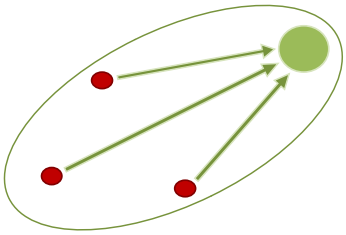
In order to make necessary interdependencies between thematic geodata and reference data identifiable, the thematic geodata are tagged in the geo-SIP with a (formalised) textual cross-reference at the level of the dossier, the snapshot, to the associated geospatial reference data (by way of contextual information).

5.1.3 New category: geodata

The SFA currently archive digital documents in three different categories. These are derived on the basis of the origin of the documents (primary data):

- digital documents from records and process management systems (GEVER)
- digital documents from relational databases
- other digital documents (primarily file systems, e.g. photo collections)

In their *Digital Archiving Policy*,[58] the SFA have expressly reserved the right to expand these categories if need be. Since account must be taken of specific characteristics when packaging and archiving geodata, it is sensible not to assign geodata to the "other digital documents" category but instead to introduce a new category entitled "digital documents from geoinformation systems".



Principle 12: New category: "digital documents from geoinformation systems"

The categories in the Digital Archiving Policy must be extended to include a new category, "digital documents from geoinformation systems", and the policy amended accordingly.

5.2 Description of the geo-SIP

5.2.1 Embedding the geo-SIP in the existing specification

According to the OAIS reference model,[59] digital documents – including geodata – must be supplied to the SFA in the form of a SIP (Submission Information Package) so that they can be secured in the digital archive. SIPs always consist of the primary data and the associated metadata. These primary data and metadata are compiled and prepared in the SIP in accordance with clearly defined rules. The SFA have comprehensively specified the requirements for a valid SIP. The Submission Information Pack-

[58] Digital Archiving Policy, chapter 4.2.1.
[59] Cf. Chapter 3.4.

age specification[60] contains all the rules for the creation (organisation, structure, content and data formats) of a SIP for submitting digital documents to the SFA.

A geo-SIP must also be constructed according to this specification so that it exhibits the basic structure defined in the specification. However, certain adjustments will need to be made (particularly with regard to the metadata fields) to take account of the specific characteristics of geodata.

5.2.2 New submission type: geo-SIP

Within the specification, a distinction is currently made between two submission types: **GEVER submissions** and **FILES submissions**. The requirements for these differ in certain respects.

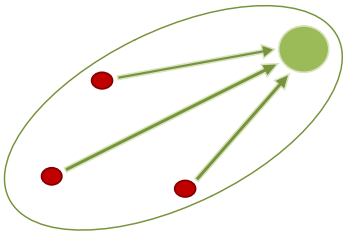
The FILES-SIP can be further divided into two subtypes:
- the “conventional” FILES-SIP (mostly documents from a file system)
- the FILES-SIP with integrated documentation (documents from databases)

It is a characteristic of the second subtype that system documentation to aid comprehension of the data must be supplied in addition to the primary data.

As things stand, the only distinction it is possible to make at submission level is between “digital”, “non-digital” and “mixed” forms. A further subdivision is not envisaged at present.

SIP-relevant properties of geodata submissions:
- Documentation is essential to permit the (long-term) comprehension of the data in a geo-SIP.
- Geodata must be identified as such in order to enable targeted searches in the AIS.
- Metadata fields must be supplemented in order to permit more specific searches (e.g. search for identifier from the Compilation of Official Geodata Sets.
- In certain metadata fields the relevance (obligatory or optional criterion) does not correspond to the FILES-SIP submission type. (FILES-SIPs may for example be organised in a classification system, but this is not necessarily the case. A geo-SIP, on the other hand, must be based on an ordering structure.)

A geo-SIP, therefore, does not fundamentally differ structurally from the existing SFA FILES-SIP, and so can to a large extent be implemented in accordance with the specification.



Principle 13: Submission type: geo-SIP

A third submission type, the geo-SIP, is to be added to the GEVER-SIP and FILES-SIP submission types. This establishes a reference level that takes account of the properties of the geodata and their origin.

This means that specific requirements can be formulated at this level in terms of:
- the metadata
- their relevance (obligatory or optional criterion)[61]
- the content (documentation)
- the formats

[60] Submission Information Package (SIP) specification, available (in German) at www.bar.admin.ch.
[61] The relevance is stored in the Data Dictionary – Submission Information Package.

The addition of the geo-SIP submission type has an impact on the following aids:

- The SIP specification must be amended to reflect the requirements.[62]
- The Data Dictionary must be amended to reflect the requirements.[63]
- The SFA principles of description must be amended.

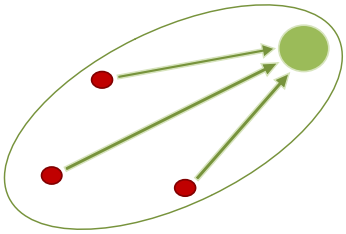
The addition of the geo-SIP submission type has an impact on the following applications:

- Package Handler
- AIS

5.2.3 Relationship between submission and package

A submission to the SFA consists of a package (SIP).[64] A SIP includes only data for which the submitting authority is responsible under the GeoIO. Documents on one or more geodata sets can be submitted in a package. It can also be used to submit more than one snapshot of the same geodata set. In order to achieve a sensible degree of granularity, however, a SIP must contain at least one complete snapshot of a geodata set.

Currently, the maximum size of a package that can be integrated into the Digital Information Repository (DIR) is 8 gigabytes (GB). When handling geodata, the SFA will encounter the situation in which individual snapshots of certain geodata sets exceed this size (e.g. orthophotos, aerial photographs).



Principle 14: Maximum SIP size

The capacity of the DIR must be enhanced, and the limit on the size of a SIP increased, such that the largest snapshot that is to be expected can be loaded into the DIR and extracted again.

5.2.4 Description levels in the geo-SIP

Description of the geodata is carried out in accordance with a hierarchical structure.[65] The levels available for the description are “series” (as many as required), “dossier”, “subdossier” and “file”. The lowest level of the series is the “rubric”. The dossiers are attached to the rubric.

[62] Submission Information Package (SIP) specification; chapters 2.1.1, 2.1.2, 4.3/4.4, 5.6/5.7/5.8.
[63] Data Dictionary Submission Information Package (SIP).
[64] Cf. Submission Information Package specification, chapter 2.5.
[65] Cf. “Concept for the archiving of official geodata under federal legislation: Interim report” chapter 4.1.4 Structuring and description.

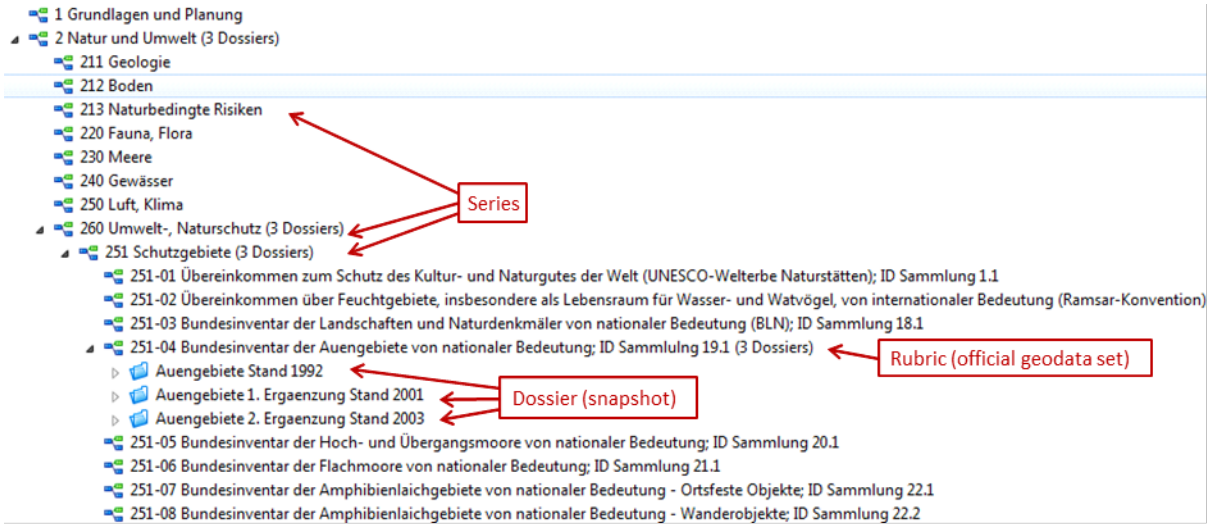


Figure 9: View of the structure of a geo-SIP in Package Handler

The geodata set is described at rubric level (title of the rubric = name of the geodata set).
The snapshot is shown at dossier level (title of the dossier = short form of the geodata set and indication of year).

Two subdossiers are created within the dossier:

- geodata (contains the actual geodata)
- documentation (contains the additional information, such as geospatial metadata, the minimum geodata model, etc.)

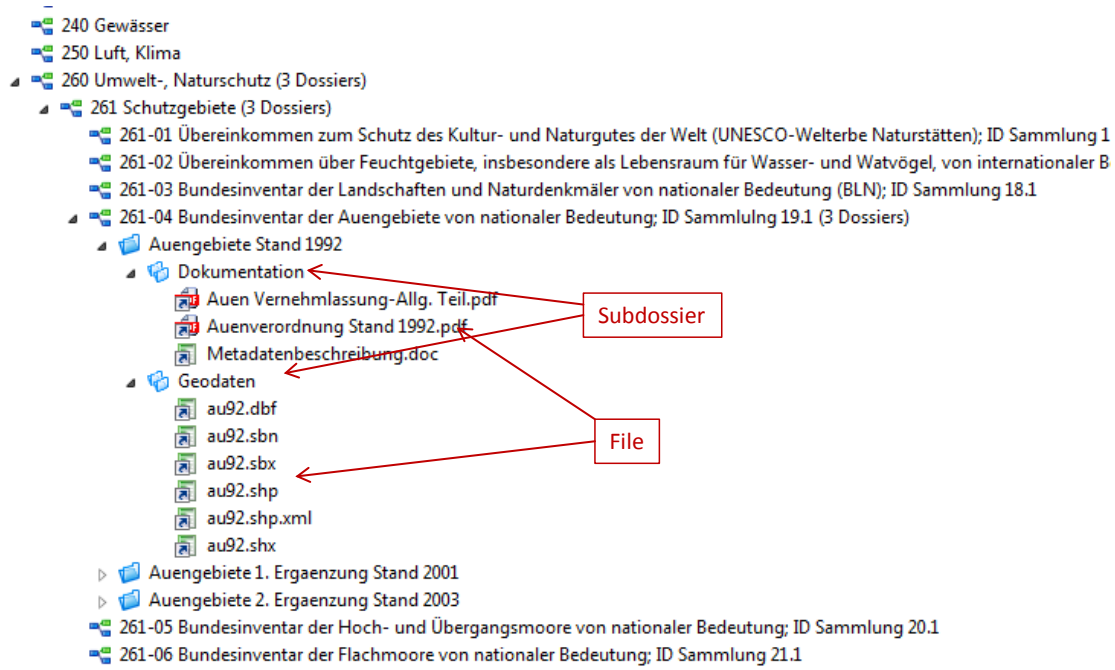


Figure 10: Substructure in the geodata-SIP

Documents can be searched for in the AIS down to dossier level (in the above illustration, “Auengebiete, Stand 1992”). This means the individual snapshots are visible and can also be searched for.

The subdossiers are not described in the AIS. Everything in the levels below that can only be seen once the package is opened.

5.2.5 Content of the geodata-SIP

Based on the OAIS reference model, the SIP contains two separate parts according to the SFA specification, which are always submitted together. The first part is the *header*. This contains all the archival metadata (descriptive information about the package and the primary data) in XML format. The second part is the *content*. This contains all the primary data. In the case of a geo-SIP, the primary data consist of the geodata and the documentation required to understand the data. All the parts of the geodata-SIP can be seen in Figure 11.

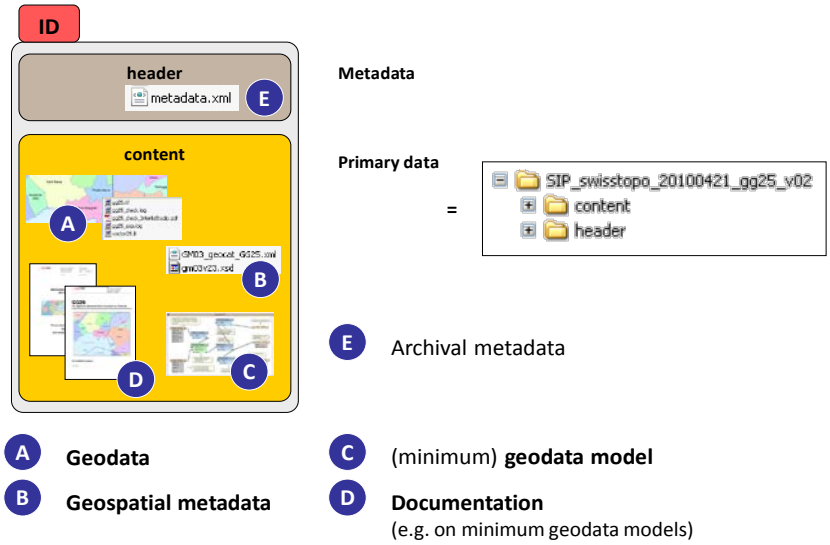


Figure 11: Components of the geodata-SIP

5.2.5.1 Primary data

The primary data consist of the following elements:

- geodata
- minimum geodata model
- geospatial metadata (e.g. from geocat.ch)
- documentation (e.g. on the minimum geodata models)

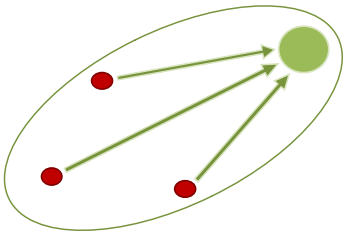
a) Geodata

The primary data must be integrated into the SIP in a format appropriate for the documents that is also archivable, as per the SFA specification.[66] For geodata, the archivable formats have been defined as part of Project Ellipse. These are dealt with in chapter 5.4.

Since geodata in a package may contain cross-references to each other, it is important that the original file name is retained. The name (title) of the file is part of the path, which is limited to 180 characters in the specification. If the path is too long, Package Handler normalises (shortens) the names of the files, documents and folders as standard.

[66] Cf. Submission Information Package specification, chapter 3.2.

The metadata contain the original titles, which are therefore visible to the user, but if uploaded to a system this information is not recognised and the system is unable to re-establish the link between the files. For this reason the file name must be retained.



Principle 15: Retaining the file names in the geo-SIP

The original names of the files must be retained in a geo-SIP; they may not be normalised.

b) Geospatial metadata

Unlike the archival metadata, the geospatial metadata are also located in *content* and cannot be searched for using Online Search. However, they are still stored in geocat.ch. The link to the corresponding data set in geocat.ch enables the metadata to be searched for and used.

c) Geodata model

The GeoIA and GeoIO require the authorities responsible to define “minimum geodata models” for official geodata under federal legislation. The aim of the modelling is to ensure system-independent documentation of the data. This enables the user to understand the data and use them appropriately. Description using a data model means that the geodata will remain easy to interpret at a later date. A data model developed in accordance with these recommendations[67] therefore also complies with the requirement for documentation in the context of digital archiving.

The recommendations contain precise information about the “minimum geodata model” submission object.[68]

Accordingly, the minimum geodata model includes:

- a PDF document (in the SIP: PDF/A), which contains the following elements:
  - a textual semantic description of the model,
  - a UML class diagram,
  - registration guidelines and
  - an object catalogue.

  → This document is filed in the “documentation” subdossier.

- a conceptual data model as an INTERLIS model

  → This document is filed in the “geodata” subdossier.

If no minimum geodata model is available, an object catalogue must be created as a minimum, to enable reconstruction of the table titles.

d) Geo-documentation

The documentation includes information that contributes to the (long-term) understanding of the geodata. If a minimum geodata model has been created, the text documentation of the minimum geodata model satisfies these requirements. If no minimum geodata model is available, the object catalogue compiled by way of a substitute is filed in the “documentation” subdossier together with the additional

[67] Cf. General recommendations on the methodology for defining “minimum geodata models” (in German and French) at: http://www.geo.admin.ch/internet/geoportal/de/home/topics/geobasedata/models.html (15.5.2013).
[68] Cf. General recommendations on the methodology for defining “minimum geodata models”, chapter 2.8:

documents that contribute to understanding the geodata (legal basis, test reports on creation of the geo-SIP, or the like).

5.2.5.2 Metadata

The archival metadata currently envisaged do not permit all the information required for a geodata-specific search to be described.

A good way to define specific metadata for the AIS is via a “form”. Geodata-specific archival metadata are defined in a “geodata” form. These are specified as compulsory or optional, and released or blocked for Online Search. These additionally defined metadata must be stored in Package Handler and added to the SIP specification and the SFA principles of description for the “geo-SIP” submission type.

In particular, there are no metadata fields containing the following information:

- form
- Compilation ID
- reference to geospatial reference data

a) Form

(precise designation: form/type (Package Handler) / Form (AIS))
Currently, documents can be characterised as “digital” but no more precisely than that (e.g. not as “geodata”). Additionally, “geodata” is not filed as a type at dossier level. This means it is impossible to search specifically for geodata.
A “geodata” characterisation must therefore be enabled in the AIS so that units described in this way can be rapidly identified as geodata and searches can be limited to this data type.

b) Compilation ID

The easiest way of correctly identifying an official geodata set is via the identifier from the Compilation of Official Geodata Sets (based on the GeoIO).

To enable targeted searches for this metadata field, the identifier from the Compilation should be filed in a suitable location.

The appropriate level of description for this new metadata field is the dossier level corresponding to the snapshot. This means all snapshots for a given official geodata set can be simply found via the ID. Conversely, at rubric level, where the official geodata set is described, it makes sense to add the ID to the title.

c) Reference to geospatial reference data

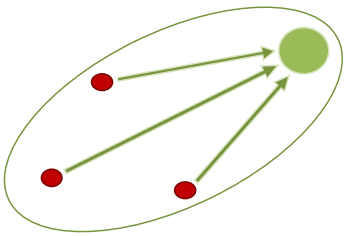
Direct references within the AIS (e.g. from thematic geodata to geospatial reference data) are theoretically possible. However, geospatial reference data sets may be conserved in long-term availability for longer than thematic geodata sets. In such cases, users would have to be referred outside the system boundary and/or direct cross-references would have to be created later (when archiving the geospatial reference data sets). Since this procedure cannot be automated, it would involve a great deal of work and the result would not be reliable.

When creating the geo-SIP with the pilot authorities, information on the geospatial reference data sets was therefore stored in the “Comment” (“Bemerkung”) field in Package Handler, and appears in the AIS as contextual information (“Zusätzliche Informationen” / “Additional information”).

An analysis of the geo-SIPs has shown that this information is desired – and should be documented if no or only rudimentary information about the geospatial reference data set can be provided (for example if the reference data set used is known but it is no longer possible to establish the precise snapshot).

The “Comment” metadata field is to be defined as a reference to the reference data set (and not described via the non-specific “Additional information” field). This data field should also contain the designation, the ID and, if identifiable, the snapshot.

Figure 12: Detailed view of the dossier with the required metadata



Principle 16: Additional metadata (AIS and Package Handler)

a) Form:
A “geodata” metadata field must be defined that can be activated. This will permit a unit described in the AIS to be rapidly identified as geodata and searches to be carried out that are limited to this data type.

b) Compilation ID:
The “Compilation ID” metadata field must be defined at dossier level. This will permit targeted searches for the identifier of an official geodata set.

c) Reference to geospatial reference data:
A “Reference to geospatial reference data” data field must be defined at dossier level. The underlying reference data set is identified in this field.

5.3 Submission process

The submission process for geodata builds on the existing process for submitting digital documents (especially of the FILES type). A submission always corresponds to a single geo-SIP (in accordance with the current requirements for the creation of digital submissions).

5.3.1 Overview of the submission process

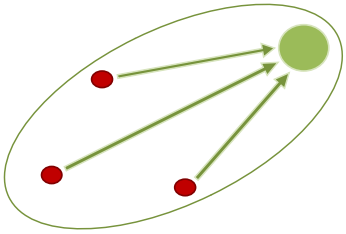
The submission process consists of a series of five sub-steps (Figure 13):

1. Preparing the submission
2. Creating the submission (geo-SIP)
3. Submitting the geo-SIP
4. Archiving the geo-SIP
5. Closing the submission

Figure 13: Submission process

There now follows a description of the submission process. The following aspects of each of the five steps are explained:

- conditions for starting the step
- actors involved
- activities that have to be carried out
- tools used / systems involved
- any additional aids required
- description of the developments that need to take place during the realisation phase to enable the step to be realised, e.g. via adaptations of / requirements for the existing process, the tools and systems



Principle 17: Process for the submission of geodata

- The process for the submission of geodata is established on the basis of the existing submission process for digital documents. Geospecific requirements and role allocations for geodata are taken into account.
- To enable the process to be implemented, (existing) tools and systems need to be adapted or expanded in order to support both the submitting authorities (the authorities responsible for the geodata) and the SFA.
- Aids (such as instructions and checklists) must be developed.

5.3.2 Preparing the submission

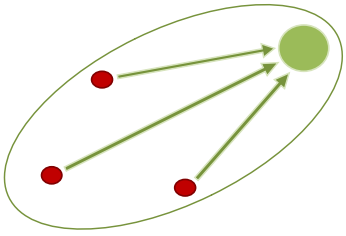
For a submission of geodata to the SFA to take place, the following conditions must be satisfied:

- The geodata have been appraised as of archival value in the CAP.
- The snapshot concerned has been appraised as of archival value.
- The conservation period for the geodata / snapshot in long-term availability has expired or the geodata are not conserved in long-term availability.

In principle, it is the task of the authority responsible to identify the geodata that are due for submission, and to notify the SFA of submissions. The authority responsible can identify the geodata that are due for submission using the CAP that has been carried out, as this records the archival value and conservation period in long-term availability. Since the SFA endeavour generally (not just for geodata, but for all types of documents) to plan upcoming submissions with the submitting authorities and request them actively, the aim is for this approach to be adopted for geodata as well. This allows the workload and the resources needed by both the submitting authorities and the SFA to be predicted, and enables the SFA to make the necessary storage space for the geodata available in the archive in good time. On the basis of the approved CAP, the SFA can plan upcoming submissions with the authorities responsible at the beginning of each year or at a point in the year still to be determined, and fix both the time and the scope of the submissions. This procedure makes it possible to coordinate planning with the execution of all submissions to the SFA.

The plan agreed between the SFA and the authorities responsible can then be communicated in the GCG in a way that is transparent for all. This means there is clear and binding information at all times regarding who is to submit what, and at what time. At the end of each year, an overview of the submissions carried out can be communicated in the GCG, so that implementation of the CAP can be tracked by both the SFA and the authorities responsible.

The actual notification of a submission is made by the authority responsible in accordance with the SFA's existing processes. The authority responsible sends a notice of submission to the SFA (mail to anbieten.abliefern@bar.admin.ch). This must state that the data to be submitted are geodata.



Principle 18: Planning of submissions

- Submissions of geodata are carried out only on the basis of the approved CAP. The conditions are as follows:
  - The geodata have been appraised as of archival value.
  - The snapshot concerned has been appraised as of archival value.
  - The conservation period in long-term availability has expired or the geodata are not transferred to long-term availability.
- Submission planning is undertaken by the SFA together with the authorities responsible. The plan is communicated via the GCG. Implementation of the plan (submissions carried out) is communicated to the GCG at the end of each year.

The following comments are based on the fact that geodata / components of a submission of geodata are currently not managed centrally by the authorities responsible. When preparing a submission, it is therefore expedient for the authority responsible to collate all components of the submission at a central place of storage so that they can then be processed into a submission.

The components of a submission (contents of a geo-SIP) are:

- the geodata to be submitted (one or more snapshots of one or more geodata sets of a single authority responsible)
- the associated documentation
- the minimum geodata model (if available)
- the geospatial metadata from geocat.ch as XML in GM03 standard, with the associated XSD files and the associated GM03 model description as an ILI file, together with the geospatial metadata, also as XML, in the international standard ISO19139
- any other geospatial metadata that contribute to understanding the geodata

As already explained in chapter 5.1.2, thematic geodata and geospatial reference data are submitted separately. The documentation should normally be compiled from existing documents. Wherever possible, it should be ensured that no special documentation needs to be created with a view to archiving. However, if the geodata set / snapshot to be archived is not documented at all, a brief description of the content and – if the effort involved is reasonable – a minimum geodata model are to be created. The geospatial metadata from geocat.ch represent the status of recording at the time of submission. To this end, the authority responsible exports the geospatial metadata from geocat.ch in XML format.

As soon as all the components of the submission are ready, the authority responsible converts all the data into the archivable formats prescribed for the element in question (for details of archivable formats, see chapter 5.4). Any losses of information in the geodata that occur during conversion must also be recorded in the documentation. A short description can be created explaining the circumstances and documenting the losses of information. During conversion, the authority responsible must also ensure that all the relevant information is available to enable the geodata set to continue to be interpreted. This check can only be carried out by the authority responsible, as it knows its data better than anyone else.

The authority responsible decides on the classification structure in which the geodata are to be submitted. It should be noted that this structure must be fixed for each authority responsible and not for each individual submission, so that all geodata from the authority responsible can be integrated into the archive using the same logic and found under the same structure. If the geodata were managed in a classification system that was also used for GEVER, this system must be used.

No component of a submission can be edited or changed after the time at which it is due for submission. This applies to all documents, i.e. geospatial metadata and documentation as well as the actual geodata. One exception is historicised databases in which snapshots are exported for archiving. Here – as with other database submissions – the defined snapshot of the geodata is to be extracted for archiving.

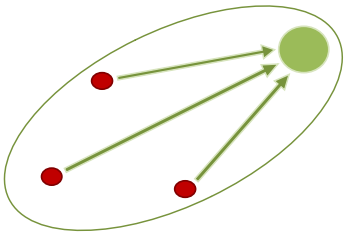
The SFA will advise the authority responsible on compiling the submission. It also makes sense to discuss the composition and the order identified with the SFA before the documents are converted and then prepared as a SIP.

For all archivable formats, the SFA must also develop recommendations for the creation of these formats beyond the archiving of geodata. A list of suitable tools for both conversion and validation must be compiled for the archivable formats used in the geo-SIP. This can then be used to support the authorities responsible and by the SFA when creating and checking for reliable applications. Suitable conversion tools for this purpose must be evaluated. If no suitable tool for a required format exists, one should be developed by the SFA in conjunction with COGIS during the realisation phase. A development may be necessary for the geodata formats themselves. The functionality for extracting geospatial metadata already exists in geocat.ch.

Additionally, it must be ensured in geocat.ch that the entries for the metadata already extracted for archiving do not change once the metadata have been extracted.

Ensuring the completeness of the geodata themselves is the task of the authority responsible. It can demonstrate completeness (integrity) via a test report that is supplied to the SFA in addition to the SIP.

Depending on the tools available for the conversion it makes sense for their use by the authorities responsible to be described in instructions so that they are used in such a way that the result of the conversion is an archivable format. Additionally, the authority responsible is supplied with a checklist describing all the necessary components of a submission and their preparation (see also chapter 5.3.3). The aim of this is to provide quality assurance in the submission process.



Principle 19: Preparing the submission

The following tools are used when compiling the submission:

- Conversion tools for geodata (for converting from customary formats into ones that are archivable). These may be commercially available tools or ones developed specifically for the archiving process.
- Conversion tools for documentation (especially for PDF/A conversion)
- geocat.ch already includes functionality for extracting geospatial metadata.
- GIS of the authorities responsible: functionality for creating a test report on the completeness of the geodata and their correctness vis-à-vis the concept model

The following aids are to be developed for compiling the submission:

- Instructions for conversion
- Checklist of components of the submission
- Scope/content – test report

5.3.3 Creating the submission (geo-SIP)

To create a SIP for the submission of geodata to the SFA, the following conditions must be satisfied:

- The components of the submission are complete and available in archivable formats or have been converted.
- The (pre-archive) order in which the documents are to be integrated into the archive has been defined.

The authority responsible can use the Package Handler tool to create a geo-SIP in accordance with the requirements (see also chapter 5.2). To this end, all the prepared components of the submission are integrated into the SIP. First, the structure for description in the archive is registered. Then the dossiers (one for each snapshot) are created and the corresponding primary data are logically allocated to the registered dossiers. The archival metadata are registered manually using Package Handler. In addition to the generally required metadata, specific metadata for geodata are registered here; these might include the name of the geodata set, the time period during which the snapshot was cre-

ated, and the identifier from the Compilation. If possible, when creating a SIP with thematic geodata, the geospatial reference data used or recommended for use should be indicated.

The proposed solution assumes that the submission is created using Package Handler. The functions of this tool need to be expanded in order to permit the creation of geo-SIPs. The emphasis is on possible ways of automating and validating the creation of a geo-SIP, such as:

- integration of the structure / classification system via an interface
- pre-standardised creation of dossiers / folders for integration of the individual components of the submission (in accordance with the prescribed structure)
- validation of archivable formats for geodata

If all the components or a large part of the documents are located centrally in a system (e.g. a geodata warehouse), it may be worthwhile to develop an interface for creating geo-SIPs at a later date (as with the procedure for GEVER systems).[69] However, this requires not only that all the primary data are available but also that the documentation, data models and archival metadata have been registered in advance and can be transferred to the geo-SIP via the interface. Since it has emerged during the project (discussions with the FOEN and SFOE, situation at swisstopo) that such central data storage is not yet a reality, priority is to be given to the development of Package Handler (see Figure 14).

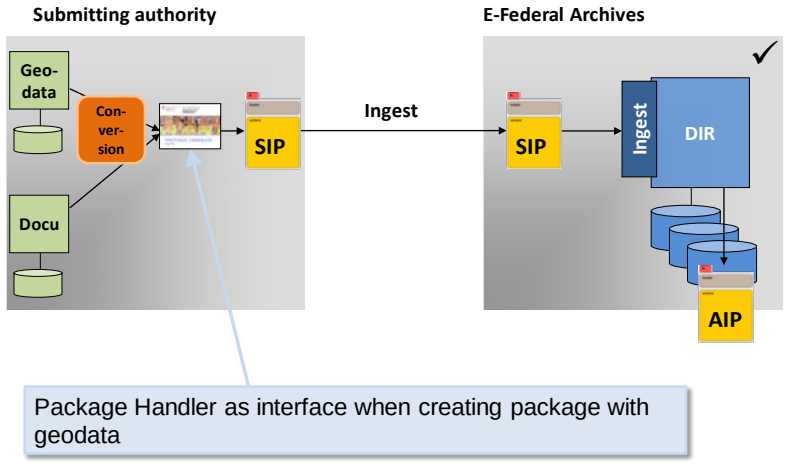


Figure 14: Role of Package Handler in the submission process

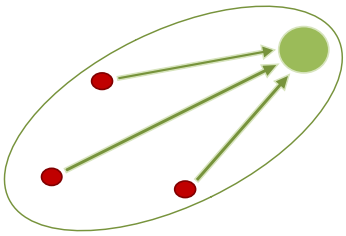
To enable the authority responsible to assess whether the geo-SIP is valid, a checklist for the components of a submission and their processing must be drawn up. This will allow the authority to check whether all details were taken into account when creating the SIP. This checklist complements the checks and validations that are automatically carried out in Package Handler, and is designed to list qualitative requirements and intellectually reviewable elements that cannot be checked automatically, such as:

- instructions for checking the content of the geodata
- a list of the elements of the documentation for checking completeness

[69] Cf. the presentation (in German) *Digitale Unterlagen abliefern*, from the 2011 programme of events on records and process management and digital archiving: http://www.bar.admin.ch/aktuell/00568/00702/01027/01543/index.html?lang=de&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1acy4Zn4Z2qZpnO2Yuq2Z6gpJCDeHx3fGym162epYbg2c_JjKbNoKSn6A-- (10.8.2012) and the media release (in German, French and Italian) on innovation in the process of submission to the Swiss Federal Archives: http://www.bar.admin.ch/aktuell/00431/01503/index.html?lang=de&msg-id=42812 (10.8.2012).

- a description of the requirements for archival metadata (how is the dossier title constructed, how are the reference data cross-referenced)

For the purposes of the documentation, both cases of geodata – with and without minimum geodata model – are to be specified. Instructions for creating geo-SIPs using Package Handler must also be drawn up. In addition to instructions for using Package Handler itself, these should also include the individual steps of creating a geo-SIP, so that the authorities responsible can plan and carry out their work.



Principle 20: Creating a geo-SIP

The following tool is used to create the submission (geo-SIP):

- Package Handler

The following aids are to be developed for creating the geo-SIP:

- Checklist of components of the submission (to assist quality assurance by the authority responsible)
- Instructions for creating a geo-SIP

Each submission must include a closure period for the documents that applies to the entire submission.[70] Since most geodata are allocated to access authorisation level "A" (publicly accessible official geodata pursuant to Art. 21, para. 1 GeoIO), these will remain publicly accessible after they have been archived and are not subject to a closure period (Art. 9, para. 2 ArchA). If the SIP contains documents that were not yet publicly accessible, the closure period is to be determined in accordance with the ArchA.[71]

5.3.4 Submitting the geo-SIP

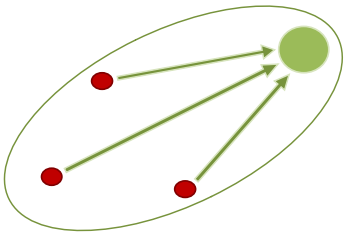
When the authority responsible has completed the geo-SIP, it can submit it to the SFA. The authority must agree the time and method of transfer with the SFA. Project Ellipse does not envisage any specific types of geodata transfer from the authority responsible to the SFA. Use is to be made of the existing transfer methods such as Web-FTP, e-mail or submission via an external hard drive. Additionally, a platform is currently being developed at the SFA that is designed to automate the transfer of digital submissions to the SFA. There are specific requirements for this platform insofar as it relates to the transfer of geo-SIPs to the archive. The size of individual geo-SIPs for submitting geodata will certainly exceed the existing limit of 8 GB. This not only has implications for the specification of the SIP itself, but also makes demands on the capacity of the transfer channels. As part of the further development of the digital archive that is currently under way at the SFA, the scalability of the new transfer system should be part of its design specification.

[70] On closure periods, see http://www.bar.admin.ch/archivgut/00941/00943/index.html?lang=en (10.8.2012): The ArchA stipulates the closure ("retention") periods for the various categories of documents. Documents that are no longer subject to a closure period can be ordered and viewed in the reading rooms. Anyone wishing to view documents that are still subject to a closure period requires approval to do so. They must submit an application to the SFA. The SFA forward this to the office responsible, which then decides whether the request is to be granted. Documents that were publicly accessible before they were submitted to the SFA remain publicly accessible.
For inspection by the bodies submitting records, see http://www.bar.admin.ch/dienstleistungen/00900/index.html?lang=de (in German, French and Italian) (7.9.2012): Article 14 of the Federal Act on Archiving (ArchA) allows authorities that submit records to consult the records they have supplied even when they are still subject to the closure ("retention") period.

[71] On the various closure periods, see: http://www.bar.admin.ch/archivgut/00941/00943/index.html?lang=en (7.9.2012).

Once the geo-SIP has been transferred to the SFA, the authority responsible must retain the geodata and all components of the geo-SIP until archiving in the SFA has been successfully completed. During this time, the authority responsible must ensure that no changes are made or subsequent work carried out on the data. An exception is made for historicised databases from which a snapshot is created using a snapshot. Documents that confirm the completeness of the geodata are supplied to the SFA together with the SIP.

There are no plans in Ellipse to develop specific aids for the submission of the geo-SIP (transfer to the SFA).



Principle 21: Submitting the geo-SIP (transfer)

- The following tools are used when submitting a SIP to the archive:
  - Existing methods: Web-FTP / external hard drive / e-mail
  - Future methods: transfer platform

There are no plans to develop geospecific aids for the submission of the geo-SIP (transfer to the SFA). It must be ensured that the transfer platform can cope with the size of the submission packages.

5.3.5 Archiving the geo-SIP

For a geo-SIP to be archived, the authority responsible must have successfully completed the quality assurance and have supplied the SIP to the SFA. The geo-SIP is integrated (ingested) into the digital archive using the existing process for digital documents. To this end, all the technical tests that check compliance with the SIP specification in the DIR must have been passed. These are carried out automatically by the DIR. At the SFA, content and quality checks are also conducted during ingest to ensure compliance with the formal requirements (composition of the submission, requirements for preparation) as well as integrability into the archive (description). This quality check is documented using the test report. In the case of geo-SIPs, the special requirements for geo-SIPs must be checked in addition to the general checks that apply to all digital documents. Once the geo-SIP has been checked in the SFA and found to be suitable for archiving, it is secured in the digital archive. To do this, an Archival Information Package (AIP) for archiving is created from the geo-SIP. This corresponds exactly to the geo-SIP in both structure and content; additionally, each AIP is given a **Universally Unique Identifier** (UUID) for identification in the digital archive and this is entered in the AIP's metadata. Together with the dossier ID, the UUID provides unambiguous identification of each digital dossier in the archive, in the form of the *digital repository identification* metadatum. Prior to final storage, part of the archival metadata including this digital repository identification is transferred from the package to the AIS and described there. The transfer of metadata and the basic requirements for description in the AIS do not need to be changed or adapted for geodata.

The DIR, which is the core application for digital archiving, is currently being upgraded from version 1.0 to version 2.0 as part of the SFA's *Expédition* project. This includes further automation of ingest. Coordination between the *Expédition* project and the realisation of geodata archiving must continue to be ensured, so that the DIR is also prepared for geodata archiving.

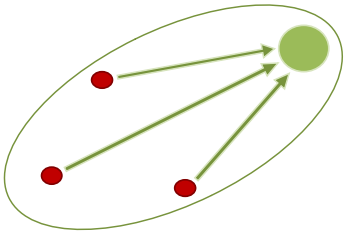
The archivable formats for geodata must be stored in the DIR so that they can be validated. The functionality for testing archivable formats is essentially available in the DIR. The step of securing in the DIR does not need to be expanded specifically for geodata. However, action must be taken to ensure

that the SFA can make sufficient storage space available for the geodata to be submitted. It must also be ensured that the correct metadata can be transferred to the AIS. To this end, the rules governing how and which metadata are transferred from the SIP to the metadata file for the AIS must be adapted for geodata (adaptation of the XSLT in the DIR).

Package Handler, which is used for creating and validating geo-SIPs, is also used in quality assurance. The validation functions that the authorities responsible used when creating the geo-SIPs are also of use here.

Specific metadata for the description of geodata are required in the AIS. The forms will have to be adapted accordingly.

The SIP test report, which is used at the SFA for quality assurance when archiving digital documents, must be revised and supplemented for testing geo-SIPs. In particular, it is important to establish which tests have to be carried out by the authority responsible before transfer to the SFA (in particular, quality of content, completeness and integrity of the submission). During these tests, the SFA check whether proof of the test has been supplied. The SFA carry out further tests in accordance with the test report (in particular, formal checks, checks of implementation on a geo-SIP, integrability into the archive).



Principle 22: Archiving the geo-SIP

The following tools are used when archiving the submission:

- Package Handler
- DIR / DAI (digital archiving infrastructure)
- Ingest assistant for transferring metadata to the AIS
- AIS

The following aids are to be developed for archiving the geo-SIP:

- SIP test report – adapted for geodata submissions

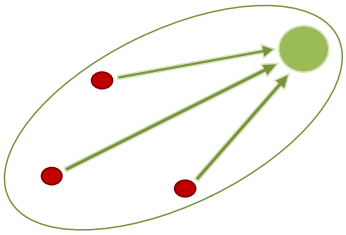
5.3.6 Closing the submission

As soon as the geo-SIP has been archived as an AIP and description in the AIS has been successfully completed, the submission process can also be closed. In the SFA, this is recorded by completing the test report and closing in the AIS. The SFA report back to the authority responsible on the successful archiving. This is done by supplying the submission list; additionally the digital repository identification of the dossiers submitted, with the individual snapshots that have been catalogued in the AIS, is communicated. The authority responsible can use the submission list to confirm that it has submitted the geodata to the SFA. It should also document the fact that it has deleted those geodata (report). The completed submission can also be recorded in the published conservation and archiving planning, so that it can be seen which geodata worthy of archiving have been submitted to the SFA.

The authority responsible must delete all the geodata that have been submitted, both in its own storage and in long-term availability. This applies to the archived snapshots of the geodata themselves. The authority responsible may retain the documentation and models and indeed publish them, if they are relevant for other snapshots. Once archiving is complete, the SFA are listed in geodata.ch as the location from which the archived geodata can be obtained. To this end, it must be possible to assign the SFA digital repository identification to snapshots with the status “archived”, in order to provide the link to the archive. In this way, geocat.ch also serves as the place of record for archived geodata. Ar-

chived snapshots / the location from which they can be obtained in the SFA must be visible in geocat.ch. The metadata of archived snapshots in geocat.ch should not be edited further.

If, by way of exception, geodata are held both in long-term availability and in the archive, this must be set out in an agreement.



Principle 23: Closing the submission

The following systems are used to close the submission:

- geocat.ch
- Geodata origin systems
- AIS

The following aids are to be developed for closing the submission:

- Confirmation of completed archiving of the geodata including delivery of the digital repository identification for integration into geocat.ch

5.4 Formats

5.4.1 Basic principles

Within geoformats, the following *format classes* can be distinguished:

- Vector data (polygons, lines, points; e.g. municipal boundaries)
- Raster data
  - image and graphic raster data
    - image raster data (e.g. aerial photographs)
    - graphic raster data (e.g. scanned maps)
- Thematic raster data (e.g. land use statistics for Switzerland)
  - Thematic raster data are filed in various forms: as image or graphic raster data, as tables (x, y, attribute), as points (vector data arranged in a raster) or as a thematic grid.
- Height data[72]
  - breaklines, height points (vector data)
  - height raster data (image and graphic raster data)
- Measurement data[73]
  - data that differ by specialist area and sensor (e.g. meteodata).

[72] TIN (triangulated irregular network) in conjunction with height data is not a format as such, but rather a method of temporarily constructing a triangulated irregular network.
[73] Insofar as they are processing stages of official geodata, metadata can be regarded as *other geodata*.

5.4.2 Fundamental considerations

The main distinguishing feature of archivable geoformats is that they are appropriate for a long conservation period; which also means they are not necessarily capable of being directly processed as widely used geoformats in the current standard GIS software.

With regard to formats, the following principles are to be observed when archiving geodata:

- Geodata stored in an archivable format must correspond to the geodata model.
- The authority responsible is accountable for correct submission of geodata in archivable geoformats.
- When inputting archived geodata into a GIS, the data model must be known or it must be possible to derive it on an improvised basis from the data. The application of the model-based approach method facilitates the input of archived geodata.
- Wherever possible, widely used and customary formats should be defined as archivable formats.
- Because of the work involved and the potential for data loss, the number of format migration cycles is to be kept to a minimum.

5.4.3 Archivable geoformats

5.4.3.1 Remarks on proprietary geoformats

In principle, proprietary formats are not used as archivable formats. As around 80% of all federal geodata are in proprietary ESRI[74] formats, ESRI was consulted to establish which formats could be declared archivable:

- ESRI does not declare any ESRI geoformat as archivable.
- ESRI's best recommendation is the shapefile format, since this should allow a large proportion of data holdings to be "archived".
- ESRI offers migration paths for migrating database- or file-based data holdings every time the format is changed (customary practice in long-term availability).

5.4.3.2 Archivable geoformats

A list of criteria[75] for assessing the suitability of geoformats for archiving has been drawn up and is now used. The formats listed below were identified as possibly archivable.

The geoformats highlighted in grey are the proposals for archivable formats drawn up in Project Ellipse that are envisaged for archiving in the SFA:

- *Vector data* format class
  - INTERLIS1 transfer format
  - INTERLIS2-XML
  - INTERLIS2-GML[76] (corresponding to the eCH-0118 standard,[77] which came into force on 22 June 2011).[78]

[74] Environmental Systems Research Institute (ESRI) Inc. is a group of companies involved in geographic information systems (GIS).
[75] Cf. Appendix: Catalogue of criteria for archivable geoformats.
[76] INTERLIS2-GML is also an XML format.
[77] http://www.ech.ch/vechweb/page?p=dossier&documentNumber=eCH-0118&documentVersion=1.00 (in German and French) (30.8.2012).

- *Image and graphic raster data* format class
  - TIFF (with georeferencing in a separate file)
  - GeoTIFF (with georeferencing in the tags provided)
  - GeoTIFF (with redundant georeferencing in a separate XML file) [79]
  - JPEG2000

  Explanation:
  For the purposes of image and graphic raster data archiving, the GeoTIFF format with an associated XML file containing metadata is proposed, within the terms of the GCG directive on modelling simple, non-vectorial geodata. This procedure must be specified in detail during the realisation phase.
  The GeoTIFF corresponds to international standard ISO 12639:2004,[80] as regards the format for the images and addressing of the tags for georeferencing. When determining what values are stored for georeferencing, it serves as a quasi-standard.
  The GeoTIFF is also a widely used geoformat that is supported by most GIS software producers and can therefore be used without loss and without conversion.
  For reasons of safety, and to ensure the greatest possible support for customary formats, a degree of redundancy in georeferencing is accepted. The submitting authority must ensure that the georeferencing in the GeoTIFF and in the XML file matches.

- *Thematic raster data* format class
  - If filed as image or graphic raster data:
    GeoTIFF (with redundant georeferencing in a separate XML file)
  - If filed as points (vector data):
    INTERLIS2-XML
    INTERLIS2-GML
  - If filed as tables (x, y, attribute):
    SIARD[81]
  - If filed as a thematic grid: no format specified

  Explanation:
  If thematic raster data are in the form of image or graphic raster data or points, the formats as indicated are proposed. Explanations can be found in the format classes of the formats referred to.

  The already established SIARD format is proposed for archiving tables. Unlike CSV, SIARD allows the table and its columns to be described with metadata. Tools are available for converting from CSV to SIARD.
  No archivable format is specified for thematic grids. One of the other three solutions must be used. The ASCII GRID (ESRI) format which is often encountered in this context must therefore be converted accordingly.

[78] As part of an intercantonal working group, this format has been identified as a possible candidate for the exchange of current geodata.
[79] In accordance with the GCG directive “Modelling simple, non-vectorial official geodata” (in German and French, Version 3 / 2012-06-22),
http://www.geo.admin.ch/internet/geoportal/de/home/topics/geobasedata/models.parsys.75473.downloadList.68092.DownloadFile.tmp/weisungmodellierungnichtvektoriellegeodaten.pdf (27.3.2013).
[80] http://www.iso.org/iso/catalogue_detail.htm?csnumber=34342 (31.8.2012).
[81] http://www.bar.admin.ch/dienstleistungen/00823/00825/index.html?lang=en (31.8.2012).

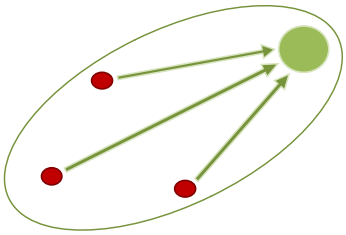
- *Height data* format class
  - For height raster data:
    GeoTIFF (with redundant georeferencing in a separate XML file)
  - Breaklines and height points:
    INTERLIS2-XML
    INTERLIS2-GML

- *Measurement data* format class
  No specific format is proposed as suitable for archiving measurement data, which differ by specialist area and sensor. Specifications will be agreed by the SFA with the authority responsible on a case-by-case basis.

The overall principle is that the number of formats declared as archivable in each format class should be as small as possible, ideally just one, so that know-how can be pooled and additional effort (e.g. in creating conversion applications) when carrying out migrations in the archive avoided. Deviations from this principle may under certain circumstances be permitted in the following case:
Although proprietary ESRI formats (in particular, file geodatabase with the freely available API[82] or shapefile) have not been classified as archivable, their widespread use inevitably means they have a certain importance. The use of ESRI formats as an ***additional, secondary*** format for vector data alongside INTERLIS2-XML may be considered. This facilitates reuse in the widely used current applications produced by ESRI and also takes account of the fact that it is at present difficult to assess how the world of geodata formats will develop in the medium term. However, INTERLIS2-XML would always have to be supplied; an ESRI shapefile would only be optional and in addition to an INTERLIS2-XML file. By analogy with the redundancy in georeferencing in the GeoTIFF referred to above, the submitting authority must ensure that the information in the primary INTERLIS2-XML format is identical to the information in the secondary, optional ESRI formats, or that the content matches as far as this is technically possible.

[82] http://resources.arcgis.com/de/content/geodatabases/10.0/file-gdb-api.

Principle 24: Archivable geoformats (SFA)



- *Vector data* format class:
  - INTERLIS2-XML[83]
- *Image and graphic raster data* format class
  - GeoTIFF (with redundant georeferencing in a separate XML file)
- *Thematic raster data* format class
  - if filed as image or graphic raster data:
    GeoTIFF (with redundant georeferencing in a separate XML file)
  - if filed as points (vector data):
    INTERLIS2-XML
  - if filed as tables (x, y, attribute):
    SIARD
- *Height data* format class
  - For height raster data:
    GeoTIFF (with redundant georeferencing in a separate XML file)
  - Breaklines and height points:
    INTERLIS2-XML
- *Measurement data* format class
  No specific format is proposed as suitable for archiving measurement data, which differ by specialist area and sensor. Specifications will be agreed by the SFA with the authority responsible on a case-by-case basis.

5.4.3.3 Implementation in the realisation phase

From the concept perspective, the geoformats envisaged for archiving have been defined.

In the realisation phase, the basis for their introduction must be created. This includes three points:

- The specific quality requirements for the formats must be specified from the archiving perspective. This means that the existing specifications for the formats must be worked out in greater detail.
- The basis for unambiguous identification and validation of the formats must be created. This will require suitable tools that enable both the authorities responsible and the SFA to carry out validation.
- If archivable formats cannot be employed directly as widely used formats, support aids must be developed (e.g. coordination in the provision of conversion tools).

[83] As part of Work Package 2 Formats, the discussion on INTERLIS-XML and international standardisation activities launched at the Spirgarten meeting 2013 is taken into account.

5.4.4 Archivable formats for documentation

5.4.4.1 Geospatial metadata

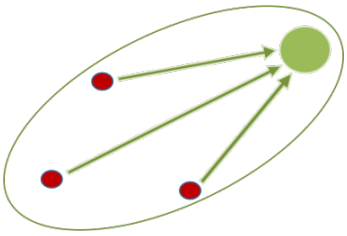
Geospatial metadata from geocat.ch are exported and archived as XML in GM03 standard with the associated XSD files and the associated GM03 model description as an ILI file. Accordingly, geospatial metadata are also to be exported and archived as XML in international standard ISO19139.

5.4.4.2 Minimum geodata models

The GCG has drawn up recommendations for describing the minimum geodata models.[84] These stipulate that INTERLIS geodata models are created as ASCII files in ILI format and graphically created in the UML standard. This ensures the model-based approach.
The entire documentation is archived as an ASCII file / in PDF/A.

5.4.4.3 Further documentation

The further documentation to enable understanding and later use of the archived geodata is very important. These documents are archived in PDF/A.



Principle 25: Archivable formats for documentation

- Geospatial metadata
  - XML (in GM03 standard with the associated XSD files)
- Minimum geodata models
  - ASCII files in ILI format
- Further documentation
  - PDF/A

6 Preservation

The overriding goal of digital preservation is to store data and make them accessible “for eternity”. For this reason, the preservation of formats is an ongoing process. Preservation comprises two main aspects:

1. Maintenance of the digital data to ensure the exact reproduction of the file. Maintenance is chiefly concerned with the storage infrastructure, i.e. the way in which formats are stored.
2. Migration, which preserves the interpretability of the data. It is concerned with the file formats, i.e. the semantics of the archived data. During migration, formats are converted into new ones.

Preservation is supported by specific preservation metadata. These contain the technical details of the formats, instructions for using the data, as well as archival processes such as the individuals respon-

[84] http://www.geo.admin.ch/internet/geoportal/de/home/topics/geobasedata/models.html (in German and French) (31.8.2012).

sible and their decisions in respect of the files. The aim is to ensure that the data remain accessible and interpretable.

6.1 Overview

6.1.1 Maintenance

The media on which digital data are stored are more or less susceptible to wear/decay. To a certain extent, this can be halted by error correction with the aid of redundancy, but sooner or later the media become impossible to read. In the analogue realm, acid-free paper has a lifespan of up to 500 years; hard disks have to be replaced after a maximum of 10 years. The big advantage that digital data have over analogue is that they can be copied as often as required without loss, so ensuring that they can be stored for an unlimited period.

It is almost impossible to predict when a digital storage medium will fail. For this reason, data must be stored redundantly on more than one storage medium, if possible at different geographic locations. Regular integrity checks are carried out to assess whether the stored data are still intact. These use checksums that are calculated for all files by the data producer and stored in the metadata. If a version of the data is corrupt, one of the redundant copies can be used to rewrite the version. If concentrations of data errors occur, this is a sign that the time has come to replace the storage medium concerned.

In addition to replacing media when defects occur, maintenance also involves replacing storage technologies before they are out of date. If this is not done, there is a risk that the equipment or knowledge needed to read the data will not be available.

6.1.2 Migration

A further task of preservation is to review the archivable formats regularly, to ensure that they remain suitable for that purpose (see 5.4.3). A format's suitability for archiving can change, for example if the number of people familiar with a geoformat is declining and only a few experts can still read it. At this point, if not before, it is appropriate to carry out a format migration.

As regards archiving, the EuroSDR assumes that format migrations have to take place every ten to thirty years. At the SFA, geodata must be migrated before the point at which it would subsequently be impossible to read them. A distinction must be made between the following cases:

a) An individual piece of software needs to be developed to convert archivable formats into new archivable geoformats that, if necessary, can be read by standard GIS applications.
b) Existing standard conversion applications can read archivable formats and convert them into new archivable geoformats that, if necessary, can be read by customary GIS standard applications.
c) The archivable formats that are to be migrated, as well as the new archivable formats, can be read directly by customary GIS standard applications.

6.2 Solution

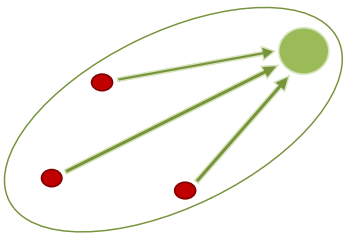
The SFA have many years of experience in the preservation of digital data. Two approaches to migration are used:

a) The data are converted within the DIR (Digital Information Repository) archiving solution. Only the formats to be converted need to be specified; the DIR then carries out the conversion of the formats into the target format automatically, using the predefined software.
b) The data are converted manually outside the DIR. Batch processing is used wherever possible. For a range of reasons, however, this is not always possible (e.g. with flatfiles). An export and reimport functionality for the DIR is currently being developed in order to manage externally converted files also using the DIR.

In the case of geoformats, the level of automation in approach a) is to be used as far as possible. This is probably also possible with “simple” formats such as GeoTIFF. Where more complex file formats are involved, however, approach b) may need to be used.

The initiative and responsibility for the migration lie with the SFA. The complex nature of geodata, however, requires training for SFA staff and cooperation with specialist authorities / GCG / COGIS. The arrangements for this should be specified and institutionalised during the realisation phase. The Ellipse concept creates the basis for specialist collaboration between the SFA and GCG/COGIS.

Of the scenarios set out in 6.1.2, c) is the preferred variant, as it greatly simplifies the handling of the data. If that variant is not economically feasible, variant b) should be aimed at. Variant a) involves the most risks to the geoformat’s suitability for archiving.



Principle 26: Archivable formats for geodata at the SFA

- Regular risk analysis of the selected archivable formats by the SFA
- Involvement of specialist authorities in the case of complex geoformats, in order to tap specialist knowledge
- Initiative/responsibility lies with the SFA – collaboration with the GCG / specialist authorities / COGIS is to be institutionalised
- When migration of archived geodata becomes necessary, this is carried out either:
  - fully automatically, using the “preservation” functionality of the SFA archive software
  - manually, via an export from the archive and reimport of the converted data (functionality currently under development)
- Migration into archivable formats that are supported by GIS standard applications is preferred.

7 Access

When developing the access processes for archived geodata, the solutions were designed in such a way as to minimise breaks. Since access to the data is still guaranteed after they have been archived, they can be transferred from long-term availability to archiving after the conservation period has ended. The following chapters explain access to archived geodata with regard to search options, displaying the data searched for, and how users obtain the geodata.[85]

7.1 Search options

The following considerations guide the proposed solutions for geodata searches:

- Archived geodata must be easy for users to search for. It should make no difference whether the search is carried out using the existing search systems for geodata or the search tools of the SFA.
- Users need not know before they start their search whether geodata are already archived or are still kept in long-term availability. They should be able, via a search portal, to find all geodata (all snapshots), with an indication of where these geodata can be obtained from.
- It would be advantageous if a search result using the SFA's search tools could display only geodata.

These considerations are the basic thinking behind the proposed expanded search and research options. By linking existing infrastructures and portals, the aim is to offer users optimum access to geodata. The linking together of geocat.ch, the metadata catalogue for Swiss geodata, and the SFA's Online Search (OLS) is proposed.

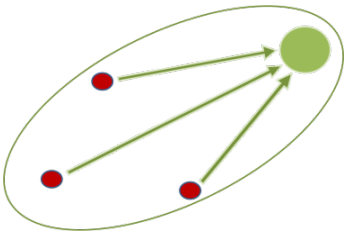
The linking of the two search systems should take account of the following points:

1. geocat.ch should provide a portal function for all geodata, including those that have been archived. In geocat.ch, the metadata of the archived geodata sets should display a link to the corresponding metadata set in Online Search. The metadata of archived geodata sets must therefore continue to be accessible via geocat.ch.
2. The snapshots of the geodata sets must be visible in geocat.ch. An *authority responsible* must be indicated for each snapshot, i.e. a geospatial metadata set must be capable of having various *authorities responsible*.[86]
3. The search results should be displayed at geodata set (not snapshot) level. Searches for snapshots should nevertheless be possible.
4. The relationship between the geodata sets and their snapshots and between snapshots should be displayed in geocat.ch.

In principle, researchers should be expected to have the skills to adapt their search requests to the two systems. However, both geocat.ch and Online Search are being further developed to provide optimum support to users searching for geodata and thus enable them to use the information in both systems.

[85] This report does not recapitulate the potential user types and research interests. For this information, see the Project Ellipse interim report dated 16.01.2012 (in German, chapter 4.2.1) http://www.swisstopo.admin.ch/internet/swisstopo/de/home/topics/geodata/geoarchive.parsysrelated1.29968.downloadList.96117.DownloadFile.tmp/zwischenberichtkonzeptionellipsev1.020120116pdffrpublikation.pdf and the SIK-GIS Infras study dated 21.08.2009 (chapter 5) http://www.sik-gis.ch/web/doku/SIK-GIS-Studie-Archivierung.pdf.

[86] The geodata sets can be obtained from the authority responsible.



Principle 27: Research skills of users of geocat.ch and Online Search

Both geocat.ch and Online Search are being further developed to provide support to users searching for geodata and enable them to use the information in both systems.

7.1.1 Online Search and geocat.ch[87]

Since January 2010 it has been possible to search the metadata of the SFA's fonds online and order the corresponding documents online for consultation in the reading rooms. Of the approximately 5.25 million metadata sets currently held by the internal Archive Information System (AIS) in the SFA, more than 2.65 million are already accessible via Online Search (as at February 2013).[88] Further metadata are progressively being placed online (up to 50,000 data sets per week).

The metadata in Online Search satisfy the minimum requirements under ISAD(G):[89]

- identification (reference code, title, time period),
- context (file reference),
- content and internal structure ("contains" description, submission),
- containers (number)
- URL for the unit of description.

The detailed view also reproduces a section of the archive plan context concerned.[90]

geocat.ch is operated by swisstopo/COGIS and was set up in 2001 as part of the National Spatial Data Infrastructure (NSDI) which is currently under construction.[91] geocat.ch is the Swiss geospatial metadata portal which serves as a platform for geodata producers to register and manage their geospatial metadata and as a search portal for all interested parties. geocat.ch contains geospatial metadata from federal authorities, cantons, municipalities and private companies. The background for the collaboration is a partnership model consisting of direct partners and harvesting partners.[92] geocat.ch currently provides access to around 4,500 metadata sets that are registered in accordance with the Swiss metadata model GM03. This in turn is based on geospatial metadata standard ISO 19115.

[87] The comments in chapter 7.1.1 take account of conclusions and solutions proposed in Isabelle Lanzrein's Master's thesis, which was written as part of her postgraduate studies in archival, library and information science MAS-ALIS at the Universities of Bern and Lausanne. The thesis was supervised by Andreas Kellerhals, Director of the SFA: Lanzrein, Isabelle: Die Kombination und Koordination eines Archivinformationssystems und eines Geo-Metadatenkatalogs zur Nutzung von Geodaten am Beispiel des *Schweizerischen BAR* und *geocat.ch* (Master's thesis MAS-ALIS), Bern 2012. In her thesis, Isabelle Lanzrein not only developed the solutions set out below but also devised proposals for their possible technical and organisational implementation. These are to be developed further during the realisation phase.
[88] Metadata at fonds, subfonds, series, dossier, subdossier and document level.
[89] The *International Standard Archival Description (General)* ISAD(G) is an international standard for describing archival metadata. It is available on the website of the International Council of Archives ICA in 14 languages: http://www.ica.org/10207/standards/isadg-general-international-standard-archival-description-second-edition.html (10.10.2012).
[90] A preview display of the corresponding data set is also envisaged in the display of geospatial metadata, cf. chapter 7.2.1.
[91] On the NSDI see: http://www.e-geo.ch/internet/e-geo/en/home/program/ngdi.html (13.9.2012).
[92] geocat.ch lists the various partners on www.geocat.ch.

While the SFA's Online Search is first and foremost a search tool, geocat.ch is also a portal in which metadata from external information systems can be listed as search results as well as the metadata sets registered directly in the system. The metadata entries in geocat.ch are made by various institutions, which results in the data being registered in a variety of ways. The metadata in Online Search, by contrast, are registered by the SFA, which results in homogeneous description.

Both instruments enable full-text searches to be made in the metadata, as well as a field search and navigation in a subject system. geocat.ch offers the additional option of a geographical search (map viewer), while Online Search permits navigation in the archive plan.

As Switzerland's geospatial metadata portal, geocat.ch is also to include the geospatial metadata for all geodata, regardless of whether they are obtained from long-term availability or the archive. The aim is to link the relevant metadata in geocat.ch with the corresponding data set in Online Search. This means that a data set identified in geocat.ch which is already in the archive can be retrieved in Online Search and ordered there via the order centre for consultation.

It has not yet been established within the project how the links are to be technically realised. Possibilities include using permalinks or search services. It is important that snapshots can be identified unambiguously in both Online Search and geocat.ch.

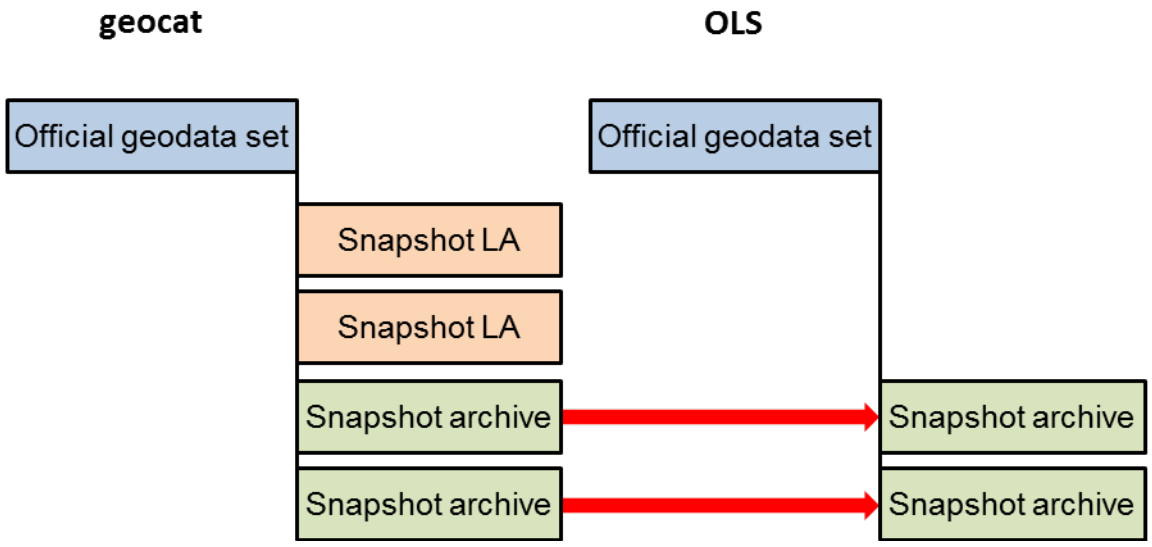
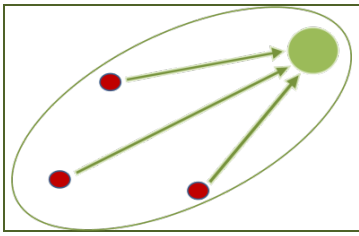


Figure 15: Linking archived snapshots in geocat.ch with archived snapshots in Online Search (LA = Long-term availability)



Principle 28: Linking geocat.ch to Online Search

- The geospatial metadata catalogue geocat.ch is to be linked to the SFA's Online Search.
- Archived geodata can also be searched for in geocat.ch and ordered via Online Search / the SFA's order centre.

The geospatial metadata in geocat.ch are in some cases very detailed and provide supplementary information on the archived snapshot; linking in the opposite direction, i.e. from Online Search to geocat.ch, would therefore expand the range of information available to archive users. Additionally, this

link would enable Online Search to refer users to geodata that have not yet been archived and to further snapshots of a data set in long-term availability.[93] The link from Online Search to geocat.ch could be realised on a general level with a corresponding reference to the SFA website / Online Search and a link to the geocat.ch homepage or between the individual geospatial metadata sets in the corresponding search systems.

The technical and organisational implementation of a future link between Online Search and geocat.ch must be worked out as part of realisation. The systems must be aligned in such a way that the links can be technically implemented. From an organisational perspective, it also needs to be established who is responsible for which changes and enhancements.

7.1.2 Fonds overview

In addition to linking Online Search to geocat.ch, a further solution for search options is proposed. The aim here is to enable a simple thematic search. The fonds overview, which is linked to Online Search, is suitable for thematic searches.

The SFA fonds overview gives a thematic overview of the Confederation's archival fonds.[94] It complements the provenance-based fonds classification system, to assist researchers in identifying the relevant fonds. The organization of the SFA fonds overview is roughly based on the structure of the Classified Compilation of Federal Legislation.

[93] Individual geodata may remain in long-term availability for a very long period (e.g. 50 years or more). In this case, archive users assume that such documents have has already been submitted to the SFA.
[94] Main Department "E": Federal State since 1848.

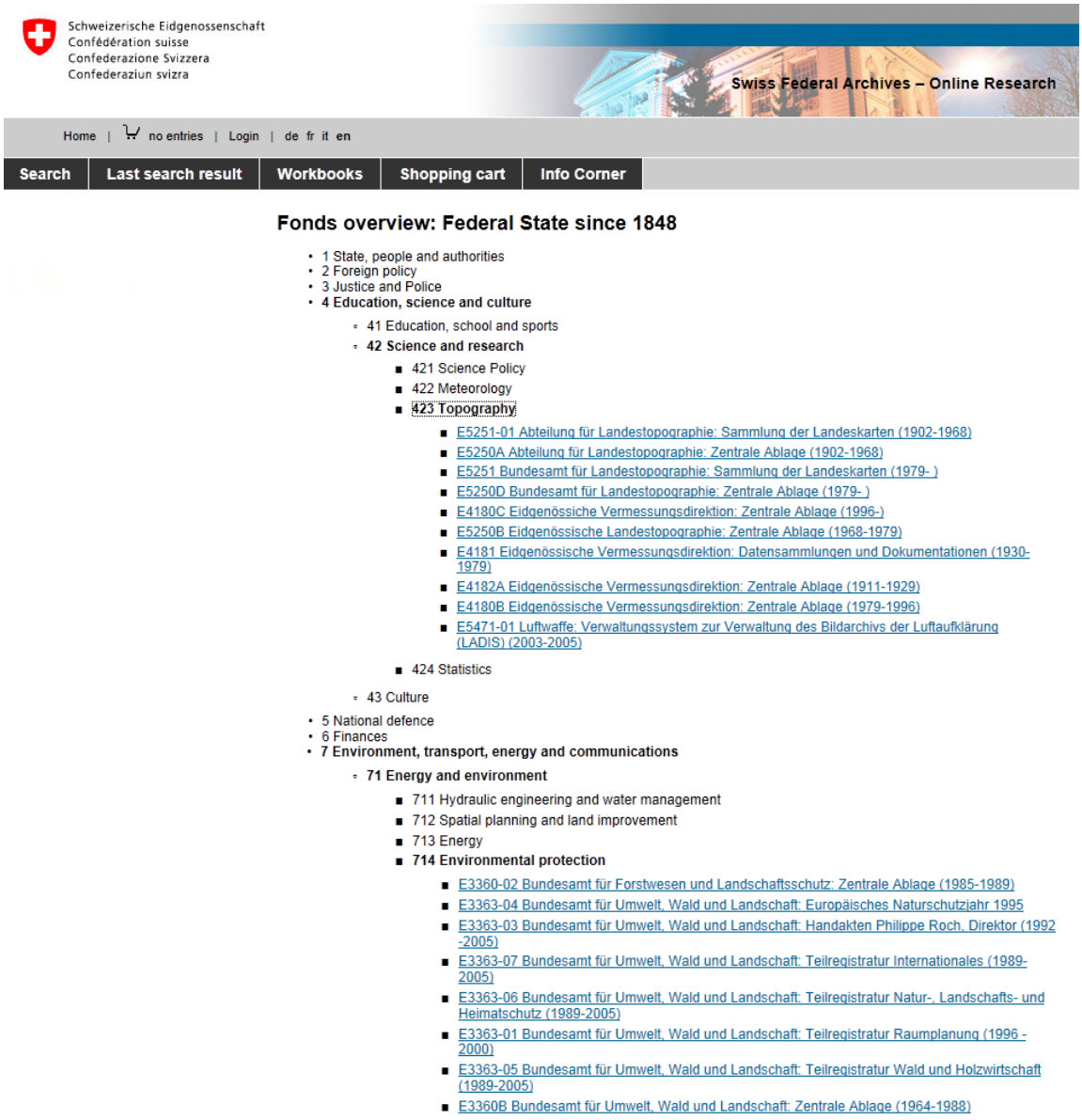
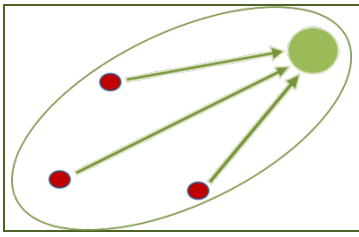


Figure 16: The SFA fonds overview

To enable thematic searches for geodata as well using the corresponding navigation, either the fonds overview should be expanded or a separate fonds overview for geodata only should be added.

The thematic breakdown of geodata in the federal geodata portal (geo.admin.ch) is based on IN-SPIRE. Its categorisation system is not always logical or comprehensible. Geoinformation specialists have expressed a clear need for an improved thematic categorisation of geodata in Switzerland that is suitable for a range of purposes. The GCG and SIK-GIS have therefore proposed a new solution based on ISO Standard 19115. This has been well received by the specialist community. The SIK-GIS has developed the proposal into eCH-0166 standard draft version 1.0,[95] which was released for public consultation by the eCH association in February 2013. It is to be expected that after the consultation period ends at the start of April 2013 the eCH-0166 geocategories will be rapidly implemented in geo-portals and metadatabase systems.

[95] http://www.ech.ch/vechweb/page?p=dossier&documentNumber=eCH-0166&documentVersion=1.0 (in German and French) (15.5.2013).



Principle 29: SFA fonds overview

- The SFA fonds overview should assist researchers in identifying geodata.
- To this end it must, as a minimum, refer to the SIK-GIS categorisation textually and via a link.

Consequently, the SFA fonds overview is to be adapted with regard to the identification of archived geodata. If necessary, the creation of a separate fonds overview for geodata is to be considered.

7.2 Graphic representation

Even before researchers prepare researched geodata and input them into a GIS, they should be able to get an idea of how the data set looks like. A graphic representation of the geodata as part of search results enables people to better understand search results and improve the nature of their search queries to find and access the information they require more quickly, which is particularly important when archiving data, given that knowledge and understanding of forms of representation and content decreases over time. Additionally, despite efforts to keep the workload involved in supplying archived data to users at a minimum, a certain amount of work is nevertheless involved. A static representation of the archived data while retaining the dynamic view is envisaged to avoid incorrect requests.

To this end, two forms of representation are being further developed in the realisation phase of the project: a preview display in the finding aid and the provisional continuation of the representation in the long-term availability view service.

7.2.1 Preview display in the finding aid

A preview display in the finding aid (in the SFA's Online Search) is envisaged to offer users a representative excerpt from the geodata. This excerpt can be stored in the metadata. The preview display facilitates identification of the geodata set being searched for; it quickly becomes evident what kind of data and what possible forms of visualisation one has found during one's research. Researchers do not require a GIS infrastructure to view these "quicklooks".

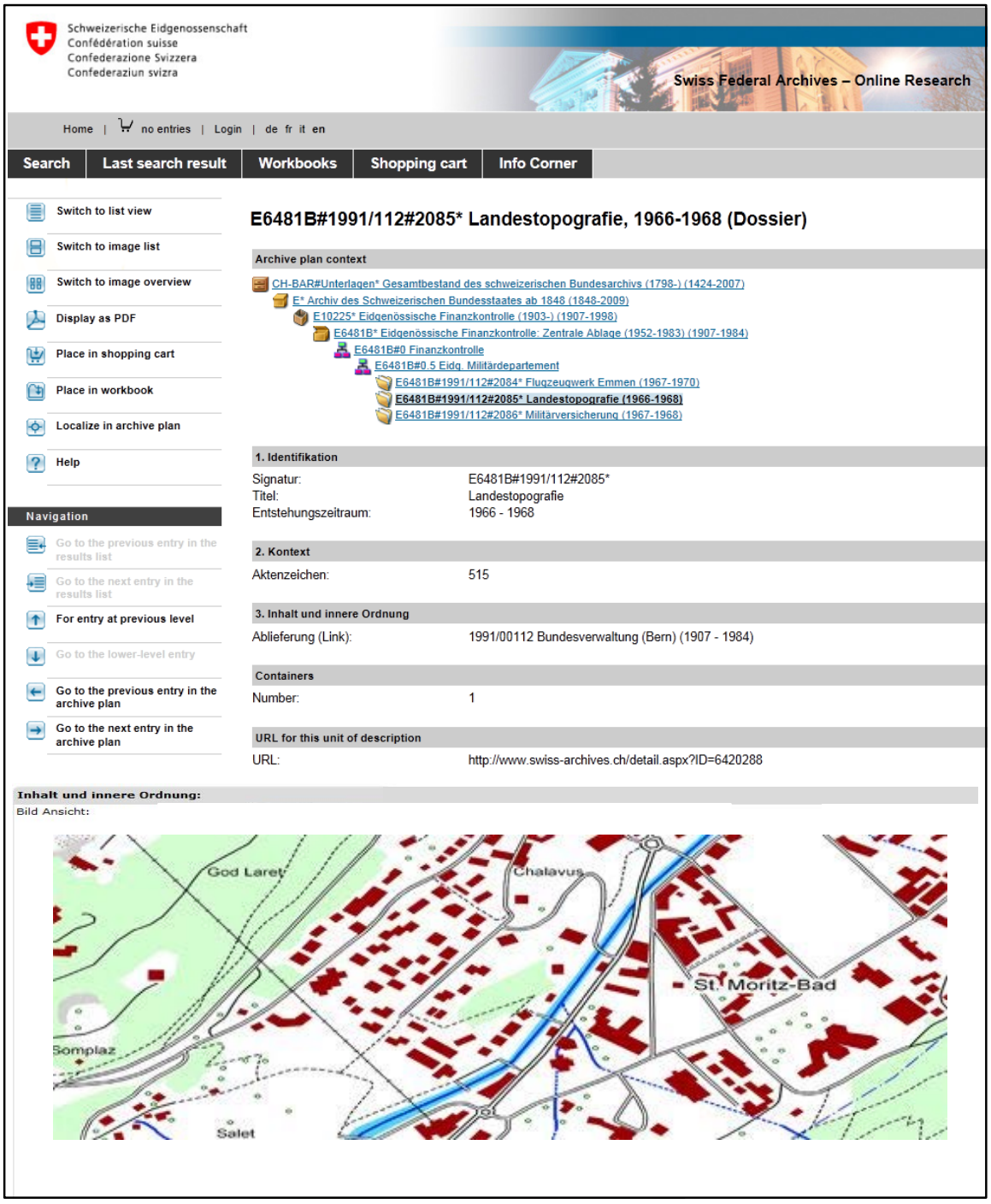


Figure 17: Preview display (montage).

Choosing an informative preview image and integrating it into the metadata involves extra work for the submitting authority. Nevertheless, this is mostly small, and is likely to be justified by the benefits of the preview image for future users.

7.2.2 Continued use of the view service

In parallel with the preview display in the finding aid, the realisation phase will also include a description of the conditions under which the SFA can become involved in the view service in long-term avail-

ability. No separate view service for the archived geodata in the SFA is envisaged. The actual geodata are deleted in long-term availability; however, the presentation data that are Web-optimised for view services remain in the corresponding view service of long-term availability (in the Federal or National Spatial Data Infrastructure FSDI / NSDI). This means that geodata are not deleted from the view service immediately after archiving.[96]

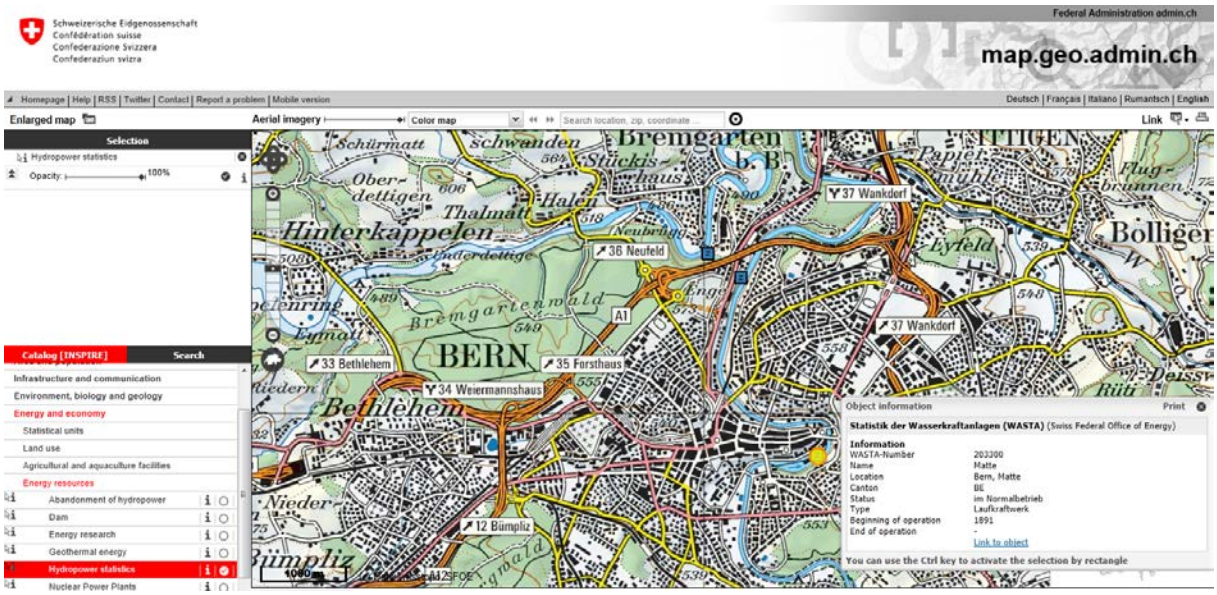
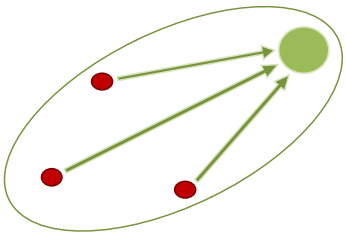


Figure 18: Display of geodata on "hydroelectric power statistics" on map.geo.admin.ch

In all cases, it is the archived geodata in the archive that are preserved. Archived data that are still visualised in a view service should no longer be maintained (e.g. migrated) in the view service. Accordingly, geodata are deleted from the view service when, for example, a format migration is due or the technology of the view services requires renewed preparation of the presentation data. If evaluations indicate that archived data which are still displayed have not been accessed for an extended period, they can also be deleted from the view service. However, the geodata that can be deleted from the view service owing to lack of demand must be defined in advance. Rules for the deletion of data from the view service must also be drawn up, setting out the corresponding procedure before or during archiving.

The metadata of geodata that are archived and not (or no longer) present in the view service are of course still made available in the finding aid via a preview display (see chapter 7.2.1). There is also the option to load archived geodata back into a view service (e.g. for certain research projects). In the realisation phase, options will have to be considered as to the degree of automation with which DIPs can be loaded not only into a GIS but also, downstream, into an existing view service.

[96] This can mean that visualisations can still be displayed there although their geodata have been submitted to the SFA and are no longer in long-term availability. This possibility was expressly accepted by the Director of the SFA in a meeting on 10.5.2012.



Principle 30: Displaying archived geodata

- Together with the metadata, the submitting authority supplies a preview display of a representative excerpt from the archived geodata. This preview display helps users to assess before ordering whether the geodata they have searched for can meet their requirements. The preview is displayed in the SFA's Online Search.
- Archived geodata continue to be displayed in the view service of long-term availability on a temporary basis. However, they are not maintained there (e.g. no format migrations). In all cases, it is the archived geodata in the SFA that are preserved.
- In the coming project phases, rules for keeping archived geodata in the view service must be drawn up (e.g. selection of the geodata).
- In the coming project phases, options will have to be considered as to the degree of automation with which DIPs can be loaded not only into a GIS but also into a view service.

7.3 How users obtain geodata

It must be possible for archived geodata to be input back into a GIS. In order to ensure the availability of geodata, processes will be identified during the realisation phase of Ellipse which guarantees that users can obtain geodata as efficiently as possible and with the minimum number of interfaces. Ideally, it should make no difference whether, when specialist data are obtained, the associated reference data are also archived or are still accessible in long-term availability.

According to Article 9 of the Federal Act on Archiving (ArchA, SR 152.1), archive records of the Confederation are available for consultation by the general public free of charge. If supplying archived geodata to users requires additional services over and above the normally free basic services of the SFA, the effort involved must not present an obstacle to users (see chapter 7.4).

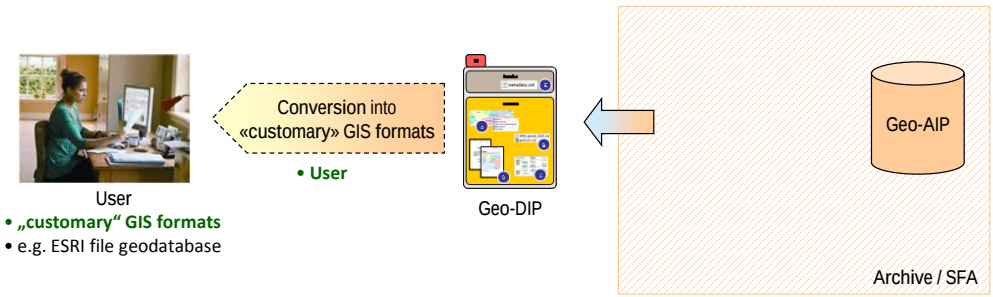


Figure 19: Obtaining geodata (users)

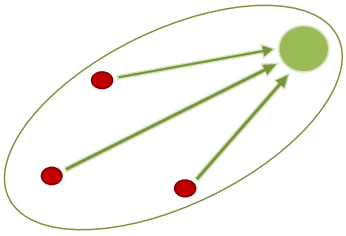
When archived geodata are ordered, the user receives a DIP that contains the geodata they have searched for in archivable formats. In order to be input into a GIS, these files must be converted into customary formats (see chapter 3.5). If the archivable format corresponds to the customary format, this task is not required.

It should be possible to offer support to users obtaining geodata from the archive when required. This means that dissemination involves the additional aspect of providing technical support. In the concept phase, the scope of the support scenarios has ranged from minimum (no support for users) to maximum (dedicated GIS unit in the SFA). Both of the extreme options have been rejected; implementation of two service offerings that lie in between is now planned: first level support for standard enquiries and second level support for geospecific specialist services.

The first level support should be able to be supplied by archive staff at the SFA. The relevant GIS and geodata expertise must be built up, ideally in collaboration with the unit that will be responsible for second level support. This will also ensure that the SFA themselves have access to the archived geodata and can open and review them if necessary. First level support will chiefly focus on regularly recurring standard enquiries concerning mostly statistical geodata and geodata of low to medium technical complexity (e.g. geospatial reference data such as national maps, orthoimages and data that are simple to process such as the high moor cadastre).

Second level support will relate to, for example, complex linking of archived geospatial reference data and (different) thematic geodata, i.e. dynamic data usage. This support will be provided by the SFA in cooperation with an external specialist unit, though here too customer contact is to be handled by the SFA.

As part of the realisation phase, potential models for cooperation on building up know-how in the archive and for collaboration with an external specialist GIS unit will be pursued. The intention is that swisstopo/GCG will offer its services to the SFA in this area with COGIS (e.g. infrastructure, advice from swisstopo experts), as for other specialist federal authorities. This collaboration is to be worked out during the project realisation phase.



Principle 31: Supplying archived geodata to users

- It must be possible for archived geodata to be input back into a GIS as efficiently and cost-effectively as possible, and with a minimum of interfaces.
- Users are to receive assistance when obtaining archived geodata.
- First level support will deal primarily with simple display and processing procedures and will be offered by staff of the SFA.
- Second level support will offer specialist geospecific services, with the SFA working with swisstopo/COGIS.

7.4 Use and fees

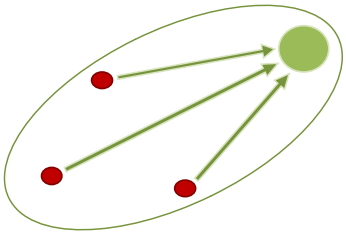
Archived geodata can only be released for use if they are freely accessible within the terms of Art. 9 para. 1 and Art. 12 ArchA or the submitting authority agrees to their use and there are no constraints or other legal provisions preventing this. However, the majority of archived geodata are likely to be accessible anyway under Article 9 para. 2 ArchA, as they were publicly accessible before they were submitted to the SFA.

The issue of use and the fees charged for it was not conclusively settled during the concept phase of Ellipse. Use relates to the right to make archived geodata available to the public. The SFA regulate

use by third parties by means of standardised conditions of use.[97] No such agreements are concluded with (submitting) authorities from the federal administration, where the use relates to data from the federal administration.

When implementing “no parallel data retention” (whereby the geodata are only in long-term availability or only in the archive), the conditions of use for long-term availability and for the archive can be stipulated specifically and do not overlap. Archived data can then, like other archive records, be used “in principle free of charge” – though this depends on the nature of the archive’s services for the geodata (see for example the SFA fees ordinance, which distinguishes between basic services and additional services). The nature of the additional services for geodata is still to be defined.

In the variant in which geodata are present in both long-term availability and the archive, access should normally be arranged via long-term availability, as this variant would apply in particular because the data are still “in constant use” and can be made available without further preparation. Users would then see in geocat.ch that the data are in both long-term availability and the archive, but would be “directed” to long-term availability to obtain them, at which point the fees could also be charged. This would essentially establish long-term availability as the primary source for use. The legal feasibility of this proposal must be assessed during the realisation phase.



Principle 32: Use and fees

- Obtaining archived geodata is normally free of charge; fees may be levied for services that go beyond the basic services.
- Geodata are normally to be obtained either via the archive or via long-term availability; parallel data retention is to be avoided.
- Proposal: If geodata are in both long-term availability and the archive, access should normally be arranged via long-term availability as the primary source. This requirement and the legal conditions must be assessed to determine legal feasibility during the realisation phase.

7.4.1 Commercial use of archived geodata by the submitting authority

In principle, submitting authorities are free to access their own archived geodata from the archive and use or reuse them either commercially or non-commercially. This may, for instance, be the case if an authority wishes to offer a time sequence service in return for a fee and has to access its already archived geodata to do so. The archive does not impose any requirements concerning use or fees when data are reused by the submitting authority. Logically, therefore, the use of geodata from other geodata producers in the federal administration should be unrestricted and free of charge within the administration. Whether an authority is to be permitted in principle to use the archived geodata of another authority for commercial purposes, for example, will however need to be further examined during the realisation phase.

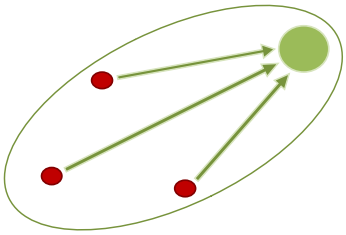
[97] The conditions of use govern rights of use and also the distinctions between them as well as commercial use and the duties of the user. When using and exploiting archive records, users are obliged to comply with the applicable legal provisions governing issues such as data protection, the individual rights of third parties, and copyright. They bear responsibility for any breaches of the provisions.

7.4.2 Commercial use of archived geodata by third parties

Under Art. 19 ArchA, the use of archived geodata for commercial purposes by third parties, i.e. not the federal administration, requires authorisation. The basis for the authorisation for commercial use is a written application to the SFA, and according to Art. 24 ArchO, the authorisation may be issued if:

a) an agreement has been reached on the scope of such use and the level of compensation;[98]
b) no opposing rights are affected; and
c) other users' rights of use are not restricted.

The authorisation may be made subject to constraints and conditions. The SFA may also waive their right to compensation.



Principle 33: Commercial use of archived geodata

- Submitting authorities may obtain archived geodata from the archive at any time and use them for commercial or non-commercial purposes.
- If third parties wish to make commercial use of archived geodata, the SFA conclude an agreement with them on the scope of use and level of compensation. Authorisation for commercial use by third parties may be made subject to constraints and conditions.

[98] The levying of a fee for the commercial use of archive records is intended to compensate the federal administration for the sometimes considerable prior financial commitment involved in the maintenance and appropriate conservation of archive records (Dispatch on the ArchA of 26 February 1997, p. 965).

Section C – Planning for the realisation phase

8 Purpose of Section C

Section C creates a defined basis for the project so that decisions can be taken on how to proceed going forward. The information necessary for the assessment is summarised.

Conservation and archiving planning constitutes the prerequisite for the ingest of geodata into the archive. Archiving is impossible without it. It also forms an important basis for other realisation projects (e.g. for the parameters).

9 Background

The development of geodata archiving for federal geodata was advanced by the SFA and swisstopo with the preliminary study and the “Ellipse – Concept” project. Thanks to this work the realisation of federal geodata archiving can now begin. Work is also to continue as part of the “Ellipse – Realisation” project for geodata archiving, as a joint project of the SFA and swisstopo (on behalf of the GCG).

10 Objectives for the realisation phase

10.1 Overall objectives

Once the realisation phase is complete, all the preconditions for the productive archiving of geodata at federal administration level are to have been established, the archiving process is to have been installed, the infrastructure and applications constructed and made ready for use, processes known and introduced, and the necessary aids put in place.

Operational archiving of geodata in accordance with the Ellipse concept is to begin at the start of 2017.
By this point, the conservation and archiving planning (CAP) is to have been completed, approved and published. This means the fonds (content, quantities) of the federal geodata available will be registered, the geodata for conservation in long-term availability identified and their archival value determined.

The SFA are to be in a position to ingest, preserve and disseminate geodata.
Geodata producers (the authorities responsible) are to be able to submit the geodata deemed worthy of archiving to the SFA in the specified form (geo-SIP) and at the agreed time.

10.2 Specific objectives

The specific objectives are divided into:

- Shared objectives of the SFA / GCG (swisstopo)
- Objectives of the SFA
- Objectives of the GCG (swisstopo)

10.2.1 Shared objectives of the SFA / GCG (swisstopo)

- Ongoing activities in connection with the archiving of geodata, such as OGD, SPO, GEVER and lifecycle management, to be managed jointly.
- Collaboration with the cantons and municipalities in connection with the archiving of official geodata under federal legislation (where responsibility lies with the cantons) established.
- The conservation and archiving planning (CAP) jointly approved and published by the SFA and the GCG.

10.2.2 Objectives of the SFA

- The operational organisation is to be in place and functional. The geodata archiving process is established and applied. SFA staff to have been trained in geodata archiving and have received instruction on the archiving process.
- The technical infrastructure and the applications can handle geodata as a document type. The corresponding interfaces, tools and working aids have been created or adapted, as necessary.
- Involvement of the SFA in the GCG during the realisation phase (especially CAP) and after completion of the project is assured.
- The SFA has determined the archival value h+s as part of the CAP.
- The first (pilot/partial) submissions have been successfully carried out.

10.2.3 Objectives of the GCG (swisstopo)

- The GCG to have integrated the SFA into the GCG.
- As part of the CAP, the GCG (swisstopo) has created the list of documents and carried out the stocktake (including parameters), established which geodata are kept in long-term availability (including conservation period) and determined the archival value l+a.
- The GCG to have provided geodata for the first (pilot/partial) submissions.
- Establishment of a body to oversee the operational work on the archiving of geodata of the authorities responsible after the realisation phase[99] (ongoing planning, updating the CAP, annual planning of submissions).

10.3 Detailed objectives

In order to achieve the high-level and specific objectives, work packages (sub-projects) are created (see chapter 11). The detailed objectives that these work packages are required to achieve are defined directly within each work package.

[99] During the realisation phase this task is performed by the SFA / swisstopo project management, reporting to the GCG.

11 Work packages

The tasks (see also phase planning 12.1) have been combined into work packages. Each of these contains a range of tasks.

11.1 Work Package 1 – Conservation and archiving planning (CAP)

a) Creating the detailed planning and basis for the CAP

Activities:

- Lay down the detailed planning for the CAP: which authorities are involved and in what sequence, define the test periods for the CAP for each authority.
- Create the templates and definitions for carrying out the stocktake, the appraisal for LA and the determination of archival value.

Results:

- Agreed detailed planning for the geodata CAP (agreed with the SFA, swisstopo, geodata producers) for communication in the federal administration / via GCG
- Geodata CAP execution kit – binding documents for processing

b) Tool to support geodata appraisal (development)

Activities:

- Define which metadata / information need to be collected and managed.
- Develop a simple tool for carrying out the stocktake and appraising the geodata (official geodata and other additional geodata).
- Compile training documentation.

Results:

- Tool for stocktake and geodata appraisal developed
- Training documentation for users

c) Carry out conservation and archiving planning (including appraisal)

Activities:

- Carry out pilot at swisstopo and FEDRO.
- Carry out stocktake, appraisal of LA for transfer to long-term availability and appraisal for archival value for all geodata in the federal administration (official geodata and other additional geodata).

Results:

-
- Pilot carried out at swisstopo and ASTRA
- Full stocktake of federal geodata
- Parameters for geodata of archival value / geodata for LA
- Full appraisal for transfer into long-term availability and for archival value of federal geodata
- Completed CAP ready for comments for federal geodata

d) Comments and approval of the CAP

Activities:

- Carry out consultation on CAP.
- Consolidate feedback and supplement CAP as necessary.
- Formulate reasoning for comments not taken into account.
- Prepare CAP for publication and publish.

Result:

- Consolidated CAP as the basis for submissions from the end of 2016 published online.

11.2 Work Package 2 – Document and specify archivable formats

e) **Document and specify archivable formats**

Activities:

- Document the candidates for archivable formats selected in the concept and prepare for publication on the SFA website (as with other archivable formats).

- Documentation must be provided for the following formats:
  - INTERLIS2-XML[100] or INTERLIS2-GMLCombination of INTERLIS2-XML/-GML and ESRI formats
  - GeoTIFF (with redundant georeferencing in a separate XML file)
  - SIARD (enhanced for geodata)
  - Geospatial metadata: XML (in GM03 standard with the associated XSD data)
  - Minimum geodata models: ASCII files in ILI format

The documentation forms the basis for creating and validating the formats at both the submitting authorities and the SFA.

Results:

- The archivable formats for geodata submissions and their specifications can be communicated and are published on the SFA website.

f) Format validation tool

Activities:

- Evaluate and select appropriate tools for validating archivable formats.

Result:

- Tools are available to the SFA and geodata producers to enable them to validate the existing formats for their suitability for archiving. The SFA can communicate these tools to the geodata producers and they receive training in how to use them.

[100] The discussion on INTERLIS-XML and international standardisation activities launched at the Spirgarten meeting 2013 is taken into account.

g) **Format conversion tool**

Activities:
- Evaluate whether conversion or creation tools are required for the archivable formats.
- If so, select appropriate tools for converting the archivable formats.

Result:
- The defined tools for converting the geodata into archivable formats are available to the SFA and geodata producers. The SFA can communicate these tools to the geodata producers and they receive training in how to use them.

11.3 Work Package 3 – Access

h) geocat.ch & SFA Online Search

Activities:
- Develop a detailed specification for linking geocat.ch and SFA Online Search (building in particular on the Master's thesis by I. Lanzrein). Define the technical and organisational requirements (for development and for data entry and maintenance).

Results:
- The requirements for both systems for the link-up are known and can be used for the applications as part of release planning.
- The data management processes are defined and have been accepted.

i) **Creating access part 1: Preview display in the finding aid**

Activities:
- Develop a preview display of geodata in the SFA in the finding aid.

Result:
- Online Search can integrate and display previews for geodata.
- Specific searches for geodata can be carried out in the AIS.
- There is a fonds overview for geodata and/or the geodata have been integrated into the existing fonds overview.

j) **Creating access part 2: Retaining geodata in view services, loading geodata into view services**

Activities:
- Clarify use of view services for archived geodata:
  - Priority 1: Define conditions and processes regarding when and for how long archived geodata must be retained in view services (organisational, technical and financial) and which geodata are eligible for consideration.
  - Priority 2: Develop technical and organisational options for (automated) reloading of archived geodata into view services.

  Develop both priorities in association with swisstopo/COGIS.

Result:

- Priority 1: The use of view services for archived geodata has been clarified and implemented.
- Priority 2: Geodata that are no longer in an existing view service can be reloaded.

11.4 Work Package 4 – Establish first and second level support

Activities:

- Define the scope of first and second level support for users.
- Coordination and agreement between the SFA and swisstopo/COGIS on the services to be provided (SFA = first level support, swisstopo/COGIS = second level support)

Result:

- First and second level support have been defined and described (for users); an SLA between the SFA and swisstopo/COGIS detailing services and demarcation of responsibilities has been approved/signed.

11.5 Work Package 5 – Geo-SIP specification

Activities:

- Document requirements for a geo-SIP and integrate them into the ordinary release planning for the SIP specification and development of applications for digital archiving.

Results:

- Geo-SIP specification is available and can be published.
- The SFA can communicate the specification for a geo-SIP to geodata producers.

11.6 Work Package 6 – Federal administration-cantons – geodata archiving

k) Collaboration in the cadastral survey geodata archiving working group

Activities:

- Collaboration/assistance in the cadastral survey geodata archiving working group

Result:

- Coordination of the working group with the Ellipse activities is ensured, in particular as regards collaboration on geodata archiving between the federal administration and the cantons.

This work package currently involves collaboration in the archiving working group; other tasks may be added depending on developments (working group results, SIK-GIS study).

11.7 Work Package 7 – Training, know-how accumulation

l) Training SFA staff on the basics of GIS/geodata and geodata archiving

Activities:

- Ongoing training within the scope of project tasks
- If required, external training, e.g. by specialists from COGIS/swisstopo

Result:

- SFA staff responsible for geodata archiving have sufficient knowledge of geodata to carry out their tasks in the project and in operation.

m) Training federal geodata producers on geodata archiving

Activities:

- Identification and development of training programmes for geodata producers on geodata archiving (e.g. submission of geodata, creation of geo-SIPs)

Result:

- The SFA are able to train geodata producers for the tasks of geodata archiving.

11.8 Work Package 8 – Project management / coordination

n) Project management

Activities:

- Ongoing planning, coordination and monitoring of all activities relevant to the project
- Close and regular coordination between swisstopo and the SFA

Result:

- Work can be carried out according to plan and the prescribed objectives achieved.

o) Project communication

Activities:

- Ensuring communication to the various stakeholders on geodata archiving
- Organisation of colloquia, workshops

Result:

- Stakeholders have been informed. Both the archive community and the geo-community have been informed about ongoing developments and involved.

p) Preparation of Federal Council application for geodata archiving (2nd tranche)

Activities:

- Survey of parameters (overall quantity and partial quantity of documents of archival value) and operating expenses to finance geodata archiving
- Draw up application to Federal Council.

Result:

- The follow-up application to the Federal Council is submitted on time. Funding for the operation of geodata archiving is secured.

11.9 Outside Project Ellipse

Outside Project Ellipse, other projects are creating the conditions that will be necessary or useful for the implementation of geodata archiving.

11.9.1 Transfer platform

As part of the *Expédition* project, the SFA are creating a transfer platform for the submission and outward delivery of digital packages to and by the SFA. Deadlines and technical requirements for the archiving of geodata must be determined during realisation of Ellipse and coordinated with *Expédition* or, after it is completed, with the application owner.

One critical point will be the expansion of the transfer platform to deal with large quantities of data (e.g. swisstopo aerial photographs). As soon as these requirements are available from within Ellipse, the implications for the transfer platform can be established and the feasibility assessed.

11.9.2 SFA archiving applications & infrastructure

The SFA's existing applications and infrastructure (Package Handler, DIR, IDA, AIS, etc.) must be reviewed and, where necessary, adapted or upgraded with regard to the archiving of geodata. Depending on the extent of the changes, this can be done during regular release planning or dedicated projects can be initiated.

As soon as the concrete requirements have been defined by Ellipse, the project managers or application owners can assess feasibility and determine the time and resources required. Close cooperation with Project Ellipse (especially from the SFA project management) is required.

11.9.3 Preservation

Productive preservation of archived geodata in operation is only necessary after geodata have been submitted to the SFA. As this will not be the case until after the project ends, no work is required here.

12 Planning and organisation

12.1 Phase planning

The following chart gives an overview of the procedure for realising Project Ellipse.

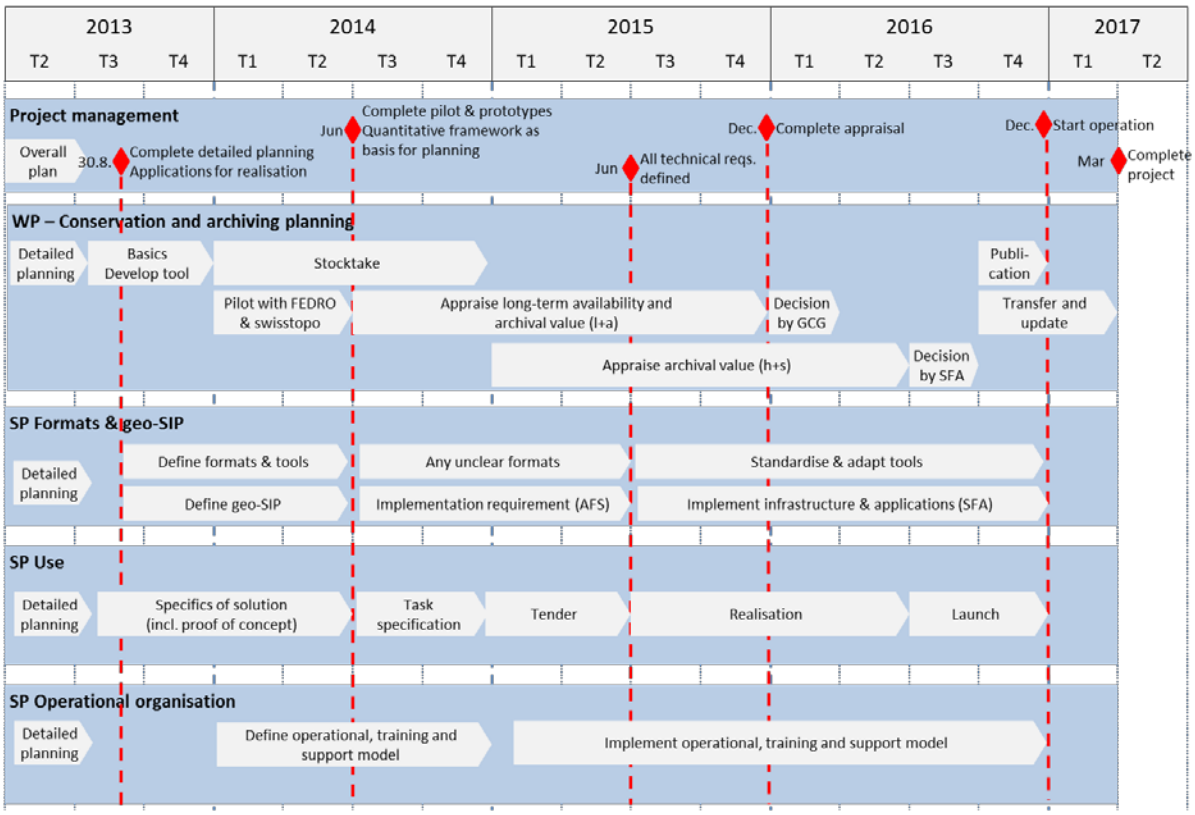


Figure 20: Phase plan for realisation

The work packages listed in chapter 11 have been translated into project activities and an initial rough phase planning has been carried out. This plan must be specified in greater detail and validated as part of the detailed planning of the individual work packages or sub-projects and consolidated into an overall plan. This overall plan, including the resource requirement and project applications, will be the result of the first milestone and will be available as from 30 August 2013. This will enable the managements of the SFA and swisstopo to grant the corresponding clearances for realisation during September 2013.

Important decisions need to be taken during realisation, for example defining the parameters for the geodata to be archived, the storage location for the archived geodata, and a solution for searching and using geodata. Such decisions will have a decisive influence on the further course of the project. It is therefore the task of the project management to review the phase planning with every milestone and adapt activities as necessary to enable the objectives to be achieved. However, this must be done within the prescribed milestone grid. Archiving of geodata must be possible by the end of 2016 and must then go into ordinary operation. The project can be completed by the end of Q1 2017.

12.2 Project organisation

The following chart shows the project organisation for the realisation of Ellipse. Further details of this organisation must be added as part of the initiation of Ellipse realisation and the staff resources allocated.

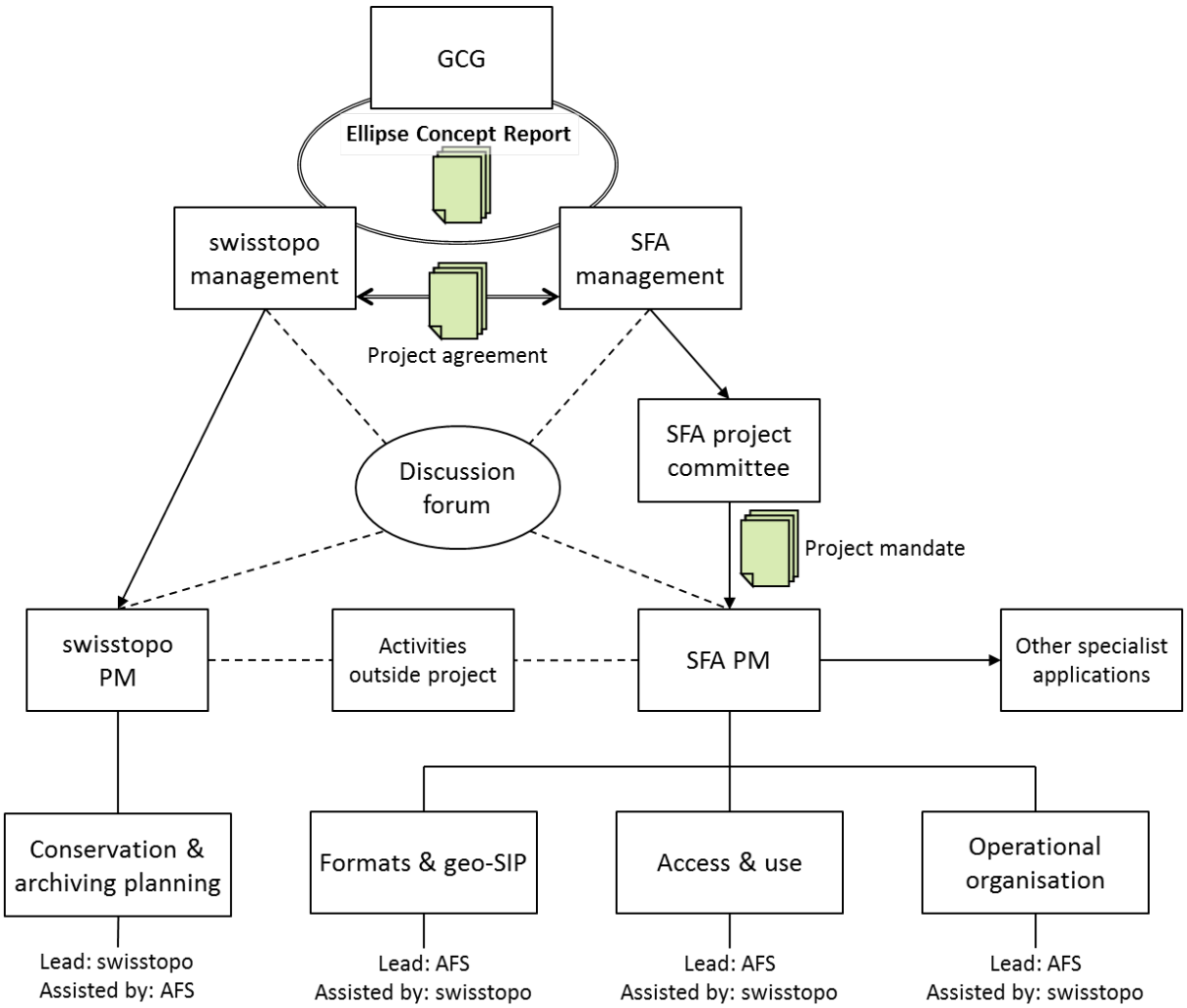


Figure 21: Project organisation

The management teams of the SFA and swisstopo provide governance for Project Ellipse. This concept report is the joint basis for the project. It sets out the objectives and principles for the organisational and technical solutions to be realised and provides a framework for execution as a project. Once the Ellipse concept report has been approved by the GCG, the latter will also be incorporated into this project.

The SFA and swisstopo will divide up responsibility for the work packages described in chapter 11. This will enable both the SFA and swisstopo to execute the projects in accordance with their established procedures and methods for project management. The joint milestones and assurance of mutual collaboration will be set down in a project agreement.
The two managements will be informed by the project management of the status and forecasts for the further course of the project at key milestones but at least every 12 months. The managements will decide for themselves whether this will take place at joint or separate meetings.

For important thematic issues and problems, the project / project managers may turn to representatives of the two managements. This may include themes such as data retention at COGIS for archived documents or funding of human resources for the SFA by the GCG/swisstopo. The aim of these theme-based meetings is the rapid and direct involvement of decision-makers.

swisstopo project organisation

swisstopo will assume responsibility for Work Package WP1 “Conservation and archiving planning” The swisstopo project management will report direct to management and execute the project using dedicated staff.

SFA project organisation

In accordance with the standard procedure for projects at the SFA, the management of the SFA will nominate a member as project principal for this project. This person will convene an internal SFA project committee and commission the SFA project manager to manage the project by means of a project mandate.

The work packages for which the SFA is responsible will be executed in three sub-projects:

- Sub-project **Formats & Geo-SIP**: WP2 “Archivable formats” and WP5 “Geo-SIP”
- Sub-project **Access & Use**: WP3 “Access” and WP4 “Establish first and second level support“
- Sub-project **Operational organisation**: WP7 “Training, know-how accumulation”

Reporting and steering will take place within the SFA project organisation in accordance with the established rules and processes for project management.

The SFA project manager will also be responsible for coordination with other project managers and application owners with regard to other SFA specialist applications (Package Handler, DIR, AIS, etc.).

Joint activities

The two project managers from the SFA and swisstopo will jointly ensure that realisation of Ellipse is carried out in accordance with the stipulated rules. They will hold regular project management meetings and minute the current status, open issues and decisions taken.

The two project managers from the SFA and swisstopo will represent Ellipse externally and coordinate work with other projects dealing with conservation and archiving of geodata (WP6: Federal administration-cantons – geodata archiving).

13 Next step

The next step is to draw up the detailed plan for the individual work packages and consolidate it into an overall plan. Using the current project organisation, the following concrete results will be worked out by September 2013:

The following results will be achieved by 30 June 2013:

- Detailed planning including estimates of work involved will be completed for all work packages.
- Interdependencies between individual work packages will be identified and taken into account.
- Personnel issues for activities in 2013 will be clarified.

The following results will be achieved by 30 August 2013:

- The detailed plans for the individual work packages will be consolidated into an overall plan. The phase planning will be adjusted as necessary.
- The total funding and human resources required will be determined: in detail for 2013 and 2014, with a rough estimate on the basis of empirically tested planning assumptions for the following years.
- Adjustments to the project organisation if required; in any event, clarification of staff allocation.
- A draft project agreement between the SFA and swisstopo on mutual assurance of the necessary collaboration and resources.
- A project application from the SFA and one from swisstopo for the respective managements, including a risk catalogue, financial viability and consequences in the event that clearance is not granted.

During September 2013 the managements of the SFA and swisstopo are scheduled to grant clearance for realisation in accordance with the project applications and sign the joint project agreement.

14 Application / resolution

At their joint meeting on 16 April 2013, the managements of the SFA and swisstopo:

- took note of Section A of the concept report
- approved Section B of the concept report and
- gave their clearance in accordance with Section C for the preparation of results by the next clearance in September 2013.

At its meeting on 3 May 2013, the GCG:

- took note of Section A of the concept report
- approved Section B of the concept report and
- took note of Section C of the concept report.

Section D – Appendix

15 Catalogue of criteria for appraising the long-term availability of geodata, with comments

Criteria for transfer to long-term availability

Legal and economic importance

(determined by the authority responsible pursuant to Art. 8 para. 1 GeoIA)

Criterion	Comments / indicators
Legal relevance	Must the data be retained for a specific period for legal reasons?
Use for science and research	Are the data constantly or frequently requested by representatives of science and research?
Use for companies	Are the data constantly or frequently requested by companies?
Use for private individuals	Are the data constantly or frequently requested by private individuals?

Administrative importance

(determined by the authority responsible pursuant to Art. 8 para. 1 GeoIA and by other authorities of the federal administration)

Criterion	Comments / indicators
Use by the authority responsible	Are the data still constantly or frequently required by the authority responsible?
Use by the federal administration	Are the data still constantly or frequently required by the public administration?

16 Catalogue of criteria for appraising archival value, with comments

The catalogue of criteria for appraisal is published (in German, French and Italian) on the SFA website.[101]

I Exclusion criteria

Criterion	Comments / indicators
Leading role	Documents concerning business in which the body required to offer records does not play a leading role are not deemed to be of archival value (avoidance of duplicate records) NB: in selected, defined thematic areas, documents from secondary players are also archived
Document type	Documents that are on an approved negative list are not of archival value

II Criteria for archival value

Legal and administrative importance

(determined by the body required to offer records)

Criterion	Comments / indicators
Legal relevance Guarantee of legal certainty	Evidence of obligations under international law Evidence of intervention in fundamental rights (human dignity, right to life, right to personal freedom, international law) Evidence of decisions that establish new law Evidence of rights and duties Documents suitable for use as evidence in legal proceedings
Evidence of business practice in the exercise of competencies and duties	Governmental compliance: Documenting the circumstances that led to a decision: responsibility, organisation of the authority and processes (where applicable: selection/models), in particular for decisions that are irreversible and/or have a wide-ranging impact Evidence of strategy and policy development Changing effect on the conduct of business, in particular with undefined legal concepts and the (ongoing) development of legal practice

Historical and social importance

(determined by the SFA)

Criterion	Comments / indicators
Benefits for research	Interpretation potential: informational value for various topics and issues Interconnectability: relevance for other areas of record, aggregation potential Demand: experience with prioritised themes and existing fields of research Existing record (coherence, continuity) Diversity of themes and sources

[101] Cf. http://www.bar.admin.ch/dienstleistungen/00929/index.html?lang=de&download=NHzLpZeg7t,lnp6I0NTU042l2Z6ln1acy4Zn4Z2qZpnO2Yuq2Z6gpJCDdoJ7fGym162epYbg2c_JjKbNoKSn6A-- (17.9.2012).

Criterion	Comments / indicators
Contemporary interest	Domestic policy agendas (guideline business of the Federal Council, parliamentary session programmes, planning of coordination conference) Media interest (media database)
Sensitivity	Conflict potential: touches on areas of dispute, organised interest groups, fundamental rights, national security, sovereignty Opportunity costs: required resources, loss of image Extent of (potential) impact: intensity, breadth, duration
Developments / progression	Changes and turning points: documents a reorientation or caesura in business management or changes in basic conditions Long-term perspective: permits an overview of an extended period (30 years and more), independently or in combination with existing record
Defining powers	Shaping forces: documents defining influence of individuals, groups or institutions on law and statute, culture or society

17 Catalogue of criteria for archivable geoformats

17.1 Basics

The catalogue of criteria is used to analyse and evaluate formats with regard to their suitability for archiving purposes. It arose out of the SFA catalogue of criteria and was comprehensively revised and expanded in the preliminary study and in the formats working group of the concept phase.

The criteria mostly permit qualitative statements about a format. They have not been adapted for a quantitative evaluation.

The primary focus is on archiving. The criteria have been selected in such a way that the ingest of the geodata and their preservation can be ensured. Later use is not excluded from consideration, but is deliberately viewed as secondary.

The catalogue of criteria is subdivided into general criteria, specific criteria for geodata, and indicative criteria. Any criteria that have been rejected are documented. Some criteria are also marked as no-go criteria. If a format does not satisfy the specifications or requirements, it must be excluded. No-go criteria are marked in red.

At present, this catalogue probably contains too many criteria. This may make evaluation more difficult, as it is often far from easy to distinguish between criteria that are formulated in similar terms. On the other hand, what matters is the overall view that arises out of an evaluation, and not so much the individual criterion.

Readers are referred in particular to section 17.5, which contains criteria that were not considered as well as characteristics that, following detailed discussion, were not formulated as criteria.

17.2 General criteria

The following list comprises general criteria that apply to all formats. It is derived from the SFA's catalogue of requirements and was revised in the course of the preliminary study.

Unambiguity	Clear and unambiguous definition of formats

This criterion ensures that there is no scope for interpretation. It is assumed that this applies in principle to the format candidates.

Openness	The definition of the formats is disclosed and publicly accessible

The openness/accessibility of the specification is crucial to the continued interpretability of the information coded by the format. Failure to satisfy this requirement would be a clear criterion for exclusion.

Standard	The format is overseen by a standards organisation (international, national)

Is the format a standard or are efforts to make it one under way? Standards issued by national and international organisations are valid for longer periods and are less susceptible to revision, which thus gives a format stability. A standards organisation is in principle more neutral and credible than an individual company that owns the rights to a format.

Licence-free	Formats must not be restricted by licences for production or use

The aim here is to prevent dependence on a given manufacturer and thus lessen or eliminate the potential risk that the licence holder can carry out and enforce modifications at any time.
The ideal case would be an open-source licence.

Distribution	The format is widely distributed

Widespread distribution means both a relatively large number of users that can be estimated at present and a degree of diversity among those users, large volumes of existing files in the format concerned, and support for the format by a large number of applications. It also refers to geographical distribution. One such format that is widely distributed is the ESRI shapefile.

Long-term support	The time that has passed since the format was created

Formats that have already existed for a lengthy period of time, are maintained and are widely distributed, can be expected to remain in existence for some time to come.

Stability	The format remains stable over a long period. The number of versions is small, older versions are still supported by current applications.

A large number of versions of a format results in frequent migrations, and this should be avoided. One example of a widespread format that is not particularly stable is DXF (see Appendix 17).

Perspective	The perspectives describes the expectation for the future of the format concerned

The expectations that may be placed on the development and future distribution of a format depend on standardisation efforts in the international arena and on the decisions regarding suitability for archiving that are taken by bodies closely associated with archiving.

This criterion is similar to the “standard” and “long-term support” criteria mentioned above.

Loss-free	Loss-free storage of data (exception: multimedia data)

The content of “read” data must be identical to that of “write” data. This is not the case with JPEGs, for example. Due to compression losses, the pixel values in a reopened file no longer correspond to the original.

Identification	Format must be systematically identifiable

The format, including its version, must be clearly identifiable by a format identification tool (e.g. DROID[102]). If no such tool is available at present, the potential for identifying the format is to be analysed and assessed in more detail.

[102] DROID (Digital Record Object Identification) is an automatic file *format* identification tool: droid.sourceforge.net (23.8.2010).

Validation	Validation of the formats for compliance with the specifications

Tools are available for verifying the compliance of the format with the relevant specifications. These tools are usually able to extract format-specific metadata.

Storage space	The amount of storage space required is economically viable

This criterion is designed to indicate how the format deals with the storage space requirement. Does the format tend to create files that are small, compact or large?

Compression	For compressed storage of data, the same requirements for the compression method apply as for formats

This should already be covered as an element of the format specification. Formats often use widely known compression procedures, and these are no longer explicitly described in the format specification. The risk involved if compression is used needs to be assessed.

Container specifications	For container formats, the requirements apply to both the container and the files contained in it

The term “container” refers to a file format that can contain different data formats. Familiar examples are ZIP files and Tar files, as well as AVI and Matroska files.

17.3 Specific criteria for geo-formats

The following criteria apply specifically to geo-formats.

External references	As far as possible, the format should not depend on external references.

Examples of external references include non-embedded fonts (requiring the user to rely on the system fonts, which may not necessarily be available in a future version of an operating system), implicit assumptions (that are presumably described externally), and references to symbols.

If the format consists of a number of files, that is a component of its specification. A file is not to be regarded as an external reference.

Properties	The format should be capable of displaying as many of the important properties of the geodata as possible

This essentially corresponds to the requirement for convertibility. The displaying of model properties is particularly important. (Counter-example: an ESRI shapefile displays lines, but not surfaces.)

Coordinates	Coordinates are adequately stored

The format meets the specified requirements in terms of numerical precision in the storage of coordinates (the data type must be checked thoroughly to establish if it meets the conditions: e.g. float (IEEE, …), fixed, integer)

Spatial reference	The format must contain information on the spatial reference

Data and information become geodata and geoinformation via a spatial reference, i.e. they refer to a location in geographical space and are geocoded.

Global terrestrial *reference systems* are geocentric, Cartesian coordinate systems with their origin in the Earth's centre of gravity. Local reference systems are the official, national coordinate and height systems, the reference ellipsoid, the geoid model and the map projection.

Global and local terrestrial *reference frameworks* are implementations of reference systems in the form of coordinate sets of terrestrial points resulting from the network adjustment of geodetic observations.

The indication of coordinates in a defined *reference system and reference framework* provides an unambiguous spatial reference (georeferencing) of geodata.[103]

Since a large number of formats do not meet this criterion either adequately or at all, it is essential to clarify how else the spatial reference is to be guaranteed:

a) embedded metadata
b) separate file
c) other mechanisms realised at the submission level

Variant a) is to be preferred, followed by b) and finally c). In all cases, the procedure should correspond to a standard or a convention.

Specific convertibility	The formats (to be submitted) can be converted to the archivable file format using a tool widely used in the geo-community.

The FME tool[104] reads and writes the archivable format.

FME is currently a recognised, comprehensive and widely used application for converting geodata. Formats (read and write) supported by FME should generally be considered as archivable.

Note: This criterion introduces a manufacturer dependency by the back door, so to speak. Nonetheless, practical and useful additional information is supplied. Formats that are not supported by FME would have to be examined much more closely as they could, for example, become meaningless over the longer term. The relevance of this criterion must be reviewed periodically.

Note: The time of conversion is primarily that of ingest into the archive (creation of the SIP). Further conversions may take place in the archive during preservation measures (preservation) and use.

[103] Reference systems: http://www.swisstopo.admin.ch/internet/swisstopo/en/home/topics/survey/sys.html (23.8.2010).
[104] Feature Manipulation Engine (FME): http://www.safe.com/ (23.8.2010).

17.4 Indicative criteria

Implementation	More than one implementation should exist for the format

The term “implementation” refers to rendering software and tools for processing or converting the format concerned. Having a number of independent implementations ensures that no undocumented features exist and the specifications can be fully implemented.

The problem is more frequently encountered with proprietary formats, which are open but are only handled by one software manufacturer (e.g. Adobe Photoshop PSD: only Adobe products can properly handle all PSD files). It is important to ensure that implementations are independent in nature, and do not take the form of integration of the same module into different software packages.

If there are **open-source** implementations for the format, this is viewed as an additional positive factor.

17.5 Criteria that were rejected or not taken into account for the evaluation

This section lists criteria that were rejected during drafting despite having been taken into account in earlier documentation. One typical reason is the lack of distinguishing features associated with a criterion, i.e. the criterion applies equally to all formats.

These criteria have only been excluded from the evaluation of geoformats. This does not therefore mean that they are generally unusable or unimportant. They remain valid for other purposes.

Convertibility (general)	Can standard formats in the same category be converted into the archivable format?

Reasoning: Firstly, it emerged that candidates into which customary formats cannot be converted did not merit further serious consideration. Secondly, the criterion of convertibility specifically for geoformats already exists.

Non-encrypted	No data encryption

Data requiring a much higher level of protection are often encrypted, but encrypted data are not suitable for archiving. A format cannot be used if it requires encryption. It must be possible to save data in the same format without encryption.

Reasoning: No encrypted formats are known in the geo-world.

Difficulties applying this criterion were sometimes encountered during the evaluation of formats. In the case of “external references”, there was often a temptation to regard some of the files in formats consisting of a number of files as external references. Following detailed discussion, the idea of having a separate criterion for this situation (number of files) was rejected. Instead, the “external references” criterion was defined more precisely.