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DE MEDIO AMBIENTE

Instituto Tecnológico
GeoMinero de España

INFORME	Identificación:
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TÍTULO

GEIXS

PROYECTO

Geological Electronic Information eXchange System

RESUMEN

El objetivo del proyecto ESPRIT nº 23802 GEIXS es crear un servidor de información geocientífica armonizada a nivel europeo, en Internet.

Como servicios disponibles en el servidor se incluyen programas de representación y recuperación de la información en 2 y 3 dimensiones. De esta forma los usuarios en toda Europa pueden disponer de un punto único de acceso a toda la información a nivel de metadatos disponible en los diferentes Institutos Geológicos Europeos.

Para el desarrollo del servidor se han completados los modelos de datos en 2D y 3D, Tesauro multilingüe, base topográfica común y aplicaciones de carga y verificación de metadatos.

* continuar al dorso en caso necesario

Revisión

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Planificación y Gestión

Fecha: 28.4.2000

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PROYECTO ESPRIT 23802

GEOLOGICAL ELECTRONIC INFORMATION EXCHANGE SYSTEM (GEIXS)

PROJECT MANAGER

JOHN LAXTON

OCTUBRE 1997

Task T002 *Maintenance of overall project plans showing task outlines, resource outlines, scheduled dates, work breakdown charts, milestones set and reached, critical and non-critical paths, resources used, budget reporting, attention to conflicts, reporting to EU. Also maintenance of links/liaison to related projects GEOMIST and OMEGA to ensure complementarity and shared developments.*

Key points

The contract initiating GEIXS was signed on behalf of the EU Commission on 28/4/97. This marked the start of the GEIXS project and was approximately three months later than the scheduled start date of 3/2/97 given in the GEIXS Project Description. All scheduled dates have been therefore put back by this amount from those given in the Project Description.

GEIXS was formally launched at a reception held in Brussels on 29/4/97, at which the project was introduced to around 60 guests from the European Commission, the European Parliament, European Environment Agency, mining, water and environmental organisations and national representations. The opening address was given by Dr Christensen, the President of EuroGeoSurveys.

The first meeting of the GEIXS steering committee was held in Brussels on 30/4/97. This meeting was also attended by Luis Torres on behalf of the GEOMIST project. The meeting discussed the activities to be carried out during the first phase, in particular: creating the data models; the multi-lingual thesaurus; the common map base to be used for GEIXS; and the configuration of the GEIXS server.

Due to an internal reorganisation of BGS David Ovadia stood down as GEIXS Project Leader at the beginning of June being replaced by Ian Jackson. Ian Jackson is David Ovadia's successor in charge of the BGS IT Group which will make BGS's technical contribution to GEIXS.

Communication between project participants has been largely by e-mail, although four surveys are not on e-mail and are communicated with using fax.

BGS has experienced some problems in distributing project funds to our partners. This was in part due to inaccurate bank details provided by some partners, but in the main was the result of problems in the telegraphic transfer of funds the reasons for which are unclear but being investigated. As a result of these problems some surveys have had to receive funds by ECU drafts, which have proved very slow for the banks to prepare.

Summary of work carried out

Details of the work that has been carried out from the start of GEIXS to the first review point are given in the three accompanying reports on 'Data Models', Harmonization', and 'Server'.

A brief summary of progress by task is given below. This is illustrated in **Appendix 1** which compares actual progress with that planned (after correction for the delay in the project start).

Task T002 GEIXS launched, first steering committee meeting held, initiation of phase 1 tasks, monitoring progress, production of review point 1 reports.

Task T003 Technical operational requirements for hardware, software, and telecommunications equipment have been drafted. Informal assessment of cost was carried out prior to a formal European wide tendering. Agreement of the final specification will be made at the steering committee meeting in November, to be followed by formal tendering.

Task T005 A library study of metadata standards was carried out, leading to the decision to adopt CEN standard prEN 287009 as the basis for GEIXS. This will require some adaptation to GEIXS requirements. Express formalism as used in the CEN standard was investigated, but did not prove entirely satisfactory. The OMEGA project will develop data model transfer tools using Express, but GEIXS could not await these developments before developing GEIXS data models. These models will be exchanged with the OMEGA project when the transfer tools are available.

Tasks T006 - T008 The CEN prEN 287009 standard was adapted to accommodate the particular characteristics of geoscience data and the hierarchy of the data triangle. A review of existing Geological Survey data holdings was carried out and from this eleven principle data categories determined. A logical data model was developed in CASE tool format, along with accompanying E-R diagram, to encompass the catalogue, metadata, and index layers of the data triangle. These have been mapped to Oracle tables, and many of the dictionary tables populated. A report documenting and explaining the model has been produced.

Task T009 The GEOMIST project has defined a 2D 'Georelational Data Model' for the geodata layer of the data triangle. This supports the Entity Relationship model. A 3D data set of borehole and geophysical data has been selected. The establishment of this data set as part of the GEOMIST project will not be completed until April 98, so a provisional data set has been set up for GEIXS.

Task T010 An evaluation study of existing geoscience thesauri and multi-lingual dictionaries was carried out, leading to the conclusion that the 'Multilingual Thesuarus of Geosciences (MTG)' was most appropriate for GEIXS. A licensing agreement to use the MTG has been entered into.

Task T011 It was agreed to use Longitude & Latitude as the common coordinate systen for GEIXS. Negotiations with the IGME working group responsible for the 'International Geological Map of Europe' have led to an agreement that the topographic base used for this can be used for GEIXS. Contacts have been established with EUROGI and the European Topic Centre on Catalogue of Data Sources.

Tasks T024 - T026 These tasks are dependent on hardware purchase **(Task T003)** which has not yet taken place as a result of the time required to prepare the necessary

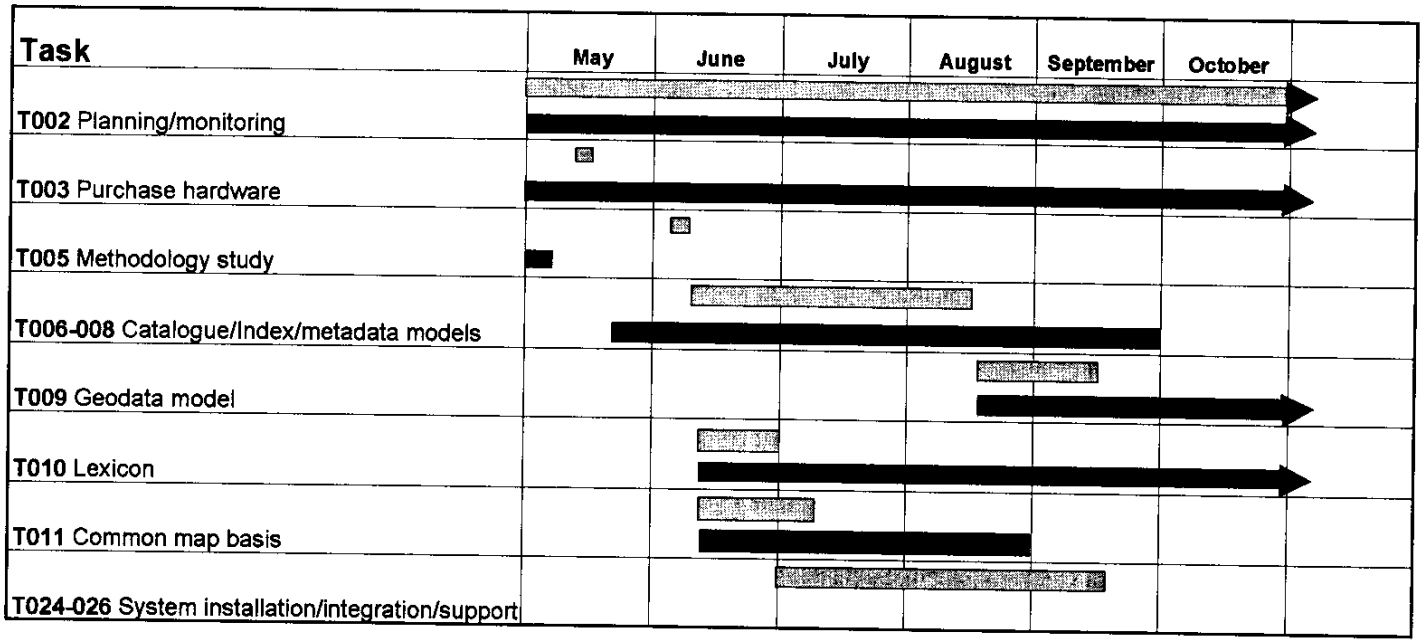
specifications. These are now ready and tendering can procede. In the meantime existing Survey equipment will be used for GEIXS development, so this delay should not impact adversely on other GEIXS tasks.

Awareness raising activities

Date	Place
20/2/97	Hungarian Geological Surveys, Budapest. Attended by the National Geological Surveys of Central and Eastern European and Baltic countries.
26/3/97	EuroGeoSurveys Seminar with POSC (Petroleum Open Software Corporation), Brussels. Attended by European Commission officials and industrial representatives.
29/4/97	EuroGeoSurveys launch of GEIXS project, Brussels. Attended by European Commission officials, industrial and national representatives. Expression of Interest lists were opened at the Bureau in preparation for the 1998 and 1999 GEIXS workshops.
9/6/97	Polish Geological Survey, Warsaw. Attended by National Geological Surveys of Central and Eastern European and Baltic countries.
17/6/97	DG III Raw Materials Plenary Group meeting, Brussels. attended by European Commission officials, industrial and national representatives.
25-27/6/97	3rd EC - GIS Workshop, Leuven. A paper was presented outlining the objectives of GEIXS.
1/9/97	FOREGS (Forum of European Geological Surveys) 1997 Annual Meeting, Keyworth Attended by National Geological Surveys of Central and Eastern Europe, Baltic and former Soviet Union countries.
9/97	Brief technical note on the GEIXS project published in the 'MIRO News' (London) Vol. 10, MIRO (Mineral Industry Research Organisation) has over 80 member organisations internationally including mining companies and consultants, metal and mineral producers and Geological Surveys.

Appendix 1

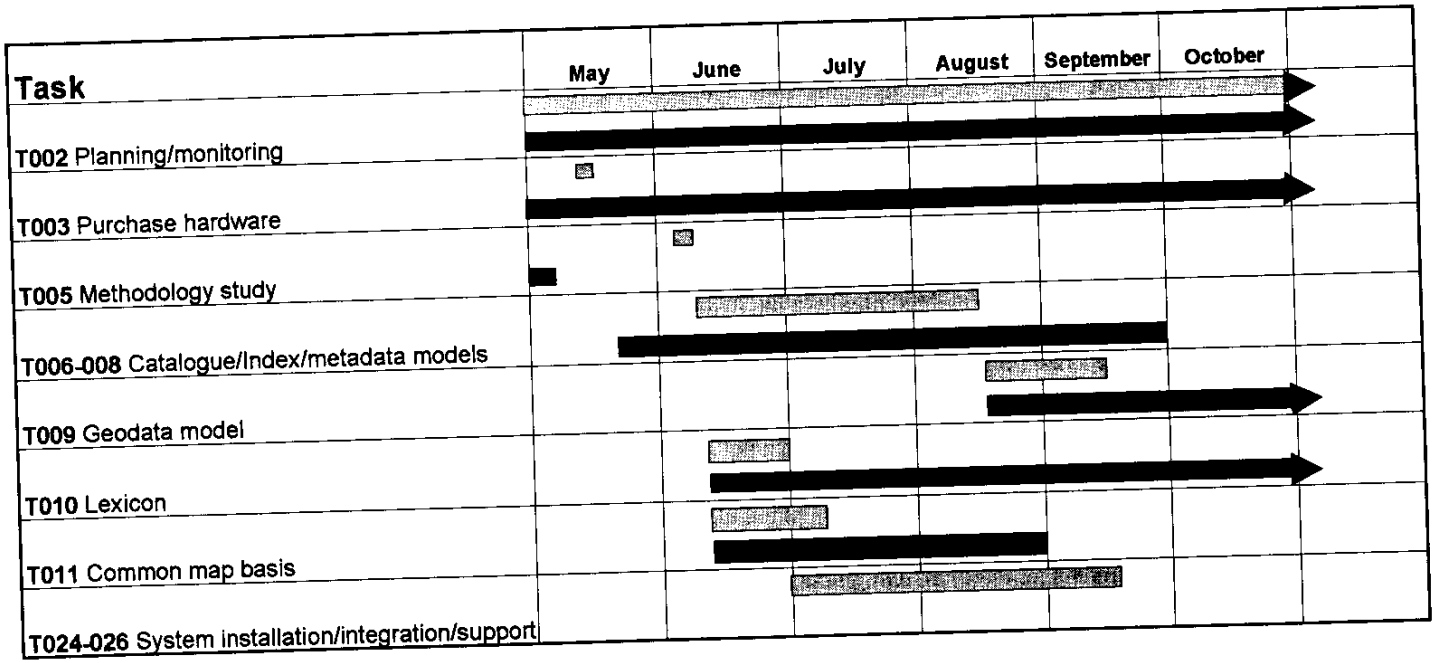
Summary of Phase 1 Progress



The above chart shows two bars for each task active in phase 1 of GEIXS. The hashed bar is for planned progress (after correction for the late start of the project) and the solid bar for actual progress. Tasks T024-026 do not have a solid bar as they have yet to start for reasons explained in report 4.

Appendix 1

Summary of Phase 1 Progress



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PROYECTO ESPRIT 23802

GEOLOGICAL ELECTRONIC INFORMATION EXCHANGE SYSTEM (GEIXS)

DATA MODELS

JOHN LAXTON
LUIS DELGADO
DENIS BONNEFOY

OTUBRE 1997

Task T005 *Evaluation study leading to a report and recommendations on the use of Express/Euclid as the meta data language linking OMEGA to GEIXS and, if so recommended, a technical implementation plan.*

Standards of description of the metadata

The library search carried out showed that there are two principal standards of description of the metadata. One is American (FGDC), the other is European (prEN 287009 drawn up by Technical Committee CEN/TC287). These two standards are close and describe the same categories of information. On the Web, associated with the American standard, tools for automatic generation of the data bases and tools for loading metadata are available. European standard prEN 287009 is still under development. The consulted documents are drafts. The EXPRESS formalism is used to provide a normalised description, but the scripts joined to the standard are approximate.

The metadata is described by:

- Identification (name),
- Dataset overview: summary, use, nature,
- Administrative information: organisations and role of each one, contact point
- Rules of dissemination: restrictions, copyright, price, media, format, contact point
- Information on quality: process of acquisition, positional accuracy, the associated set of themes,
- Geographical system of reference,
- Spatial extent: limit of covered zone,
- Temporal extent: dates of acquisition,
- Description of the data (data model).

The choice to be based on the work of CEN was made by the steering committee of GEIXS. This standard is in development. To satisfy the needs of GEIXS, the standard was simplified and adapted to include information that it omits. The result of this work will be communicated to the European Committee of Standardisation. The remarks on the preliminary version of the standard relate mainly to the optional definition of a particular type of object: the spatial index. This latter will be described in the phases to come (WP2).

Implementation of standard prEN 287009

The preliminary version of metadata standard prEN 287009 proposes scripts roughly respecting the Express formalism. A study of these scripts was carried out. An attempt at using the EXPRESS files was made with the assistance of a specialised consulting company (SPRI). The results did not give complete satisfaction. A dialogue with the OMEGA project team made it possible to discuss the requirements of the two projects. One of the objectives of OMEGA is to develop tools for the exchange of data models and data described with the CDL, CDIF and EXPRESS formalisms. Tools for this will only be available in December. The planning of GEIXS does not make it possible to wait for these developments, and the budget available does not authorise the investment

necessary to use these tools. A traditional entity / relation approach is thus used to constitute the GEIXS database. Nevertheless, in order to allow the exchange of data models, it is planned to export the data diagram used in GEIXS using the EXPRESS format. The tools developed by the OMEGA project on bookshop CAS.CADE will be re-used in WP5 to implement the demonstrator 3D system. The demonstrator 3D will also re-use the work completed on CAS.CADE within the framework of the GéoFRANCE3D project.

Tasks T006-008 *ER diagrams in CASE tool formats of the catalogue, metadata and index layers of the data triangle model with mapping to table level of relational database management systems used by national surveys (Oracle, Ingres, Access), with documentation, implementation notes, help files, computer aided training packages and e-mail based support.*

Procedure

A letter was sent to all EU Geological Surveys asking for details of their data models. The response to this varied greatly with some surveys able to provide detailed data models, products of previous internal data modeling exercises, while others were only able to provide lists of the type of data that they held. In addition the Web site 'GEIXS - Geological Datasets of Europe', which was previously set up by the Dutch Survey as a GEIXS prototype, was examined. Although this prototype site is not kept up to date it contains much useful information on geoscience data sets held by the Surveys. One of the main conclusions to come out of this review was to emphasise the huge range of types of data held by the Surveys.

The CEN standard prEN 287009 'Geographic information - Data description - Metadata' was used as a starting point in designing the model. This was done by comparing the metadata listing of the standard against the data model information provided by the Geological Surveys and the objectives of the GEIXS project.

The model was built using the Systems Engineer CASE tool from Select Software, as developed by LBMS, which can generate the data and entity definitions and entity-relationship diagram, contained in the logical model report **(Appendix 1)**, and can produce scripts for database generation. We developed this using the Oracle database, but the CASE tool can generate similar scripts for other commonly used relational databases and we are at present producing these for Ingres. The decision to use Systems Engineer was based simply on the fact that this is the product BGS is familiar with. There is no requirement within GEIXS for other Surveys to load the model into a CASE tool, they simply require documentation of the model and a means of physically implementing it in their own database system. The means of communicating the data model with the OMEGA project will be investigated as discussed under Task T005.

The first draft of the data model was distributed to all EU Geological Surveys for comment. The model comprised a report explaining the model and containing the detailed entity and data descriptions as well as the entity-relationship diagram, and digital script files to allow the generation of the database tables constituting the physical implementation of the model. Comments received on the first draft of the model were used to draw up a revised final version which was also distributed to all Surveys.

Key points of the Logical Data Model

The full logical data model report is included in **Appendix 1** and so it will not be described in detail here. This section identifies key points which should be borne in mind when examining the logical model.

A logical data modelling exercise should be guided by the objective for which the exercise is being carried out - in this case to set up a Web metadata server with a GIS interface for all EU Geological Survey data. This objective imposed certain key requirements which were born in mind during the modelling exercise:

- there should be conformity across Europe
- the physical implementation of the model will be queried on the basis of both spatial and topic criteria
- many of the users of the system will not be geoscientists
- part of the model will be physically implemented in the spatial data structure of the GIS
- there will be a requirement to retrieve on the basis of both direct (numeric) and indirect (descriptive) spatial criteria
- the system should be multi-lingual and, ideally, linguistically transparent
- the time available for data entry is limited
- different Surveys are starting from very different positions

The starting point for designing the model was the CEN prEN 287009 standard. However the requirement for Europe-wide standardisation of coverage meant that the CEN standard needed to be simplified, with the removal of non-essential fields. Without this there would have been a danger that data entry would concentrate on providing a lot of information about a few data sets while omiting others through lack of time. In addition those Surveys with more existing digital data would be much more able to provide this detailed information, resulting in a very inconsistent coverage over Europe. Our aim is to ensure that consistent, albeit simple, information is provided for as many geoscience data sets as possible.

Other modifications of the CEN standard were necessary to accommodate the three-tier data model: catalogue level, index level, and metadata level as described in the GEIXS project description. This model is designed to reflect the hierarchy of, for example, geological maps, a particular series of geological maps, and an individual geological map. On examination of the Surveys' data holdings it became clear that the three-fold hierarchy was a simplification of a more complex hierarchical structure that differered significantly between data sets. In addition, within a single category of data different Surveys hold data to different hierarchical levels. To accommodate this the GEIXS logical model was constructed using two main descriptive tables. One, for the top categorical level, defines data holdings within eleven broad categories. This will be standard throughout Europe. The second, detail table, embodies a multi-level hierarchy allowing the huge range of different types of geoscience data, held at different levels of detail, to be accommodated within the same structure.

The eleven broad categories of geoscience data identified are:

- Bibliography
- Boreholes
- Extractive Industry
- Geochemistry
- Geology
- Geophysics
- Hydrogeology
- Maps
- Mineralogy & Petrology
- Oil & Gas
- Other

A further complication arises from the fact that any dataset may refer to more than one of these categories, such as a geochemical map series or oil exploration boreholes. The model was designed to allow the many to one relationships necessary to accommodate this.

Spatial information needs to be described differently at different levels in the hierarchy. For example when describing the extent of a map series a descriptive term such as 'France' or 'Bavaria' may be most appropriate, whereas when describing the extent of an individual map sheet specific spatial co-ordinates must be used. Similarly in structuring a query a user may want all maps of a particular type within Bavaria, or s/he may want to define, numerically or graphically, a specific area for retrieval. The model accommodates these requirements by implementing both direct and indirect spatial descriptors and linking these to levels in the hierarchy.

As GEIXS is aimed at both non-geoscientists and at non-national data access, it is important the terms used in the database are readily understandable. For example indirect spatial descriptors should use terms that reflect natural areas and are widely known, such as 'Sweden north of the Arctic Circle' or 'the Pyrenees', rather than administrative areas which are both emphemeral and not widely known outside of national boundaries.

The GEIXS project is not considering the fourth level of the data triangle, the actual geodata. However, ideally, there will be a link between GEIXS and the underlying geodata held by the Surveys established in the future. To allow for this future development the model includes a logical entity 'National Survey Link' which will allow for a link to be established between the primary keys used in the underlying geodata and those used by GEIXS.

Physical implementation

Although logical modelling is independent of subsequent physical implementation, CASE software enables the establishment of a direct link between the entities and data items identified in the model and the tables and fields of a relational database. The scripts produced for the GEIXS model reflect this link. In practice however there are other means of implementing a logical model, and in the case of GEIXS the direct spatial entities will probably be implemented in the internal data structure of a GIS. This is an

issue to be resolved in Work Packages 2 & 5. For this reason the scripts produced from the logical model should be seen as a guide to physical implementation of the model rather than a blueprint for it.

As well as providing the table structure many of the dictionary tables were populated and triggers set to constrain database population against these dictionaries. The values in the dictionaries were determined as a result of the review of Surveys' existing data holdings and data models, and constitute a key part of the GEIXS model - they are the means by which standardisation will be achieved. In some cases, such as the dictionary defining the major categories of geoscience data, the values are unlikely to be supplemented during data entry. Other dictionaries, such as the list of Keywords, are likely to have items added during data entry, while others, such as the list of Regions, have been left to be populated by Surveys.

A feature of the GEIXS model, as with most data models, is the use of unique primary keys. It is envisaged these will be generated automatically by the data entry procedures. This raises the question of whether data entry should be to a single central database or to satellite systems operated by the Surveys. The former has the advantage of facilitating centralised management of the dictionaries as well as ensuring unique primary keys are used. It may however prove technically difficult to implement. Satellite systems would be easier to implement, but would require more management to ensure consistency of dictionaries and uniqueness of keys. This issue will be addressed in Work Packages 2 & 3.

Task 009 *ER diagrams in CASE tool formats of selected (demonstration) data sets in the geodata layer of the data triangle with mapping to table level of relational database management systems used with documentation, implementation notes, help files, computer aided training packages and e-mail based support. It is intended that the 3-D data from GEOMIST will be utilised here, together with a small number of other 3-D data suitable for inclusion as demonstrations of 3-D search and retrieve capabilities to support the development of 3-D GIS applications (tasks T031 and T032).*

Geodata Model

The GEOMIST project (ESPRIT Project n° 24481) has defined a 2-D data model at the geodata level called the 'Georelational Data Model'.

The Georelational Data Model represents entities (geological bodies, structural elements, mineral occurrences, lineaments, geophysical stations, etc) as spatial objects of 0, 1 and 2 dimensiones (points, lines, polygons and cells) to which spatial attributes (geographic location or geometric characteristics) and nonspatial attributes (values or properties) are associated. Relationships are the spatial (topology) and nonspatial links between the objects. The most important characteristic of this model is that spatial and attribute data are stored separately in bidimensional tables linked by a unique identifier.

This Georelational Model supports the Entity Relation model. Three different structures have been defined:

i) Coverages to store cartographic vectorial data such as geological units (polygons), geological contacts and structural elements (lines) based on the arc/node structure.

ii) Grids to store raster data such as the distribution of a continuous variable (e.g. gravity and magnetic field)

iii) Images to store digital pictures made up of regularly-spaced cells or pixels.

For the 3-D Geodata Model a geological data set showing spatial integrity and incorporating the Z coordinate has been selected. This data set composed of borehole and geophysical data has been prepared to build up a software application to represent and retrieve 3-D geological data.

Work on this 3-D data set will elucidate if a 3-D object oriented model is more adequate than a 2-D GIS derived model with the Z coordinate added.

3-D Data Set

The objective is to establish an adequate 3-D reference dataset to help define standards for the exchange of 3-D data and in the development of 3-D visualisation tools. As a logical step of the GEOMIST project this task will only be completed in April 98, as stated in the Gantt chart. But constrained by GEIXS timings the requirement of a 3-D data set was scheduled at an early stage. This means that the data set given is provisional, especially because the data model needs to be refined and all the GEIXS

developments about 2-D metadata standards, must be implemented. On the other hand input from OMEGA is also necessary, and the CAS.CADE training programme which will take place shortly is a prerequisite.

Before getting into details about the work done, a few general considerations are in order, as part of the analysis undertaken. This will put in perspective the limitations of the stage reached now and the need to do more work, to get practical results. However we include as part of the report a CD-ROM with the reference data set, a description of data model, the GIS coverages and the metadata.

To adequately define standards for 3-D data, we must define more precisely what we mean by 3-D geo-objects. The subject has been elaborated throughly, but a good reference is still the NATO workshop proceedings of 1989. For our purposes we may consider the objects, from the point of view of the "raw" geoscientific data used to "construct" the geo-objects. Another approach is to consider the objects from the point of view of one of the multiple modes of its representation (mostly as surfaces, volumes, etc or as variations of properties in space with somewhat "fuzzy" geometric boundaries).

In the first case we must describe the different types of "raw" data, needed to create the geo-objects. Obviously a point or line will not qualify, but sections, although 2-D, may constitute building blocks. In general N non-coplanar tuplets with associated lithologies, known or inferred are a minimum requirement. However this is in general a derived product, the starting point being in general 2-D GIS datasets and a number of related tables, appropriately described by the metadata. In the second case a whole new ensemble of classes: faults, layers, bodies, etc, must be developed as part of a 3-D object oriented development environment.

The problem may then be decomposed in three steps:

a) Define the metadata standards of the basic themes and tables, supported by a consistent data model.

b) Develop and/or adapt the tools to represent, query and manipulate such basic themes and tables as 3-D objects.

c) Store such representations in a suitable way, for later fast retrieval, querying and manipulation.

We proceed now to list the different layers of information, contained in the CD-ROM we provide, under headings "Data Model" and "GIS Sets and Metadata". These layers are described in detail in the Progress Report of the GEOMIST project.

1. **Topo base.** Topographic base : Road network, dams, railways, rivers,..

2. **Digital Elevation Model.** Altimetry data.

3. **Geological Cartography**. Geological maps at different scales

4. Boreholes including physical properties. Boreholes drilled for mining purposes in the study area

5. Geophysics

* **Ground data - Electrical.** Geo-electrical surveys data: resistivity and electromagnetic
* **Gravimetry.** Gravity field data
* **Airborne Magnetics.** Magnetic field data from airborne manetic surveys
* **Geological/Geophysical sections.** Derived data on geological/geophysical sections inferred from drill-hole data or geophysical data.

6. Mining data. Mineral occurrences data.

7. Groundwater. Groundwater data concerning boreholes for water

8. Remote Sensing data. LANDSAT TM images and ERS-1 pancromatic images

Task T010 *Evaluation study and report of existing geoscience thesauri and multi-lingual dictionaries; implementation, creation of applications and gateways, documentation, help files and e_mail based support.*

Introduction

If we want to improve communication between geoscientists, there are several aspects to consider:

Language
Meta-information
Norms
Workprocedures/Culture

Language

Presently English is the standard language of exchange between geoscientists, so the exchange of ideas and technology is no real barrier for the educated geologists. This is different for the regional and local specialists, who do not build up enough experience in other languages. Also regional data and knowledge are only available in the national language and thus inaccessible to foreigners. Therefore it is recommended to have tools available for easy translation.

On-line textual translation in all European languages is what is ideally required. For this goal several initiatives on the translation of the grammar have resulted in interesting programs. However, this is outside the scope of this project. Also these programs do not cover the specialized terminology of the geosciences. Many bi-lingual lists are available, but for the geosciences a multi-lingual list of the most common terms in all European languages is paramount.

For organizational and personal communication the common practice is based on the English language. Exchange through letters is gradually being replaced by exchange using E-mail. Reporting is mainly done on paper, but the first signs can be seen that reports are being presented on Webservers.

Meta-information

In order to locate the right documents and databases a compact set of key-words is necessary to describe the content. These standardized terms are put in a list called a thesaurus.

These lists were originally only available for national languages. The international Guidelines for establishment and development of mono-lingual thesauri is ISO 2788-1986.

In the UK British Standard 5723 is used, in France norm NFZ 47-400, and Germany has DIN 1463.

To access foreign information translation tables, multi-lingual dictionaries are used. This requires a lot of work to harmonize tables in order to make them compatible. Guidelines for these are the newer multi-lingual ISO 5964, British Standards 6723, and DIN 1463 Teil 2. Relevant also are the UNISIST-guidelines from UNESCO (Paris Unesco/Unisist 1980)

Presently it is common practice to attach to databases and documents first key-words in the local language, and then by translating these terms to English facilitate access to the information from other countries. For very important databases and documents, next to the national description, an English textual description is provided as well.

The central world collection point for all these English descriptions is the A.G.I. in the United States. They collect every year 80.000 citations.

Norms

If a term like gravel is translated into another language the general meaning could be similar, but the domain wherein this term is valid is often different.

For example, the grain-size of gravel will be located between those of sand on one side and rocks on the other side, but for different countries the actual boundaries could be different.

Also measurement methods and accuracy are incompatible as interest and laboratory practice will differ from region to region. For example the method of measuring water acidity changes from region to region and comparison of results is dangerous.

Work procedures/Culture

As resources and areas of interest of the geosciences are widely scattered around the world, within one country we find only a few of these resources. Sometimes oil is present, or there is an interest in sea-level rise but there is no mining activity. This results in a different emphasis in national geological education and research. Because of these national trends the culture of the geosciences is different in every country, for example Iceland with a large amount of young volcanic material will have a totally different orientation to the Netherlands with only sedimentary formations.

This also implies that geoscience methodology is different, some countries have extensive seismic surveys while other countries mainly work with satellite or aerial photography.

The general need to communicate between countries on a daily basis is small. This is in contrast to other disciplines like meteorology or medicine. Only within a specialism like oil and gas or geohydrology can regular exchange of technology be seen. For oil and gas this is due to the character of the industry, which consists of many multi-national operating companies. Geohydrology is a rather new profession, where the technology can be applied on a small-scale in many different parts of the world.

If international exchange of geological information takes place, it is usually restricted to knowledge or interpreted data. Until now exchange of measurement data is negligible and mainly occurs between participants in international projects.

Summary of experience in different countries

Germany

In the BGR GeoRef is the basis of the national thesaurus Geoline.

A total of 12.000 terms in German-English is available.

Next to the geological terms 3.000 geographic terms are maintained to describe the topography of Germany.

A translation table to French was maintained up to 1994, but was terminated because the French organization INIST changed its policy.

At present the most popular means of international exchange is the new Multi-lingual Thesaurus, in which there is active participation.

There is a continuous exchange of terms and book descriptions with AGI in America.

Contact BGR: Fr. Niedermeyer. Geo-Fiz

UK

GeoRef is the basis of all registration. Queries are made by Geosearch on the extensive Geosaurus databases. The standard for registering documentary information is MARC.

Translation lists to other languages are not actively maintained, all foreign material is first provided with an English translation.

Contact BGR: Miss J.C.Bird.

France

Translation of terms is done by the current Multi-lingual Thesaurus of Geosciences.

GeoRef is the basis for compatibility with the PASCAL/GEODE lexicon.

Netherlands

The NITG-TNO maintains a thesaurus of 30.000 Dutch-English terms.

The underlying framework is GeoRef from the AGI.

Contact: Mrs. L. Apon.

Spain

The Multi-lingual Thesaurus is integrated in the retrieval systems of the ITGE.

Through the GeoMiner database of Spanish Publications translation between different languages can be performed.

Contact: Mr. L. Delgado.

Italy

The national thesaurus, CNR/GEODOC, is compatible with the MTG.

Specialist geoscience thesauri

Elseviers dictionary of Hydrology and waterquality management

in English, French, Spanish, German and Dutch
J.D. van der Tuin

Dictionary of environmental protection technology

in English, French, German and Russian
E. Seidel.

Geological Nomenclature (Deep subsoil)
in English, French, Spanish, German, and Dutch
Royal geological and mining society of the Netherlands

Onshore/offshore Oil and Gas Multilingual Glossary
Commission of the European Community

It is a pity that most of these dictionaries are only available on paper. In the GEIXS project there is a preference for the multi-lingual thesaurus as it digitally available and good cooperation can be established with the developers of this application.

Conclusion on Thesauri

The Multilingual Thesaurus of Geosciences. (MTG) (Gravesteyn, Kortman, Potenza) is internationally accepted.

The following languages are presently covered: (American) English, French, Spanish, German, Russian and Italian. Later Czech and Finnish will be included.

At present it contains 6.000 terms in digital format, and is classified and indexed.

This thesaurus was an initiative of the International Union of Geological Sciences under the supervision of the Commission on the Management and Application of Geoscience Information (IUGS/COGEOINFO), in joint cooperation with ICSTI.

The remaining languages should be included in the longer term: Greece, Dutch, Portuguese, and the Scandinavian and other Slavonian languages.

Document exchange

The future exchange of reports sees a trend towards HTML on webservers. Document management on HTML still needs to be developed.

The SGML standard is a more strict standard for documents, but is only seldom applied in practice.

E-mail

The last few years have seen a fast development of E-mail standardization. From supplier-based systems it has changed world-wide to the following standard:

Network protocol: TCP/IP.

Fileconversion: MIME.

For the Unix-area there is still some enthusiasm for UUCP, but UNIX-workstations are mainly used for heavy calculations and large modeling. In the context of international customers for geoscience data, preference should be given to a PC-based system.

Reference:
American Geological Institute
4220 King street
Alexandria Virginia 22302
United States.

Activity report

Three activities have been performed:

1. Finding support for a Dutch translation of the Multi-lingual Thesaurus. Planning has been carried out, but financing is not yet complete.

2. Acquiring a license from COGEOINFO for the Multi-lingual Thesaurus of Geo-sciences. Because of several organizational changes in COGEOINFO the decision structure was complex and took several months. An acceptance was reached in the middle of September **(Appendix 1)**, and the developing and building process can start now.

3. Investigating and finding background data on thesauri to support the choice of the MTG. BGR has created a subset of terms for use as GEIXS dataset descriptors. At present around 200 such descriptors have been created at the highest level of the MTG hierarchy. These terms are provided in digital form in English, German and French for integration into the metadata catalogue.

With thanks to Mrs. L. Apon, chief librarian of the geological library in Haarlem.

Task T011 *Evaluation study and report of coordinate systems used by data suppliers; development of in/out conversion applications to a common system to be used for georeferencing the data to a common map basis; liaison with OMEGA on POSC standards and with EUROGI on GIS methodology; evaluation of European topographic map data to be used as a common map basis with an acceptable projection on the Web server. Implementation notes, documentation, help files and e-mail based support).*

The question of whether or not coordinates for referencing of geographical data and metadata from national coordinate systems can be accepted, was answered by the members of the Steering Committee. They decided not to accept national grids as the only reference to location or space. In Europe there are too many different systems in use, even inside a country.

It is therefore necessary for the partners to convert coordinates to an accepted common base with their own transformation routines and send these in addition to their national grid coordinates. E-mail contacts showed that all partners can provide geographical coordinates in Longitudes and Latitudes with reference to Greenwich in an accepted format: signed degrees in sDDD MM SS.s. BGR can offer transformation into decimals, when necessary.

The problem of getting a common topographic map base for referencing of GEIXS data has been solved through negotiations with the IGME-working group, which is responsible for the new edition of the *International Geological Map of Europe* with a mandate from the Commission for the Geological Map of the World. Our contact person is Mrs. Kristine Asch (BGR), who made the topographic map base of the geological map available for use in GEIXS as a subset. She worked out a contract on the „Agreement for the provision and the use of spatial data" of the topographic base map (**Appendix 2**). The base map is supplied in digital form (ARC/Info-export formats). It has already been transferred to some of our project partners for evaluation and testing.

The IGME topographic map base is described in the IGME Guidelines, which have been sent to our partners. An overview is given in **appendix 3.** Technical details are given in the guidelines. Projection details are Lambert Conformal Conic with two standard parallels: 30° and 60° N. Meridian of origin is 20° E of Greenwich. The map content can be listed as:

Shorelines, rivers, intermittent streams, canals, lakes, reservoirs, cities. Transportation lines can be added, if tests show their necessity.

In/out conversion applications to the common base map system are given in ARC/Info and ARC/View by giving the projection name = Lambert and the parameters of the standard parallels and the central meridian. In addition to this tool, BGR has a coordinate transformation program to be used without the ARC components. This can be made available to all partners.

Contacts with EUROGI have been established via the German Association for Geoinformation (Deutscher Dachverband für Geoinformation, DDGI) by directly

contacting the project group „Geodaten-Anbieter" and participating in its first meeting on aspects of metadata (Bad Godesberg, 28. August 1997). The GEIXS project and its aims were presented there.

Another very important contact was made with the European Topic Centre on Catalogue of Data Sources (CDS), where metadata concepts have been worked out for the environment. The BGR representative participated in the 4th Workshop on Catalogue of Data Sources and Thesaurus (Hannover, 18.-19. Sept. 1997). Ideas for system integration (from **T003** via **T015** to **T025**) are given in a report by K. KÜHNE (NLfB, N1.26).

At the 3rd EC - GIS workshop at Leuven in June 1997 contacts were made with MEGRIN (an organisation owned by 19 European Mapping Agencies) to obtain the administrative boundaries of Europe at a resolution of 200m. A contract defining the rules and rights of use of this dataset by GEIXS is being negotiated, and a test dataset has been delivered.

Appendix 1

AGREEMENT WITH IUGS/COGEOINFO FOR THE USE OF THE *MULTILINGUAL THESAURUS OF GEOSCIENCES* BY GEIXS

On behalf of CoGeoInfo, I am pleased to agree that the GEIXS project may to use a digital copy of the Multi-Lingual Thesaurus (MT) subject to the following conditions:

1) The agreement is initially for a period of two years from 16 September 1997, with the possibility of renewal thereafter.

2) The GEIXS project meets any direct costs of making the data available, including but not limited to the costs of computer materials, time, postage etc.

3) The GEIXS project takes all necessary steps to ensure that end-users are unable to download, in whole or in part, by whatever means, any of the MT.

4) That the MT is recognised in GEIXS by notices of copyright and intellectual property rights to show that all rights to the MT reside with its authors, their publishers and IUGS (CoGeoInfo) and that the MT is promoted in GEIXS by a hypertext link giving reference to the CoGeoInfo Home Page.

5) A licence to use fee of $1000 (one thousand US dollars) per year is paid by the GEIXS project to CoGeoInfo. This will be used partly in recognition of past efforts and partly to support future extensions of the MT into European languages not currently included.

David Ovadia

Appendix 2

AGREEMENT FOR THE PROVISION AND USE OF SPATIAL DATA

between the **Distributor:**

The Federal Institute for Geosciences and Natural Resources (BGR)
Stilleweg 2
D - *30655* Hannover

Contact:
Phone:
Fax:
E-mail:

and the **User:**
Name of Organisation:
Address:

Contact:
Phone:
Fax:
E-mail:

Object of the Agreement

Digital data of the topographic base map for the International Geological Map of Europe 1:5,000,000 (IGME 5000/2)

Conditions of the Agreement

BGR supplies the User with the current digital data described above free of charge.

The Data are to be used only for the preparation of a draft map for the new edition of the International Geological Map of Europe 1: 5 000 000, which will be compiled by BGR, and the GEIXS-project.

The Data or any product derived from the Data, either digitally or on hardcopy, must not be sold, given away, traded, or leased.

Should the User wish to use the Data for other purposes, e.g., commercially, a special contract for this purpose must be obtained from BGR.

The User is permitted to use the Data in demonstrations and displays provided that the source is properly quoted or a statement acknowledging that the Data were supplied by BGR is displayed on the demonstrated or displayed object.

The Data are put at the disposal of the User until the end of the year 2000, at which time the Data have to be deleted from all Computers of the User or the contract is prolonged otherwise.

This Agreement can be modified or terminated by mutual consent of User and Distributor. This must be done in writing.

Legal measures will be taken in the case that this contract is breached.

Signed for and on behalf of the Distributor:

Name (block letters):
Date:

Signed for and on behalf of the User:

Name (block letters)
Date:

APPENDIX 3

New Edition of the
INTERNATIONAL GEOLOGICAL MAP OF EUROPE

as Common Map Basis for GEIXS

The second edition of the International Geological Map of Europe, scale 1:5 000 000 (IGME 5000/2) was started in December 1994 by BGR under the aegis of the Commission of the Geological Map of the World (CGMW). The new edition of the International Geological Map of Europe 1 : 5 000 000 map will show the most recent geological knowledge on a printed map, on the one hand, and will serve as a basis for a geographic information system (GIS) including a geological database, on the other hand. The geology of both the land and sea areas will be displayed. The map will be compiled by the editor K. Asch (BGR) on the basis of the numerous contributions of more than 50 involved countries.

Commission for
the Geological Map
of the World

BGR
Federal Institute
for Geosciences
and
Natural Resources

PROYECTO ESPRIT 23802

GEOLOGICAL ELECTRONIC INFORMATION EXCHANGE SYSTEM (GEIXS)

HARMONIZATION

JAN JELLEMA
HOST PREUSS

OCTUBRE 1997

PROYECTO ESPRIT 23802

GEOLOGICAL ELECTRONIC INFORMATION EXCHANGE SYSTEM (GEIXS)

PROJECT MANAGEMENT

JOHN LAXTON

FEBRERO 1998

Task T002 *Maintenance of overall project plans showing task outlines, resource outlines, scheduled dates, work breakdown charts, milestones set and reached, critical and non-critical paths, resources used, budget reporting, attention to conflicts, reporting to EU. Also maintenance of links/liaison to related projects GEOMIST and OMEGA to ensure complementarity and shared developments.*

Key points

The second meeting of the GEIXS Steering Committee was held in Brussels on 3/11/97 at which progress with Workpackage 1 was reviewed and the project's hardware and software requirements were discussed. Because of delays in hardware and software purchase it was agreed to initiate Workpackage 2 (creating database structures and input/output applications) using BRGM facilities.

The first GEIXS Review Meeting was held on 4/11/97 in Brussels.

The third meeting of the GEIXS Steering Committee was held in Brussels on 28/1/98. A decision on hardware and software purchase was made, and purchase has been initiated through EuroGeoSurveys. Progress with Workpackage 2 was reviewed.

It was decided the GEIXS server will be hosted by BRGM in the first instance so as to ease application development. If problems are encountered by TNO during the data entry phase (Workpackage 3) with the server being remote it will be moved to Delft for this phase of the project. Otherwise it will remain in Orleans and a decision will be taken by EuroGeoSurveys on where it should be permanently sited after the GEIXS project is finished.

A draft proposal for an East European extension of GEIXS has been drawn up and submitted to Ulrich Boes for comment. This is based on the countries involved with the Syd-Norden project and would be coordinated by Denmark, the Syd-Nordern coordinator.

Dominique Bonte, the GEIXS contact with Matra, has left Matra. This has caused problems in communication with Matra and it has proved difficult to obtain information about Matra's input to the project.

There have been problems in obtaining input from the national surveys of Italy, Greece, and Luxembourg. This has not been a big problem up until now, as their planned contribution to this point has not been significant. Efforts are being made by their respective Steering Group partner countries to ensure these problems are overcome prior to the data entry phase of the project, when their contribution is required.

Good progress has been made with Workpackage 2 with beta versions of the data loading software developed and now being tested by the partner countries. Release versions of the applications are due in March when data loading is scheduled to start.

Summary of work carried out

Task T002

Second and third Steering Group meetings held, first Review Meeting held, monitoring progress, production of review point 2 reports, production of draft East European extension proposal.

Task T003

The final version of the shopping list was compiled after the agreement on hardware and software specifications at the steering committee meeting in November 97 (Appendix 2).

The hardware, the software and the data necessary to construct the "GEIXS" Web server are currently being ordered.

EuroGeoSurveys, via the BRGM, is buying the following hardware and software :

- one SUN Ultra Creator Model 170E server with 10 GB of disk,
- one Workgroup Oracle license, 16 users,
- one license to use SABE200 (administrative limits of Europe) throughout project,

EuroGeoSurveys, via the BGS, is buying the Spatial Data Engine software :

- SDE Workgroup 10 users,

This hardware, software and data will be delivered to the BRGM which will carry out the installation and start the first loading of metadata.

Task T009

Based on the approach to defining 3-D geo-objects described in GEIXS Report 2: Data Models, the "raw" geocientific data to construct geological objects have been chosen.

Different types of elements have been defined to construct the theoretical model. These elements or phenomena are:

Observations
Sections
Method
Geological Objects (qualitative and quantitative)

The GEOMIST data set selected has been examined. Entities have been defined and the E-R diagrams and CASE tool formats are being developed.

A CAS.CADE training programme was held in December and some important aspects must be pointed out. A great deal of software development must be undertaken in order to built a real management, retrieval and visualization system for three-dimensional geodata:

A data entry application must be built

A geological object library must be devoloped

Contacts with other related projects will be established when a minimum skill level in CAS.CADE has been reached.

Task T010

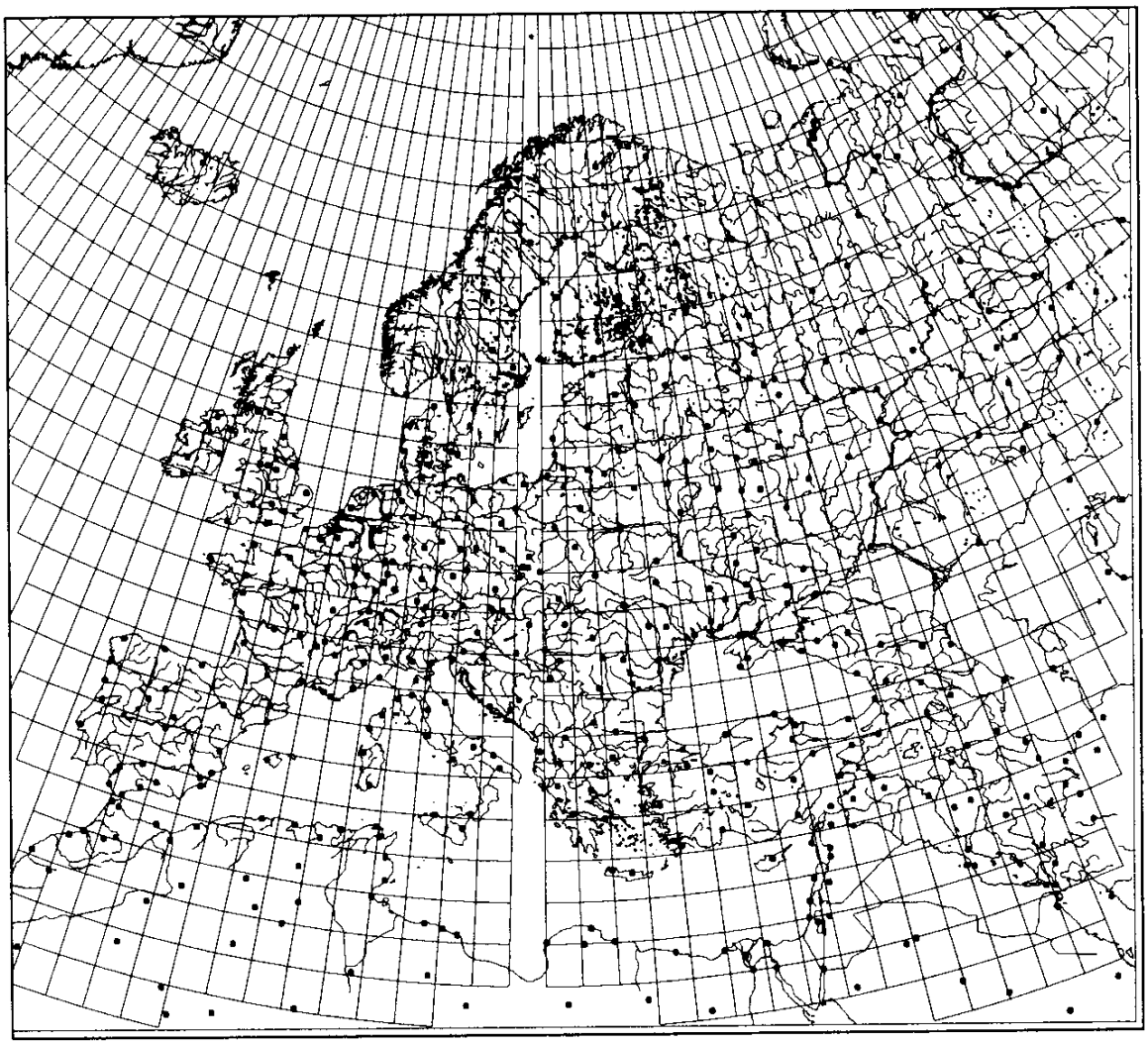
- The first work has been done by entering 3.000 Dutch words in the Multi-ligual thesaurus.
- The license for using the Multi-lingual thesaurus has been acquired.
- Jan Jellema has travelled to Italy to obtain the data and the Thesaurus is already internally in use for GEIXS.
- A design will be made for a translation tool to give the user additional functionality in translating geoscientific terms.
- In BGR the thesaurus Geoline, based on GeoRef, is used for bibliographic references. A total of 12.000 terms in German-English-French is available. Next to the geological terms 3.000 geographic terms are maintained to describe geographic features and regions. There is a continuous exchange of terms and book descriptions with AGI in America and there was active participation in setting up the new Multi-lingual Thesaurus (MT). A number of Geoline terms had been entered there. A subset of about 200 terms for the uppermost level of metadata descriptions was created for GEIXS.

Task T011

1. An extended and revised version of the topographic base map of the IGME 5000/2* to be used as the common base map for GEIXS has been prepared for distribution among the IGME 5000/2 and GEIXS partners via ftp server. A user name and password must be given for downloading. It can be obtained in due time from the IGME 5000/2 coordinator (K. Asch, BGR). For this purpose the map layers are available in ARC/Info E00-export format. The data are prepared for input into the ORACLE database on the GEIXS Web server, where they will be managed by SDE (the Spatial Data Engine, an ESRI-product). Other GIS software can be applied for viewing, feature selection, zooming etc. Tests have been made with ARC/View and the freeware Internet product ARC Explorer.

* IGME 5000/2: International Geological Map of Europe and adjacent areas, scale 1:5 million, see Report 3

Figure 1. IGME 5000/2 Topographic Base Map, exported from ARC/View to MS-Word via CGM-format, and reduced to scale 1:20 million approximately. © BGR



The extensions now cover the western part of Europe and Greenland. A new attribute layer has been created containing the major cities (Annotation is not shown in the example view). The topographic features have a reasonable resolution and an accuracy for scales up to 1:500 000 (in parts up to 1:200 000), which is considered to be sufficient for general overviews in GEIXS.

For detailed views of national data in scales larger than 1:500 000 the Steering Group decided to use SABE (from MEGRIN), which shows administrative areas. Further, a map for the entrance level of GEIXS retrieval has been created by importing the political boundaries of the IGME topographic base map with the same projection into the graphics processing program Freehand, and by exporting a gif-file. This file can be used to click onto the countries for demanding further information by utilization of internet browsers.

2. Since the metadata describing the datasets comprise national and also geographic coordinates, the coordinate transformation program (Appendix 3) had to be modified for implementation into the metadata input module. A well documented ACCESS BASIC routine for conversion of geographic coordinates to Lambert coordinates has been written additionally. The projection parameters used for the IGME 5000/2 are included in this routine so the ACCESS data input module provided by BRGM could be extended by this routine to perform the coordinate transformation to the common base map. Tests of the ACCESS BASIC routine were made with coordinates of different points, which could easily be identified in the map (Centre of Fair Isle/Shetland Islands; Centre of Baltrum/Germany; Butt of Lewis/Hebrides). The accuracy is sufficient for scales ranging from 1:5 000 000 to 1:200 000.

A short description of the transformation routine is given in Appendix 3.

Tasks T014 & T016

A unified application for loading the metadata was developed and is now being tested in the national geological surveys. Each survey will thus use the same application and the same key words to describe its metadata.

Common dictionaries and lexicons have been used in the input application with triggers and control of entered data. These tools will ensure as far as possible data integrity.

A detailed quality plan has been developed comprising: a general document describing the GEIXS system, and in addition documents describing the procedures for specific tasks. All these documents and application are beta versions.

The installation kit for this application and the associated documentation can be downloaded from the prototype GEIXS Web site (http://eurogeosurveys.brgm.fr).

The final version of the data loading application, with documentation, will be distributed at the beginning of March to each survey.

Task T015

An application for automatic consolidation of the metadata collected in the various geological organizations from the regional level up to the European level was developed. In practice, all local metadatabases are initially consolidated into national metadatabases. Then the national metadatabases are consolidated into the European database accessible on the Web. The associated documentation is available as a beta version.

Awareness raising activities

Date	Place
27/11/97	EuroGeoSurveys 7th General Meeting of Directors in Athens. The meeting considered the priorities for applying the GEIXS structure to various fields of geoscience data and agreed to: 1. expand GEIXS to include the non-EU members of the Syd-Norden group of geological surveys within the present time frame (Estonia, Latvia, Lithuania, Norway, Poland and Russia) with Denmark as coordinator; 2. draft a new project proposal for a Surveys-industry interactive database for use by the EU ornamental and construction stone industry.
10/12/97	Meeting between EuroGeoSurveys and UNESCO Division of Earth Sciences, in Brussels. The objectives of GEIXS were explained, with emphasis on its potential application to Developing World work.
21/12/97	Meeting between EuroGeoSurveys and MIRO (Mineral Industry Research Organisation), in Brussels to discuss how to use GEIXS to develop an interactive database for the EU ornamental and construction stone industry.
8/1/98	Meeting between EuroGeoSurveys and the Minister of Geology and Mines, Angola in Brussels. The objectives of GEIXS were explained, with emphasis on its potential application to work in the SADC (Southern Africa Development Corporation) countries.
30/1/98	Meeting between EuroGeoSurveys and Euromines in Brussels to discuss forward plans for GEIXS, including how to use the system to develop an interactive database for use by the EU ornamental and construction stone industry.
5/2/98	Meeting between EuroGeoSurveys and FOREGS in Nottingham to discuss how to expand GEIXS to include the non-EU members of the Syd-Norden group of geological surveys (see 27/11/97 above).
12/2/98	EuroGeoSurveys Urban Geoscience Network (GEURBAN) Information Day in Brussels to discuss plans for work within the EU Urban Agenda, including applications of GEIXS. Invitees included members of the European Parliament, European Commission officials (DG III, DG XI, DG XII, JRC, DG XIII, and DG XVI, European Environment Agency, EU city managers/engineers and the insurance industry.
17/2/98	EOGEO-98 Workshop (Earth Observation & Geo-Spatial Data), Salzburg: Attended by Web and Internet experts from geoscience

institutes, mainly from Europe. GEIXS project presentation by H. PREUSS.

As part of its preparations for the July 1998 GEIXS First User Workshop EuroGeoSurveys also plans to present a brief progress report on GEIXS and its future plans at the 16/3/98 EUROGI Members' Session in Luxembourg. A presentation on GEIXS is also planned for a World Bank meeting on Developing World mineral economies in Paris on 27/3/98.

In order to familiarise the regional organizations, a presentation to the German lander was made on December 18 in Hannover by Denis Bonnefoy and Horst Preuss. A similar meeting will be organised in France in March for the 25 regional geological surveys.

Project success criteria

It is proposed that GEIXS project success criteria be based on the list of **"Project quality indicators"** given in the BRITE-EURAM Coordinators' manual. These are *[with some examples of their application to GEIXS given in italic brackets]*:

- Degree of achievement of objectives and conformity to original objectives
- Innovation level
- Awareness of the state of the art
  [To be heightened through two workshops with users from a wide range of backgrounds.]
- Technological risk
- Quality of management
- Effectiveness of partnership
- Breadth of applicability and potential for technology transfer
  [e.g. use for a whole range of different geoscience information fields and extension of their use to C/E Europe, Former Soviet Union and Developing World. Also use in other EuroGeoSurveys projects with public, research or industrial users such as EUMARSIN (MAST), urban geoscience, groundwater, mineral occurrences, etc, or for other EU users such as the European Environmental Agency and the Joint Research Centre.]
- Impact on safety, social and environmental conditions
- Impact on industrial standards

[GEIXS will upgrade EU metadata standards.]

- Exploitation timing

[Excellent for bringing further applications of GEIXS on-stream during FP V.]

- Size of potential economic impact

[Will enable rapid and cost-effective sharing, transfer and utilisation of the previously inaccessible and very extensive results of quality EU research already carried out.]

- Degree of dissemination of results

[Rapid and cost-effective over wide geographic areas.]

- Patents

Related projects

Link with GF3D and OMEGA:

One of the objectives of the GéoFrance3D project is to develop tools for 3D-modeling of the geological data. A library of geological objects was created within the framework of this project. It is built as a Matra CAS.CADE library and on classes developed in OMEGA.

GéoFrance3D also implements an environment of geological data management ranging from the metadata description (standard CEN) up to the basic geological data level. This is based on the CAS.CADE and OMEGA object library.

The GEIXS metadatabase uses the same standard (CEN) and same basic technologies.

One special type of metadata, the "3D geological model", will be described in the GEIXS metadatabase. An Internet link to the GéoFrance3D and OMEGA projects will be set up on the GEIXS server.

Lastly, an application (entirely written in Java) making it possible to collect and request CEN metadata is under development in the GéoFrance3D programme.

Use of standards

As discussed in GEIXS Progress Report 2 - Data models, the GEIXS logical data model was based on the draft CEN standard for Geographic metadata prEN 287009 (July 1996). At the first GEIXS review meeting it was pointed out that a more recent version of the draft standard was available - prEN 12657 (October 1997). This document was studied and found to be broadly similar to the earlier version, but still very much a working draft document with many cross-references to other as yet unfinished related documents.

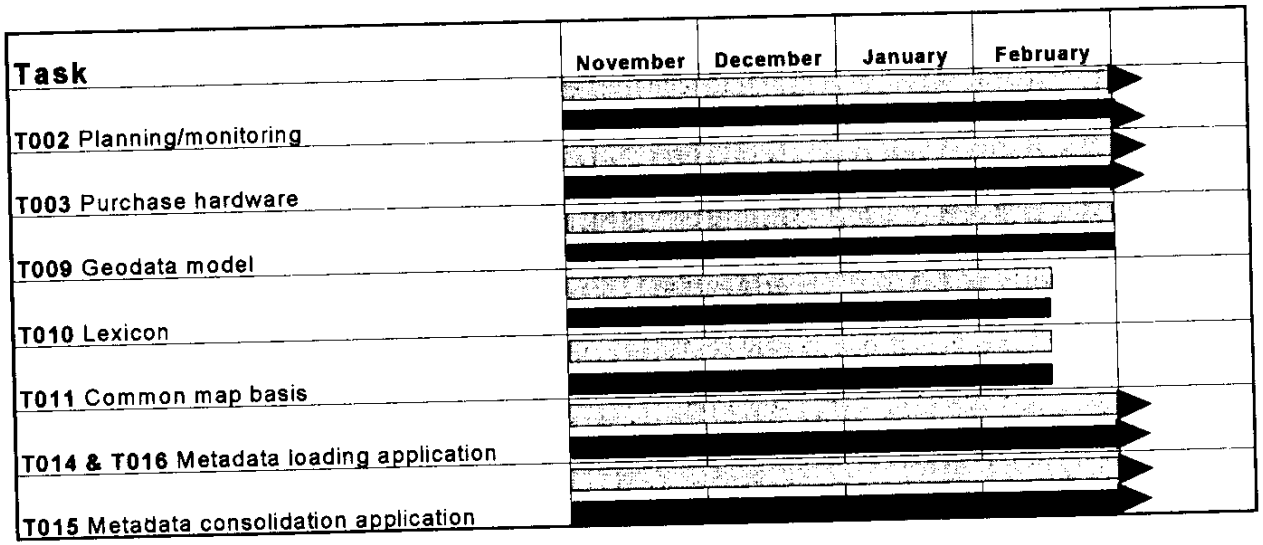
It was decided by the Steering Group that it was essential that the standard against which GEIXS was working was fixed and therefore it was agreed that the development

of the database structures and data entry and retrieval applications (Workpackage 2) would build directly on the GEIXS logical model already developed (Workpackage 1). Any modification of the underlying standards would cause unacceptable delays in the implementation of GEIXS.

At the first GEIXS Review Meeting it was suggested that it would be useful if the experience of GEIXS in applying the CEN Geographic metadata standard to geoscience information could be incorporated in the deliberations of the relevant Technical Committee. In subsequent discussions with Francois Salge it was suggested that this be pursued through the head of the UK delegation to the CEN committee, John Rowley. He in turn referred us to the UK technical representative, Les Rackham of Ordnance Survey. Mr Rackham showed little interest in acting as liaison between GEIXS and CEN. In any case it is questionable whether a European project such as GEIXS should act through a particular national delegation which inevitably has its own agenda. It is still felt that the experience of GEIXS in using the CEN Geographic metadata standard for geoscience data should be fed into the standardisation process, but the means by which this can be done needs to be determined.

Appendix 1

Summary of Phase 2 Progress



The above chart shows two bars for each task active in phase 2 of GEIXS. The hashed bar is for planned progress (after correction of the project plan) and the solid bar for actual progress.

Appendix 2

Technical operational requirement document for hardware, software, and telecommunications equipment for GEIXS**

EuroGeoSurveys*, Brussels, plans to set up a SUN based server for the World-Wide-Web, to serve users of the Internet with metadata from an ORACLE-Database by using a forms dialogue. The hardware alternatives and necessary software are specified as follows:

Hardware specification	**Ultra Enterprise 1 server**	**Ultra Enterprise 450 server**
Processor type	UltraSPARC-I	1 × UltraSPARC-II
Clock speed	167 MHz	250 MHz
external Cache	512 kB	1 MB
Memory	128 MB	128 MB
Harddisk system	Raid-1, SCSI-UW, 10 GB net	Raid-5, SCSI-UW, 10 GB net
Backup system	Exabyte tape drive	Exabyte tape drive
Graphics controller (2 MB)	X	X
Monitor	17 inch	17 inch
Case	tower	tower

Ethernet controller (10/100)	X	X
CD-ROM, 3.5" disk drive	X	X
Country kit (keyboard, documentation)	English, option for Dutch & French	English, option for Dutch & French
Maintenance for hardware after warranty period	X	X
Software specification		
Operating system	Solaris 2.5.1 (upgrade option to Solaris 2.6) server	Solaris 2.5.1 (upgrade option to Solaris 2.6) server
C-Compiler	X	X
Database server (20 licenses for web appl.)	Oracle Workgroup Server 7.3	Oracle Workgroup Server 7.3
Web server	Netscape Enterprise Web Server	Netscape Enterprise Web Server
Spatial Data Engine (ESRI)	X	X
Maintenance for software	X	X
Prices (in ECU)		

Contact person: *D. Bonnefoy*
Address:

Phone:
Fax:

*EuroGeoSurveys is a non-profit making European Association, governed by French law, with membership of the 15 Geological Surveys of the European Union.

**GEIXS (Geological Electronic Information Exchange System) is a EuroGeoSurveys project, sponsored by the EU. It is aimed at serving the public with European geoscientific information of the data catalogue level, index level, and metadata level.

Appendix 3

Description of integrated Coordinate Transformation Routine

Call:
Sub calc_lambert_coo (ByVal phi As Double, ByVal lambda As Double, x_coo, y_coo)

Purpose:
Access Basic routine for calculation of coordinates in Lambert's conformal conic projection from geographic coordinates. This projection is based on two standard parallels making it a secant projection and is well suited for middle latitudes. The total range in latitude should not exceed 35 degrees.

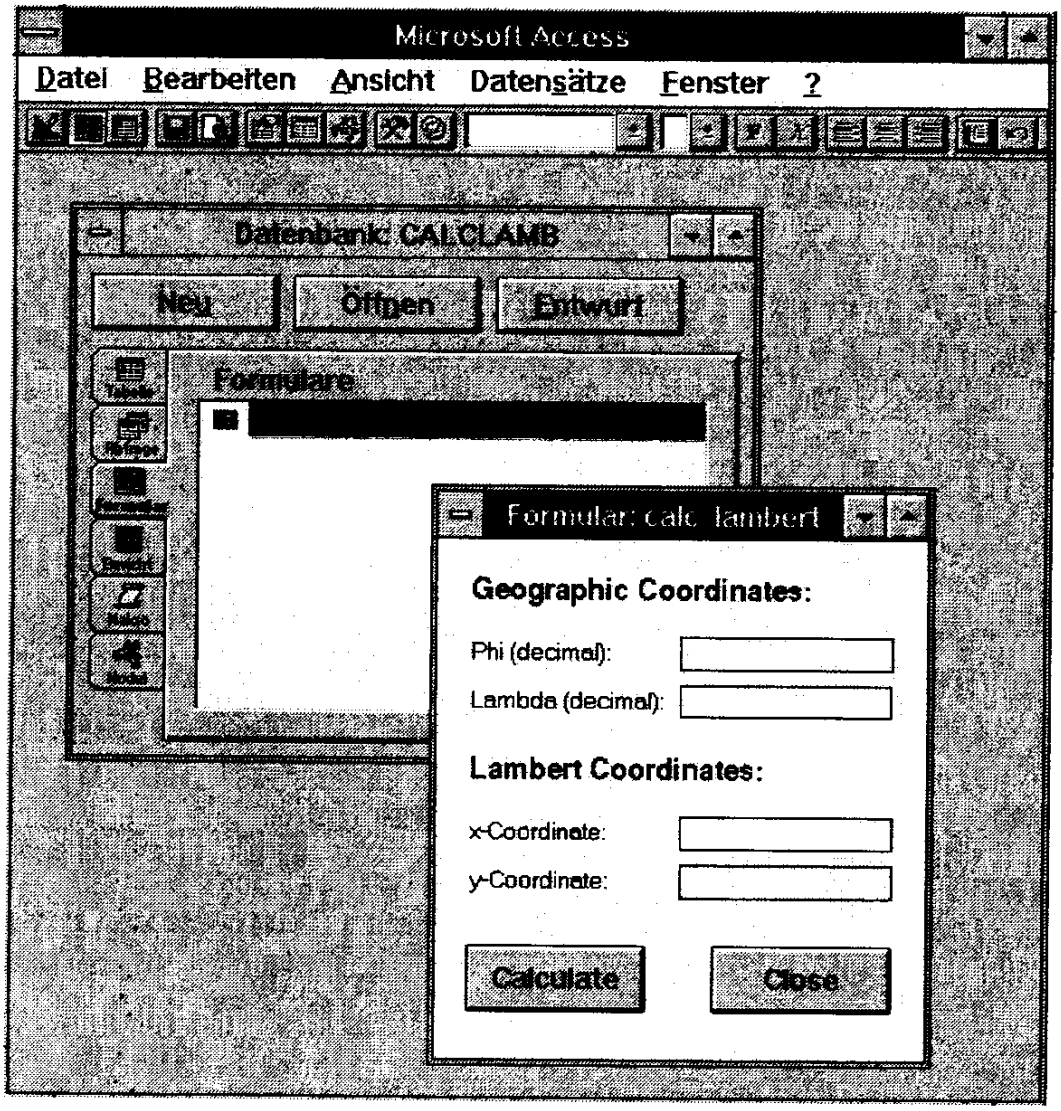
Parameters:
ellipsoid (International, Bessel, WGS72, WGS84, Clarke1866 or Sphere)
phi_1: first standard parallel (in decimal format)
phi_2: second standard parallel (in decimal format)
phi_or: latitude of projection origin (in decimal format)
lam_or: longitude of projection origin (in decimal format)
offset_x: false easting in meters
offset_y: false northing in meters

(parameters used for the IGME 5000/2:
ellipsoid: Sphere
phi_1: 60.0°N
phi_2: 30.0°N
phi_or: 0°
lam_or: 20°E
offset_x: 0.0 m
offset_y: 0.0 m)

Input Values:
phi: geographical latitude (in decimal format)
lambda: geographical longitude (in decimal format)

Output Values:
x_coo: Lambert coordinate east
y_coo: Lambert coordinate north

Input screen for testing the integrated Coordinate Transformation Routine



Appendix 1

Example of multilingual lexicon "Category"

FRANCAIS	ANGLAIS	ALLEMAN	ESPAGNOL	DANOIS	NEERLAND	FINLANDAI	SUEDOIS	GREC	PORTUGAIS
Bibliographie	Bibliography	Bibliographie	Bibliografia	bibliografi	Bibliografie	bibliografia	Bibliografi		Bibliografia
Sondages	Boreholes	Bohrung	Pozo soldeo	boringer	Boringen	kairanrei'ät	Borrhål		Sondagens
Industries	Extractives industry	Rohstoffwirts			Ontrekkingsi	kaivannaisteo	Råämneutvin		Indústria
Géochimie	Geochemistry	Geochemie	Geoquimica	geokemi	Geochemie	geokemia	Geokemi		Geoquímica
Géophysique	Geophysics	Geophysik	Geofisica	geofysik	Geofysica	geofysiikka	Geofysik		Geofísica
Hydrogéologie	Hydrogeology	Hydrogeologi	Hydrogeologi	hydrogeologi	Hydrogeologi	hydrogeologi	Hydrogeologi		Hidrogeologia
Cartes	Maps	Karte	Mapa	kort	Kaarten	kartat	Kartor		Mapas
Minéralogie et	Mineral and petrology	Mineralogie	Mineralogia y	mineralogi og	Mineralogie	mineralogia	Mineralogi		Mineralogia e
Pétrole et gaz	Oil and gas	Öl und Gas	Hidrocarburo	olie og gas	Olie en gas	öljy ja kaasu	Olja och gas		Petróleo e gás
Autre	Other	Anderes	Otro	andet	Andere	muu	Annan		Outros

PROYECTO ESPRIT 23802

GEOLOGICAL ELECTRONIC INFORMATION EXCHANGE SYSTEM (GEIXS)

DATA LOADING

JAN JELLEMA

SEPTIEMBRE 1998

Introduction

The GEIXS work programme is divided into 6 work packages that are further sub-divided into tasks (numbered T0..), each with a deliverable. In addition, there is a project management work package involving the members of the Steering Committee (D, E, F and NL) under the chairmanship of the UK.

The work packages and tasks are listed in Table 1 of Annex A (of the Technical Annex, Part 2). The critical paths and dependencies are shown on the project plan Gannt chart (modified chart of March 1998).

This report is a progress report on Work Package 3 (Data Loading), Tasks T019 & T020, which is carried out under the leadership of NL with contributions from all partners.

Work Package 3 (WP3): Data loading

Purpose

Description of WP3 from the Technical Annex, Part 2: *This is the largest work package in terms of resources utilized and comprises the preparation and delivery by each of the participating national surveys of metadata and index layer data in digital form ready to be loaded to the GEIXS Web server through the applications built in task T014. Although largely routine, it will be necessary to establish clear procedures and work flows, with good project coordination and reporting. At the conclusion of the data loading, final testing and validation will occur. This represents a major milestone / check point in the project.*

Deliverables

Task T019 *Specifications (via standards agreed through the Steering Committee) for and documentation setting out the requirements from national surveys (data providers) of the type, extent, format, metadata descriptors, fields, formats timescales and media of data to be supplied. Work flow records showing receipts, acknowledgements, security copies, actions, activities, reporting on progress. Support by e-mail, telephone and fax.*

Work carried out:

- Testing the Input Application Module (F). A proposal for improvements has been made. Also all comments of the other partners were collected by e-mail. The points were discussed with the developers at BRGM in Orleans on February 16 and 17 1998. The improvements were checked and discussed at the next Brussels meeting.
- The organisation of the lexicon has taken a lot of effort. The list of keywords was discussed and adapted where necessary. The original list was drafted by the BGS in the UK. Thereafter all partners were provided with copies to translate these terms into their own language. Also the other partners were active in explaining and discussing these lists of keywords with their adopted countries. Germany especially promoted a more scientific basis to the terms, which will be an improvement to the definitive presentation.
- Supporting the data-entry process. General instructions were given during the Brussels meeting on March 10 1998. Thereafter many requests for support and assistance were received mostly by E-mail, which were all answered. About 300 E-mails and 20 phone calls were handled.

Examples of complaints or discussions were: the input of polygon information to a data set, the language of the title, and the conversion from the national coordinate system to the central system.

- On 13 July 1998 a meeting was held in Hanover for consultation with H.PREUSS and A. MAUL of BGR, where the first results of data collection from the Deutsche Lander had resulted in clear recommendations and improvements for the whole process of data-entry.
- From June 1998 the data sets began to be submitted. The first were those from Belgium and Sweden. The data were checked and, if necessary, recommendations for improvements were sent back to the participants.

Task T020 *Digital data on agreed media to the specifications set out by task T019 with supporting documentation. [Note - Much of the metadata supplied will be re-worked to the GEIXS harmonized standards from existing national meta databases].*

Work carried out:

1. **Austria (GBA):**
   Up to now about 155 internal metadata-sets have been entered into the GEIXS database. The metadata describes maps (digital and analogue), data sets (digital and analogue) and archives (libraries). The thematic fields which are covered are:
   Geology (mapping Geology, tectonics, palaeontology)
   Hydrogeology
   Engineering Geology (geological risks)
   Environmental Geology
   Geochemistry
   Geophysics (magnetics, electromagnetics, gamma-ray spectroscopy, airborne geophysics)
   Archives and library-reference systems
   Since there was no index- or metadata system at the GBA the Austrian Survey had to start from scratch. About 60 man-days were spent to collect, analyse, describe and enter the data sets into the GEIXS database.

2. **Belgium (GSB)**
   The Geological Survey of Belgium has been very active and was the first to transfer twelve data sets, which has taken about 20 man-days. By the end of September this will have been increased to about 20 data sets.
   A point to note is that several data sets are not updated anymore within the Belgian Survey. Therefore the Belgian Survey is also co-ordinating the input of the newly created Wallonian and Flemish regional surveys.

3. **Denmark (GEUS)**
   In August six data sets were finished. Progress has been slow in July and August because of holidays. It is expected that by the beginning of October the whole set will be completed.
   Up until August about 10 man-days were spent.
   We have to wait a little longer for the Greenland data as fieldtrips are still underway and the geologists have not yet returned.

4. **Finland (GSF)**
   The Finnish Survey had all data sets already complete. The main activity is to write an export-program to transfer the existing content to the GEIXS internal format. After that some checking of the English language translation is necessary

5. **France (BGRM)**
Already in May France had added five data sets to the application. In August another 15 data sets were added. It is expected that before mid-September the work will be completed. The following subjects were covered:

- Subsurface database
- Underground water database
- Geological map of France at 1:50 000 scale
- Gravimetric data of France
- Geochemical data of France
- Vectorised numerical Geological map of France at 1:1 000,000 scale
- Scanned Geological map of France at 1:1 000,000 scale
- Historical Seismicity
- Inventory of Old Factories sites
- Inventory of Ground Movements
- Inventory of underground cavities
- 3D Model of the Massif des Morges
- Piezometric monitoring by the Seine Normandie Agency

A special word of appreciation should be given for all point-information which is also made available through the application.

6. **Germany (BGR):**
BGR has carried out a new inquiry in all its sections to get an overview over the data sets of national and European relevance. The old existing metadata catalogue was outdated and not applicable because the old structure does not compare with the GEIXS metadata structure based on the European standard.

In a preparatory phase the metadata field descriptions from the lists in the GEIXS input application module were translated from English into German. A computer form containing empty data fields, the names, and the descriptions was designed in table format as a WORD document (6 pages per data set description) and sent to all section leaders in paper form. A flyer giving information about GEIXS and the data input task was also sent with the forms. Additional information was given in two meetings with the section leaders (one in the main office in Hanover and another one in the branch office Berlin).

The data input was started in July with the first return of the completed computer forms. The latest version of the input application module from BRGM has been installed on 2 PCs after downloading from the GEIXS server. Not all of the sections have replied to the inquiry call yet, but 48 completed forms with the "full input" description and another 20 forms with the "quick input" description are available now. Others will follow. Data set title, abstract, purpose, data definition, and data set distribution (as shown in the computer forms) have been translated into English, where this was not already given by the senders. Some additional work to harmonise the descriptions was necessary. The work on data input continued through August and will be ready by mid-September.

The preparation of index maps to be included into the meta databases for geographical reference of single map sheets or subsets of cartographic databases has been started. Index maps show the subset status and therefore are highly dynamic for many of the standard map series. They will not be available for all cartographic data sets unless an automatic creation procedure is developed (which is out of the scope of the project).

Metadata preparation and input has taken 40 man days for project personnel so far. Much effort has gone into the details of the descriptions and the support of the complex metadata structures.

7. **Greece (IGME)**
   No progress report received

8. **Italy (DSTN)**
   No progress report received

9. **Ireland (GSI)**
   By mid-August some 50% of the work was finished. At present many maps are being scanned to make them digitally available in the future.

10. **Luxembourg (SGL)**
    As the contact person of Luxembourg is on holiday until September 5, no information is presently available.

11. **The Netherlands. (NITG-TNO)**
    Describing the data sets is an ongoing process, which will also continue into the future. Most data sets were already available in the Dutch language, so it was not necessary to set up a new project organisation. Only the manual translation to the English language and the subsequent checking by the data managers was time-consuming. By June about 20 data sets were available in the GEIXS-system, which has taken about one day for every data set. It is expected that by the end of September 40 data sets will be available and also that 40 working days will have been used.

12. **Norway(NGU)**
    The Norwegian Survey was very eager to start with data-entry, but the data-entry application will not be able to handle the Norwegian language until September. Therefore data entry can only start in the second half of September.

13. **Portugal** (IGM)
    The Geological Survey of Portugal has been quite active, not only was there good communication with the working group, they also offered to complete the Multi-Lingual Thesaurus for the Geosciences in the Portuguese language. The activity of describing the datasets continued until August, after which the complete set will be transferred to the working group.

14. **Spain (ITGE)**
    In May six data sets were already described. At present the work is half way through. It is expected that in October the whole process of data-entry will be finished

15. **Sweden (UGS)**
    The Geological Survey of Sweden has forwarded the first data sets, all perfectly provided with index-polygon sets. Most data sets received show applied geology, but in the future geological maps and mineral deposits will also be added. Considering the many databases available in the Survey it is possible that by the end of September the total number of data sets will increase to 40.

16. **United Kingdom (BGS)**
    The BGS has entered metadata at the 'Quick Entry' level for around 120 data sets. This information was derived from an old paper data catalogue, which is now two years out of date. A print-out was produced from the GEIXS tables which has been sent round data managers for verification and to identify missing data sets. 28 August is the deadline by which responses from all data managers should be received and all corrections to the tables should be finished by 4/9/98. The total data set will be submitted the week beginning 14/9/98 so will be complete before the mid-September deadline.

In addition around 25 ArcView Shape files containing graphic index information and related attributes will be sent. This data comprises around 300Mb, the borehole file for example contains around 700,000 boreholes and is 111Mb in size. This data is currently being processed and it is hoped to have it ready by the end of September. The Spatial Index table will be populated for this data to link the ArcView Shape files to the metadata previously submitted - this has not been done yet.

So far 32 man days have been used on the data loading activity

Overview of all countries, expected final number of data sets.

Name	**Number of data sets**	**Man-days**	**finished**
Austria	155	60	August, 27
Belgium	20	20	October, 15
Denmark	45	50	October, 15
Finland	60	25	September, 7
France	50	55	September, 20
Germany	120	65	September, 15
Greece			
Ireland	40	40?	September, 30
Italy			
Luxembourg			
The Netherlands	45	40	September, 30
Norway	40?	40?	?
Portugal	40	50	August, 28
Spain	45?	50	September, 30
Sweden	40	50	September, 30
United Kingdom	120	50	September, 14.

Not all national reports were clear in detail, so some figures (?) are estimated.

PROYECTO ESPRIT 23802

GEOLOGICAL ELECTRONIC INFORMATION EXCHANGE SYSTEM (GEIXS)

WORKSHOP I

DICK ANNELLS
JOHN LAXTON

SEPTIEMBRE 1998

Task T035 *Technical and logistical arrangements for Workshop 1 with invited end users; publicity; questionnaires and analysis of feedback. Reports.*

1. INTRODUCTION

The aims of the meeting were:

- To demonstrate to users how GEIXS and its potential have developed from April 1997 up to July 1998.
- To explore suggestions to:
  - ensure the continued improvement of GEIXS to fit user needs.
  - ensure the uptake of GEIXS after September 1999.
- To find additional partners to further develop and commercialise GEIXS after September 1999.

The meeting was planned for about 50 people, to involve:

- Representatives of user groups/associations already detailed in the GEIXS progress reports and presentational material.
- People who had already expressed interest in GEIXS to EuroGeoSurveys.

EuroGeoSurveys advertised the meeting in advance on the CORDIS Web site at http://www.cordis.lu as event RCN 10360 and sent out 173 invitations, each including a brief technical outline of the GEIXS project. A wide group of potential users was thus informed of the scope of GEIXS.

A total of 25 people took part in the meeting:

- 3 from industry
- 3 from institutes
- 5 from non-EU Geological Surveys
- 14 from EuroGeoSurveys member organisations

2. THE WORKSHOP PROGRAMME

1 July 1998: GEIXS TODAY
(Day 1) *Moderator: Dr Richard Annells (Secretary General, EuroGeoSurveys, Brussels).*

Morning: Arrival of participants.

13:30 -13:45 Welcome and opening remarks:
Dr Jacques Varet (Director, Service Géologique National, BRGM Orléans).

13:45 - 14:05 Introduction to the GEIXS project and progress to date
Mr Ian Jackson (British Geological Survey, Keyworth: Coordinator of the GEIXS Project)

14:05 - 14:15 General discussion

14:15 - 14:35 European topographic and geological bases (including demonstration).
Dr Horst Preuss (BGR Hannover)

14:35 - 14:45 General discussion

14:45 -15:05 A Multilingual Thesaurus for the Geosciences (including demonstration).
Dr Jan Jellema (NITG-TNO Haarlem).

15:05 - 15:15 General discussion.

15:15 - 15:30 Refreshment break.

15:30 - 15:50 The GEIXS data model and compliance with emerging European and world meta-data standards.
John Laxton (BGS Edinburgh); Per Ryghaug (NGU Trondheim).

15:50 - 16:00 General discussion.

16:00 - 16:20 The GEIXS database and input system (including demonstration of prototype).
Dr Denis Bonnefoy (BRGM Orléans).

16:20 - 16:30 General discussion.

16:30 - 16:50 GEIXS linkages with other projects and agencies: GEOFRANCE 3D, OMEGA and GEOMIST.
Mr Patrick Ledru (Director, GEOFRANCE 3D; BRGM Orléans), Dr Antonio Guillen (BRGM Orléans), Dr Luis Delgado (ITGE Madrid).

16:50 - 17:00 General discussion.

17:00 - 17:30 Open discussion: what do the users think of the GEIXS project and concepts?
Moderator: Mr Ian Jackson (BGS).

17:30 -18:30 Continuation of discussion.

19:30 Aperitif and dinner on le Loiret River.

2 July 1998: (Day 2) **TAKING GEOSCIENCE INFORMATION EXCHANGE INTO THE FUTURE**

Moderator: Dr Richard Annells (Secretary General, EuroGeoSurveys, Brussels).

09:00 - 09:30 The extension of GEIXS in Europe and beyond.
Dr Erik Stenestad (GEUS Copenhagen); Mr Tomasz Mardal (Co-ordinator of the Central Geological Database, Polish Geological Institute, Warsaw)

09:30 - 10:00 General discussion.

10:00 -10:30 The future of GEIXS: - Applications of GEIXS to other programmes and projects in Europe and the wider international field.
Dr Richard Annells (Secretary General, EuroGeoSurveys, Brussels).

10:30 -10:45 General discussion.

10:45 - 11:00 Refreshment break.

11:00 -12:00 The future of GEIXS: - Open discussion and summing up.
Mr Ian Jackson (BGS).

12:00 - 13:30 Buffet lunch at *BRGM Orléans.*

13:45 Participants leave.

3. NOTES ON DISCUSSIONS

[These notes record the main points arising from the discussion sessions held after most presentations - they do not record the points made in the presentations themselves which were documented in the copies of the overheads given to participants.]

Wednesday 1st July

Discussion after Introductory talk by Ian Jackson:

There were questions on exactly what was required from proposed partners in the East European extension and there was concern over potential problems in providing the data. In response it was emphasised that GEIXS is concerned with high-level catalogue information but that the metadata provided must conform to GEIXS standards.

Discussion after talk by Horst Preuss on topographic and geological bases:

There were questions on the accuracy of the transformation routines used in GEIXS - in response it was stated the base map is accurate to 1:500,000 but that the transformation is accurate to 1m. It was suggested there is more accurate alternative software (to 1cm) but in response it was

emphasised that GEIXS was based on free software and that in any case accuracy to 1cm wasn't required.

The lack of roads on the base map was questioned. The problem here is that roads are copyright so would have had to be redigitised. Various data sets had been examined before deciding on that used as the base for the Geological Map of Europe.

Discussion after talk by Jan Jellema on the Multilingual Thesaurus:

There were questions concerning the hierarchy of terms, the addition of new terms, and the compatibility of terms used in different countries. It was stated the aim is to have a single set of terms translated into all languages. The question of the compatibility of the lexicon used in GEIXS with those used elsewhere was raised as was the question of those languages not yet in the thesaurus. It was stated that not all of these problems can be resolved within the context of GEIXS, as we were using an existing thesaurus (not creating one from scratch) so had to accept its limitations.

Discussion after talk by John Laxton on the GEIXS data model:

The fact that there were some incompatibilities between the GEIXS standard and the emerging ISO standard was pointed out. It was felt that the CEN standard, on which the GEIXS standard is based, would converge with the ISO standard and that the ISO standard was likely to emerge as the most widely used. It was pointed out that being an EU project there was some political pressure to use the CEN standard. It was felt that in the future the development of a geoscience profile within the ISO standard framework would be the best approach for further development.

Discussion after talks by Denis Bonnefoy, Patrick Ledru, and Luis Delgado on linkages with other projects:

The ability to feed back corrections to the geological map as a result of 3D examination, as demonstrated by GéoFrance 3D, was seen as very useful. It was noted that this would require very accurate spatial referencing to work.

Open discussion:

It was emphasised again that the ISO metadata standard was most likely to 'win' and this should be borne in mind by GEIXS.

It was suggested that UTM should be used as the GEIXS coordinate system. In response it was pointed out there is only limited data in UTM coordinates but that a conversion to UTM is provided if required.

It was said that what users really want is geodata, not metadata, and there should be a link to this in GEIXS. It was stated that GEIXS is limited to metadata but that a potential new EU project may address geodata. The practicalities of providing users with the geodata they identify in GEIXS need to be addressed

Those surveys not part of GEIXS, particularly those from Eastern Europe, expressed enthusiasm to join. However it was suggested that GEIXS might be too complicated for 'real' users who want interpreted data - GEIXS appeared to be aimed at geoscientists, who want to do their own interpretation. It was pointed out that it is often difficult to get input from 'real' users, as witnessed by the attendees at this Workshop who were almost all from Geological Surveys. This also raised the more fundamental question of the role of Geological Surveys. GEIXS provides a cooperation framework, it doesn't change the underlying role of Surveys.

It was suggested that the GEIXS Web site needs a more fundamental description of its purpose, even down to 'what is geology?'. This needs to be explained before getting into the more detailed functions.

It was pointed that, in terms of commercial exploitation, it was necessary to have a clear identification of who the prospective clients are.

It was noted that there is active development of standards for minerals terminology, but that to get standardisation of European stratigraphic terms would be a major problem.

Thursday 2nd July

Discussion after talk by Erik Stenestad on the extension of GEIXS:

It was suggested that GEIXS might become a *de facto* geoscience metadata standard. The EC wants to see GEIXS disseminated as widely as possible and it has no problem with making the GEIXS Web site and applications available to all. EuroGeoSurveys and Dr Varet (Director SGN, BRGM) saw no problem with wide dissemination of GEIXS - it was a contract requirement of DG III - as long as any funding issues were resolved.

The need for a document describing the minimum requirement for compatibility with the GEIXS standard was expressed. It was pointed out this information is available on the Web site.

It was suggested that the Surveys need to convince DG IA to work with FOREGS to fund further extension of GEIXS. There is no barrier to extension apart from funding.

It was pointed out that if the GEIXS standards are made widely known they can be followed, even if not as part of a formal project extension.

The need for more attribute data was stressed. It was suggested most Surveys have data sets of relevance for internal use, national use, and European/International use. It was felt that those for both national and European/International use should be in GEIXS. It was again pointed out GEIXS is for metadata not geodata but that GEIXS allows more metadata to be input than the minimum standard defined. It also incorporates links to spatial data in Arc files, which can be held in GEIXS, and points to the underlying geodata held by the national Surveys. The need to provide a direct link to this underlying geodata was noted.

Discussion after talk by Dick Annells on the future of GEIXS:

The speaker pointed out that the right to possess Survey data should not be assigned commercially to others by GEIXS or EuroGeoSurveys; the use of data provided by Surveys should be correctly acknowledged. It was pointed out that different Surveys have different policies concerning the dissemination and commercialisation of geodata and this can't be resolved by GEIXS. However the Survey Directors need to formulate a harmonised view on this and on the related question of electronic commerce. The Surveys have a duty to provide data but need to find a means of providing more complex products.

It was pointed out that GEIXS customers are perceived as geoscientists but many potential users of geoscience data are not geoscientists. Perhaps the use of non-geoscientific keywords could help these users? It was suggested this problem was to do with the products the Surveys were providing, rather than with GEIXS.

These questions all emphasised the need to maintain GEIXS after the conclusion of the project and a means of doing this needs to be determined - this is a question for the Survey Directors. The question of whether other projects, which use GEIXS, could help fund the maintenance of GEIXS was raised. Other projects could add other layers to GEIXS thus increasing the value of GEIXS. There is also the issue of organising a possible GEIXS2.

It was suggested that in order to get further funding we needed to demonstrate the relevance of Geological Survey data to users. We also need to raise the profile of Geological Surveys

Open discussion on the future of GEIXS:

It was reported that EuroGeoSurveys are very positive towards funding the future maintenance of GEIXS, but no decision has yet been made.

The question was raised whether future extension of GEIXS should be 'wider' or 'deeper'. It was suggested new 'information platforms', such as for offshore users could be added. It was stated that deeper and wider extension are not mutually exclusive and the aim should be to do both. The Surveys need to discuss the best way forward with the EC. Wider extension could be through new projects. The Surveys should form a common policy on data provision.

It was reported that the EU sees wider extension along with more work on standardisation as being important future developments. Within the 5th Framework it will be necessary to put forward a broad strategy of development of which the EU may fund part.

It was pointed out that there is a lot of current interest in GEIXS from organisations not part of the project and that this should be encouraged. This would generate user feedback to guide future development and could result in GEIXS becoming a *de facto* standard. An attempt to control development too much could be counter-productive. The need to get the Surveys involved in developing international standards was important. Some problems were seen with a 'deeper' extension of GEIXS due to the Surveys' different policies on the exploitation of geodata.

It was noted that the priorities of GEIXS have changed since the project was conceived and the importance of exploitation and dissemination of the project results has increased. It was pointed out that work needs to be done in defining the dissemination activity, in particular to address specific markets. GEIXS should be publicised at as many conferences as possible and Ian Jackson's introductory talk will be made available on the GEIXS server for use by others if required.

4. *PARTICIPANT LIST*

4.1 User Groups

Ms	Marielle	ARREGROS-ROUVREAU	PANGIS-CIFEG	3 Av Claude Guillemin BP-6517	F-45065 ORLEANS Cedex 2	France
Dr	Dana	CAPOVA	Geofond CR	Kostelni 26	170 06 Prague	Czech Republic
Mr.	Olivier	DOLLEY	MATRA		Les Ulis	France
Dr.	Elisabeth	ERDELYI	Hungarian Geological Survey	Stefania 14	H-1143 Budapest	Hungary
Dr.	Max	FERNANDEZ	Royal Museum for Central Africa	Leuvense-steenweg 13	B-3080 TERVUREN	Belgium
Dr.	Janos	HALMAI	Hungarian Geological Survey	P.O Box 106	H-1442 BUDAPEST	Hungary
Dr.	Peter	HEITZMANN	SHGN		Berne	Switzer-land
Mr.	Gerard	LIESENFELT	AFIGEO	136 bis rue de Grenelle	75700 PARIS 07 SP	France
Mr	Tomasz	MARDAL	Polish Geological Institute		Warsaw	Poland
Mr.	Alexandre	PARILUSYAN	MATRA		Les Ulis	France
Mr.	Gordon	RIDDLER	MIRO		Keyworth Nottingham	United Kingdom

4.2 EuroGeoSurveys

Dr.	Richard	ANNELLS	EuroGeoSurveys		Brussels	Belgium
Dr.	Denis	BONNEFOY	BRGM		Orléans	France
Dr	Luis	DELGADO	ITGE		Madrid	Spain
*Dr.	Jacques	DEMANGE	BRGM		Orléans	France
Dr	Bjørn	FOLLESTAD	NGU		Trondheim	Norway
Dr.	Antonio	GUILLEN	BRGM		Orléans	France
Mr	Ian	JACKSON	BGS		Keyworth	United Kingdom
Ir	Jan	JELLEMA	NITG-TNO		Haarlem	The Netherlands
Mr	John	LAXTON	BGS		Edinburgh	United Kingdom
Dr.	Patrick	LEDRU	BRGM		Orléans	France
Dr.	Per	RYGHAUG	NGU		Trondheim	Norway
Dr.	Andreas	MAUL	BGR		Hannover	Germany
Dr.	Horst	PREUSS	BGR		Hannover	Germany
Dr.	Erik	STENESTAD	GEUS		Copenhagen	Danmark
Dr.	Jacques	VARET	BRGM		Orléans	France

* Part attendance

PROYECTO ESPRIT 23802

GEOLOGICAL ELECTRONIC INFORMATION EXCHANGE SYSTEM (GEIXS)

PROJECT MANAGEMENT

JOHN LAXTON

SEPTIEMBRE 1998

Task T002 *Maintenance of overall project plans showing task outlines, resource outlines, scheduled dates, work breakdown charts, milestones set and reached, critical and non-critical paths, resources used, budget reporting, attention to conflicts, reporting to EU. Also maintenance of links/liaison to related projects GEOMIST and OMEGA to ensure complementarity and shared developments.*

Key points

The fourth meeting of the GEIXS Steering Committee was held in Brussels on 9/3/98. A revised project plan was presented and agreed. It was reported that Work Package 2 was almost complete and the data load application would be imminently distributed to all partners. It was reported Work Package 5 had started ahead of schedule. Erik Stenestad (DK) joined the Steering Committee and agreed to coordinate the proposed East European extension.

The second GEIXS Review Meeting was held in Brussels on 10/3/98.

Work Package 2 has been completed with the Data Loading application distributed to partners on schedule at the end of March.

A proposal for an East European extension of GEIXS was drawn up involving Armenia, Bulgaria, Estonia, Hungary, Latvia, Lithuania, Norway, Poland, and Russia. This went through several iterations and resulted finally in a revised version of the GEIXS Technical Annex being submitted to the EU Commission in early August. This revised Annex also proposed an extension of the project to account for the three month delay in starting.

The time that has been required on GEIXS project management has proved significantly greater than originally budgeted for. If the extension proposal is approved this situation will be exacerbated. This needs to be considered as part of the review of the distribution of project funds described in section 2.2.4 of part 2 of the Technical Annex.

Work Package 4 has been completed with all necessary software and hardware purchased and installed at BRGM in Orléans.

Contact was made with the European Spatial Metadata Infrastructure (ESMI) project and a presentation on GEIXS was made at the 1st ESMI Panel Workshop in Lisbon in May.

Good progress has been made with Work Package 3 (Data Loading) and this activity is on schedule. Communication has still proved difficult with the National Surveys of Greece, Italy, and Luxembourg.

Good progress has been made with Work Package 5 (Retrieval tools) with a demonstration 2D retrieval application available on the GEIXS WWW site for review by the partners.

The fifth meeting of the GEIXS Steering Committee was held in Orléans on 30/6/98. Progress with data loading was reviewed. The retrieval application was demonstrated and discussed. The maintenance of GEIXS after the end of the project was discussed and it was agreed a proposal on this would be submitted to the EuroGeoSurveys executive for consideration.

The first GEIXS Workshop was held in Orléans on 1/7/98 & 2/7/98. Most of the attendees were from National Geological Surveys including several from Eastern Europe. Useful discussions took place on the future development of GEIXS, in particular on the best way to conform with developing International metadata standards and on how best to extend GEIXS. It was clear there is a high level of interest amongst National Surveys, particularly in Eastern Europe, to participate in GEIXS. The question of providing geodata, as opposed to metadata, through GEIXS was discussed. This was generally considered desirable but it was noted that different National Surveys have very different policies concerning the provision of geodata which will make such a development difficult.

Contact with Matra was reestablished after the departure of Dominique Bonté from the company, and Matra representatives attended the GEIXS Workshop. Discussions took place with the company on its rôle in the project.

Summary of work carried out

Task T002

Fourth and fifth Steering Group meetings held, second Review Meeting held, first Workshop held, monitoring progress, production of review point 3 reports, production of revised Technical Annex.

Task T003a

BRGM has purchased on behalf of EuroGeoSurveys all the hardware and the software necessary for GEIXS, with the exception of SDE. SDE was purchased by BGS on behalf of EuroGeoSurveys, as a better price could be obtained from ESRI in the UK. This task is now completed.

Task T003b

BRGM obtained and set up a web address (http://eurogeosurveys.brgm.fr) for GEIXS. The site is maintained by BRGM for GEIXS. The data loading application and accompanying documentation have been made available to project partners on the site. The 2D retrieval application has been made available for review on the site.

Task T010

The first lexicon was drafted by BGS at the beginning of 1997. This list consisted of 250 terms and was originally only available in the English language. The main use of this was the GEIXS input application, and therefore the terms were distributed in several normalised database files by BGRM.

It was the task of the Netherlands representative to take care of the translation into other languages and to optimise and up-date the list during the period of data entry. The lexicon was therefore distributed to all partners to include their own translation in the second half of 1997. After the return of the input forms the translated terms were added to the lexicon. This still required a lot manual typing.

The main difficulty appeared to be the Greek characters, which could not be handled by the input application. Although the Greek addition to the lexicon has been received, it has not been added to the list and the Greek Survey has been kindly requested to use another language for input.

During 1998 the bulk of data entry was carried out and as result of this activity regular requests to add or change keywords were received. Of course every specialist prefers his own set of keywords to discriminate his work from other specialisms. On the other hand some keywords were so global, like the keyword 'map', that they have no discriminating effect. Several keywords like 'Samba' and 'Dalradian' have not been used so far.

In conclusion, it became clear during data entry that maintaining a lexicon is a continuous task, it should grow with the data sets and to find an optimum configuration needs a lot of consideration and discussion. A difficulty is that every change needs to be translated into six languages, for which the help of all partners is needed, and all data already entered then needs to be adapted retrospectively to the new standard.

During the last six months the availability of the Multi-Lingual Thesaurus for the Geosciences was a great boost.

All new versions of the lexicon were sent to the central server at the BRGM in Orléans. The fourth version including the Norwegian terms was sent on August 12, 1998.

A requirement to use less scientific keywords became apparent, in order to make the databases more user-friendly and open to the public. Geo-scientific terms are often hard to understand by local contractors and small industries.

The organisation of the first version of the lexicon required about fourteen days from the Dutch Partner, and one and a half days from the other countries. During the last six months maintaining the lexicon required nearly one day every month from the Dutch partner. This activity has to continue until the last data set is entered.

Task T011

BRGM has negotiated with MEGRIN on behalf of EuroGeoSurveys and finally bought the administrative limits of Europe for the duration of the project. These data were delivered by Megrin. Some further processing was carried out (creation of hierarchy of the administrative units) and the data were then loaded onto the GEIXS server. The preparatory work on the data was important.

The negotiation of an endorsement to the contract for the addition of SABE data for Norway and the countries of Eastern Europe is current.

Task T014

The final version of the metadata input application and documentation was disseminated to all fifteen National Geological Survey partners on schedule at the end of March. The mechanism of update of the lexicons was developed in connection with the Geological Survey of the Netherlands. This task is now completed.

Tasks T019 & T020

These tasks are described in the accompanying 'Report 8: Data Loading'.

Tasks T024-026

The hardware and software necessary for GEIXS have been delivered to BRGM and installed. They are now operational. The hardware comprises: a Sun Server Ultra 1 Creator 170E with 128 GB RAM, 10 GB, Disk Raid1, CROM, and DAT. The Sun Solaris operating system has also been installed.

The Oracle data base management system has been installed. ESRI Spatial Data Engine has been installed.

A CAS.CAD runtime license has also been ordered and has now been delivered (Unix version because Windows NT is not yet available).

Security mechanisms for the GEIXS Web server were installed. It is protected from external access by the use of the firewall in BRGM. Today, the GEIXS server is installed inside the BRGM firewall and is not accessible from the outside. It is used as a development and test computer. The prototype is hosted on the Web hardware of BRGM and located outside the firewall. The address of this prototype is http://eurogeosurveys.brgm.fr.

Data security mechanisms are also in place. Every day, the modified data on the GEIXS server are saved selectively and all the data are saved weekly.

The 'users' and 'administrator' accounts were opened.

These tasks are now completed.

Task T029

The specification of the GEIXS web server has been drawn up and was presented to all partners at the March meeting. The specification includes the presentation of the GEIXS project, thematic search of metadata, and geographic (2D) search of metadata. The partners have validated the specification. This task is now completed.

Task T030

The development of the 2D retrieval system is now 85% complete (see http://eurogeosurveys.brgm.fr). The final functionality to be developed is:

- Use of the latest version of IGME data for GIS searching,
- Spatial index management,
- Translation into more European languages (today only French and English are available)

These developments will be done before the end of 1998.

Norway has been added to the GEIXS home page and the GIS search.

On line documentation is available.

Integration of East European countries will require some more work for which no funds are available at present.

Tasks T031 & T032

The specification for the 3D demonstrator is complete and was presented at the last Review Meeting and at the first Workshop. The concept is to describe a 3D geological model by using the formalism of the European metadata standard (overview, spatial extent, quality, and administrative information). This geological model is based on an application developed using CAS.CAD software in the GEOMIST and GeOFRANCE3D projects. The geometry of the geological model is stored in the form of VRML files in the GEIXS metadatabase and can be visualised using VRML plug-ins in the web browser.

The co-operation established between the BRGM/GeoFrance-3D and ITGE/Geomist projects has been used to address these tasks.

Task T035

The first GEIXS Workshop was held at BRGM Orléans on 1/7/98 & 2/7/98. This task is described in the accompanying 'Report 9: Workshop 1'.

Awareness raising activities

Date	Place
16/3/98	EUROGI Members' Session, Luxembourg. Dick Annells gave a report on the progress of GEIXS and its future plans.
27/3/98	World Bank meeting on Developing World Mineral Economies, Paris. Dick Annells made a presentation on GEIXS.
11-13/5/98	Central European Initiative meeting, Bucharest. Ian Jackson gave a presentation on the GEIXS project and progress to date.
18-21/5/98	GIS and the Earthsciences conference, Ljubljana. Ian Jackson gave a presentation on the GEIXS project and progress to date.

26-27/5/98 1st European Spatial Metadata Infrastructure (ESMI) Panel Workshop, Lisbon. John Laxton gave a presentation on GEIXS and participated in the panel discussions.

24-26/6/98 4th EC GIS Workshop, Budapest. Luis Delgado gave a paper entitled 'GEIXS Harmonised Geological Information System for Europe'.

1-2/7/98 1st GEIXS User Workshop, Orléans. Presentations on GEIXS and discussions on its future development.

Project Critical Success Criteria

Draft critical success criteria have been drawn up and sent to all partners for comment. They will be discussed at the sixth Steering Group meeting on 28/9/98 and presented at the third Review Meeting on 29/9/98. Subsequent to these discussions a final version of the criteria will be drawn up.

GEIXS needs to develop criteria by which the success of the project can be judged. Ideally these should be objective and measurable, although inevitably for some criteria hard measures will be difficult to define. There follows a list of provisional GEIXS success criteria designed to cover all aspects of the project, along with proposed measures for each (**in bold**), and some explanation (*in italics*).

1. Development of GEIXS. **Meeting project development milestones as defined in the project plan.** *The revised GEIXS project plan (March 1998) gives clear completion points for each GEIXS task, so success during the development phase can be measured by the successful completion of each task by the defined time.*

2. Metadata entry. **The percentage of a Survey's data holdings referenced by the GEIXS metadata.** *The amount of metadata in GEIXS at the end of the data loading phase is a key criterion of success, but measuring this is difficult. A simple measure of the number of metadata records in the system is of less value than a measure of the percentage of a Survey's data holdings referenced by GEIXS.*

3. WWW site usage. **Number of visits to the GEIXS WWW site.** *The business generated by the GEIXS metadata service is one of the most important criteria of the project's success. Ideally we would measure this directly, but as GEIXS simply points users to the data provision services of the National Surveys it will not be possible to specifically measure the volume of business attributable to GEIXS. The measure of number of visits to the GEIXS site will crudely reflect business generated, and is a measure commonly used on WWW sites for this purpose.*

4. Harmonisation of National Surveys metadata. **The number of National Surveys which either use GEIXS as their metadata system or establish a close link between GEIXS and their internal metadata system.** *GEIXS provides a harmonised metadata system so the more this is used by the National Surveys internally the more will European geoscience metadata be genuinely harmonised.*

5. Harmonisation of GEIXS with National and European Spatial Data Infrastructures. **The number of National and European Spatial Data Infrastructures to which a link is established by GEIXS.** *Several European countries are establishing National Spatial Data Infrastructures, and there are similar initiatives at a European level (eg the ESMI project). The more GEIXS is integrated with, or at least linked to, these systems the more accessible it will be and thus the more it will be used.*

6. Collaboration of the GEIXS partners. **Evidence of the active involvement of all partners – input of metadata, contribution to discussions, attendance at meetings.** *GEIXS involves the partnership of all 15 EU National Geological Surveys, along with Matra and EuroGeoSurveys. This is the first time all 15 EU National Surveys have worked together on a project and their ability to collaborate effectively is itself a criterion of the success of GEIXS.*

7. Conformance to International Standards. **Demonstrated links between GEIXS and relevant International Standards.** *Spatial metadata standards are being actively developed at the National, European, and International levels. In order to be widely adopted it is important that GEIXS conform to the relevant standards. This is likely to require GEIXS to be reappraised once a single international standard has emerged.*

8. Acceptance of GEIXS as de facto geoscience metadata standard. **Evidence of non-partner organisations, or other projects, conforming to the GEIXS standard or wishing to add their data to the GEIXS system.** *A measure of the success of GEIXS is the extent to which organisations which are not project partners adopt the standards developed in the project.*

9. Widespread dissemination of the project results and methodology. **The number of conferences and other fora at which GEIXS has been presented.** *It is important for the success of GEIXS that the project results are widely known amongst relevant potential users. Presentation of GEIXS at conferences and other fora is a good way of achieving this.*

10. Continuation of GEIXS after the project. **An agreed plan for the maintenance and update of GEIXS after the completion of the project.** *For GEIXS to be a success it must continue to be used, maintained, and have new metadata added to it after the project that developed it has finished.*

Rôle of Matra

Following Steering Group decisions on the selection of software, Matra's absence from the first two Review Meetings and the resignation of their GEIXS contact (Dominique Bonté), Matra's contribution to GEIXS had been a subject of serious concern for the project management team. This concern had been relayed to Matra's senior management and has now resulted in an affirmation of their intention to be actively involved in GEIXS. Matra representatives attended the first GEIXS workshop in Orléans (and the problems of their potential contribution were discussed

in the margins of the meeting). They are scheduled to attend the third GEIXS Review Meeting in Brussels when Matra's future contribution can be further assessed.

Metadata infrastructures and standards

At the 2nd GEIXS Review Meeting the need to establish links between GEIXS and the various National Spatial Data Infrastructures (NSDI) which are being developed throughout Europe was emphasised. There is also an INFO 2000 funded project to develop a European Spatial Metadata Infrastructure (ESMI) the objective of which is 'to establish a framework for the distribution of geographic information by creating a universal metadata service'. A presentation on GEIXS was made at the 1st ESMI Panel Workshop, organised by EUROGI, and contacts established with both the ESMI project and EUROGI. Much interest was expressed in GEIXS as the project has already addressed many of the problems with which ESMI is faced, particularly in the area of metadata standards. It was clear from the discussions that ESMI recognises that there are many existing metadata systems, such as GEIXS, and that ESMI's aim should be to provide a framework to link these together rather than attempt to replace or duplicate them. Such a framework will also link the various National Spatial Metadata Infrastructures.

The ongoing development of various spatial metadata standards at the National, European, and International levels is being kept under close review. As discussed in GEIXS Report 6: Project Management (February 1998) it has been agreed that for the duration of the GEIXS project the draft CEN standard prEN 287009 will continue to be used, as it is not practical to revise the underlying data model during project development. However the issue of standards compliance was extensively discussed at the 1st GEIXS Workshop at which the general view was that the emerging ISO spatial metadata standard is the one likely to gain the widest acceptance. It was also noted that the CEN and ISO standards were likely to converge. A key part of the ISO standard will be a framework for the development of specific topic profiles. It was generally felt that there was a need to develop such a profile for the geosciences, and that GEIXS was in a position to provide significant input to this on the basis of our experience. If a geoscience profile is developed then GEIXS should be adjusted to ensure conformity with it.

Links between GEIXS and National Surveys internal metadata systems

At the second Review Meeting a statement was requested on the links between GEIXS and the internal geoscience metadata systems, if any, used by the National Survey partners. These are as follows:

1. **Austria:** No internal metadata system and GEIXS will be used internally.
2. **Belgium:** No internal metadata system and GEIXS will be used internally in the near future.
3. **Denmark:** GEUS has no digital metadata system on the GEIXS level. On several occasions reports on the contents of databases, map archives etc. have been produced to answer questionnaires from other governmental bodies whose

responsibility it is to keep track of all data registered in governmental institutions. These reports have only been snapshots at the minimum necessary level of detail.

As a result of an ongoing programme related to databases on oil and gas, groundwater, quaternary geology, and Greenland data GEUS now has very detailed metadata descriptions for most digital data.

The establishment and maintenance of a metadata system is currently under consideration, and if it is decided to proceed with this GEIXS is likely to be used.

4. **Finland:** GSF will build a link from existing metadata pages to GEIXS.
5. **France:** BRGM has no internal metadata system and GEIXS will be used as the metadata management system. One regional initiative is running to create a local metadatabase (Région Pays de la Loire) by using the GEIXS tools and data model. The metadatabase will describe all geographical (including geological) data sets available in the 'Pays de la Loire' region. The end-product will be an Internet server and a freely available CD ROM.
6. **Germany:** The old and outdated BGR metadata catalogue (MDK) will be replaced by the GEIXS metadata system, using the European standard, for the detailed descriptions of the internally managed metadata.
7. **Greece:** No report received.
8. **Ireland:** GSI has other internal metadata systems and is considering replacing these with GEIXS.
9. **Italy:** No report received.
10. **Luxembourg:** No report received.
11. **Netherlands:** TNO use GEIXS as the internal metadata system and hope in the future to integrate this with the Dutch national system on www.geoplaza.nl. At present textual data is just copied from one system to the other.
12. **Portugal:** IGM is just beginning to create an internal metadata system and intend to adopt the GEIXS metadata model. The work that has been done within the GEIXS partnership has both provided a lot of knowledge and a data model that can be used as a starting point for IGM requirements. IGM intend to have the two systems linked so that both GEIXS and the internal metadata system can be updated at the same.
13. **Spain:** No report received.
14. **Sweden:** UGS is working on an internal metadata system and aims to:
    - update GEIXS metadata index files from it as automatically as possible
    - update GEIXS data with links when we have something to link to
15. **United Kingdom:** BGS is in the process of developing an internal metadata system for use by BGS staff. The GEIXS data model has been a key input to the design of this. It is intended there should be close links between the internal system and GEIXS so that a single data entry system populates both databases. GEIXS will be used as the BGS 'public' metadata system.

The Future of GEIXS Beyond the Current EC Funded Project

This issue has been discussed, informally by members of the project management team and formally at the Steering Group Meeting in Orleans on 30 June 1998 and the Workshop which followed. The fundamental need is to maintain the GEIXS system. This is recognised by EuroGeoSurveys and a formal request to fund maintenance is with their Executive. A firm proposal for "GEIXS2" has, however, still to be developed. Ideas include the need to ensure other projects capitalise on GEIXS (and perhaps extend it); the addition of offshore data; and the wider dissemination and adoption of the GEIXS system (by other countries) so that it not only acquires more extensive (wider) data but also becomes a de facto standard.

The V Framework Programme may provide support for these objectives which should be set within a strategic GEIXS programme. The call for proposals for the V Framework programme will be at the end of 1998.

East European extension

Background

The Syd-Norden Programme (SNP) proposed in 1997 a metadata base project - Baltic Region Information on Geology (BRIG), which had the same aims as the GEIXS metadatabase project. The SNP partners (the National Geological Surveys of the ten countries bordering the Baltic Sea) proposed that BRIG should preferably use the same formats and standards as GEIXS with a view to combine the two databases at a later stage. This aim was endorsed by the GEIXS steering committee. Subsequently the possible extension of GEIXS was discussed and it was suggested that BRIG might be a first step of the extension because the SNP network already existed and was active. In the first extension proposal the non-EU members of the SNP were proposed as new project partners. It was revealed that Norway could not be financed by the EU because Norway is neither a member of the EU nor an Eastern European Country. However Norway could be included if funding was provided from within the existing GEIXS project budget by reallocation of money from existing partners. Further, the Commission expressed the opinion that Central and South-Eastern European countries should be included in the extension.

The Commission also expressed the view that disseminating knowledge about GEIXS and the techniques used widely within the CCE and NIS countries, beyond just the proposed new partners, should be an important additional objective of the extension. For this reason an Awareness Raising Workshop to be held in Eastern Europe is proposed.

A revised version of the complete GEIXS Technical Annexe, incorporating the proposed new partners, the new tasks, and extended timescale, was drawn up and submitted to the EU Commission in early August in draft form for consideration.

Present status

Partners

The present proposal now has the following partners:

- Armenia Institute for Informatics and Automation Problems - Yerevan,
- Bulgaria Technical University of Sofia - Programming and Computer Systems Applications (PIIS) Department,
- Estonia Geological Survey of Estonia - Tallinn,
- Hungary Hungarian Geological Survey - Information Centre - Budapest,
- Latvia State Geological Survey of Latvia - Riga,
- Lithuania Geological Survey of Lithuania - Vilnius,
- Norway Geological Survey of Norway – Trondheim,
- Poland Panstwowy Instytut Geologiczny - Warsaw,
- Russia North-West Regional Geological Centre - St. Petersburg.

Organisation

The co-ordination of data loading by the new partners has been undertaken by the Geological Survey of Denmark and Greenland (GEUS) in co-operation with the National Geological Surveys of Finland, Norway, and Sweden. The Geological Survey of Austria has kindly agreed to assist GEUS in the co-ordination of the contributions from Armenia, Bulgaria, and Hungary. The co-ordination will not be reimbursed by the Commission. The Hungarian Geological Survey will organise the proposed Awareness Raising Workshop.

Actions

On 7 July 1998 all extension partners were informed by e-mail about the status of the extension proposal. On 7 August 1998 a letter was sent to all extension partners with two enclosures:

- System GEIXS - User's guide,
- A Draft of this status report for comment by 17 August.

Plans

The GEIXS extension project will start in October assuming that the formal contract is signed in time. The eight project partners and the co-ordinators will use the existing information exchange network to discuss problems and progress, and for the exchange of data. The co-ordinator of the GEIXS extension project will participate in the meetings of the GEIXS Steering Committee and the Review meetings with the Commission, and report on status and progress.

1 - INTRODUCTION

This 3D demonstrator is to make a link between the two ESPRIT projects OMEGA and GEOMIST.
The development of this 3D DEMONSTRATOR will be available only on NT platform.
The partner involved in this task are :

- ITGE for GEOMIST
- Matra Datavision for GEOMIST and OMEGA
- Beicip Franlab for OMEGA.

This task is just began and progress will be reported trough the different steps.
This progress report is to detail the different steps of the development of the 3D DEMONSTRATOR. Those steps have to be validate by both ITGE and Matra. That is why a collaboration between each other is required. Furthermore, a specilist analysis is required for a good modelling of geological entities.

The workplan schedulded is detailed in the second part of this report.

2 - WORK PLAN

The workplan is splited into 6 steps.

STEP 1 : VALIDATION OF THE 3D DATA SET

The 3D Data set sent to Matra Datavision two weeks ago, includes two files :

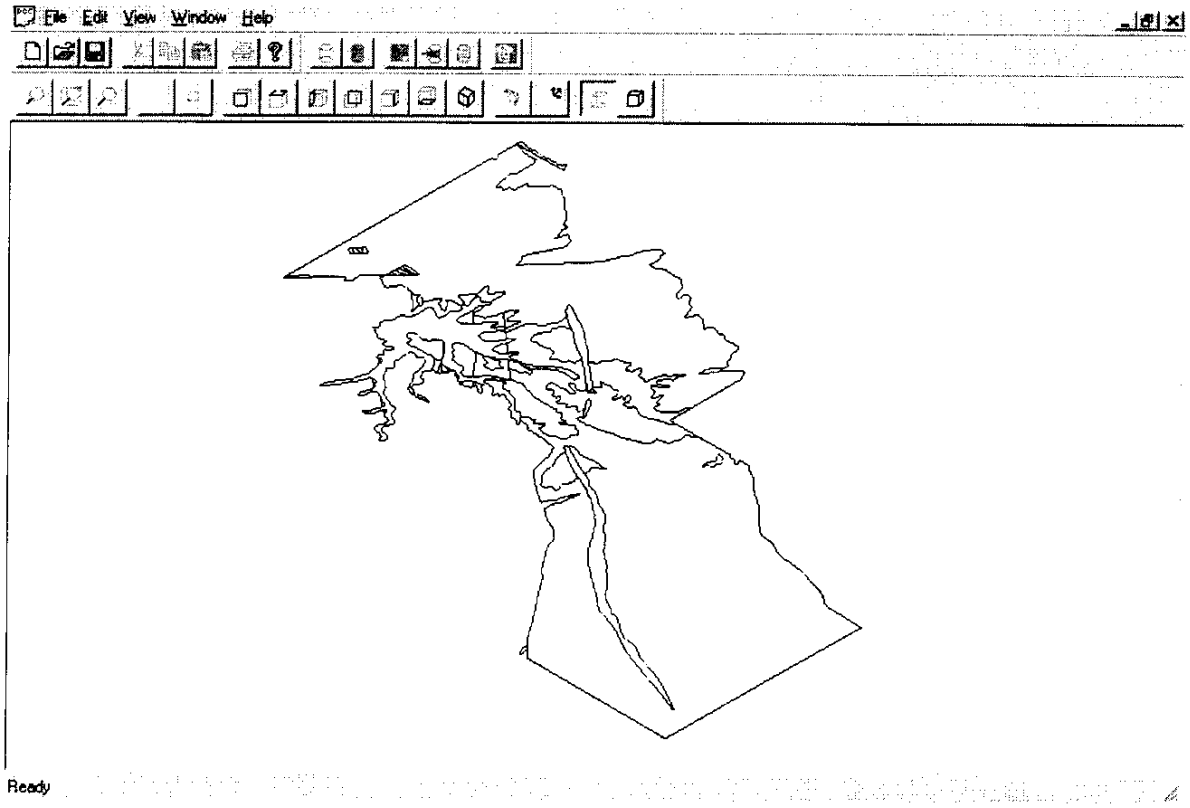
- .dxf file : surface geological map
- ASCII file in which are described boreholes properties.

ACTION : MDTV & BF

- import dxf file into the CAS.CADE environment
- export with CAS.CADE exchange tools (Brep file)

The result of this action is a boundary representation of the map. The shape resulting is valid. This action is illustrated in the folowing picture.

The reading of the ASCII file and its interpretation will start in the week 45 and should be finish during the week 46. This step is combined with the step number 3.



ITGE sent to MDTV specifications. Those one have to be analysed and commented in order to be sure that they can be developped into the 3D DEMONSTRATOR application.
The specifications will be analised by Matra for the visualisation requirement anf both Matra and Beicip Franlab for the modelling aspects.
Reports will be done and communications between ITGE and both Matra and Beicip are necessary.
The final specifications will have to be validated by ITGE and Matra.

This step is planned to begin during the week 45 and the issue of this step have to be validate between ITGE and Matra.

STEP 3 :3D MODELLING

OMEGA partners (MTDT and BF) are involved on this step.
The realisation of it will be done through OMEGA tools developped during this propject. The result depends on the analysis of the data file study.
This step will start in the week 45 and will take two weeks.
The construction of structural framework, structural grid and lithostratigraphic surface will de done in the Beicip headquarter with OMEGA tools.
The technical details are described in the specifications written by ITGE.

STEP 4 : ANALYSIS OF THE 3D MODEL

The building of 3D model will be done with Beicip tool developped during the OMEGA project. The start of this action has been replanned one week later.
The result will be discussed with geologist expertise (ITGE).

STEP 5 : FUNCTIONNALITIES DEVELOPMENT

All the visualitions specifications are enables to be developped in a NT platform.
We have tested those on a sample application witch allows the user to :

- select one entitie
- display properties attributes
- display coordinates

Regarding the other functionnalitites, it will have to be estimate when the 3D geological entities will be built and it is a bit early to answer correctly to those requirements

STEP 6 : ANALYSIS OF THE 3D DEMONSTRATOR

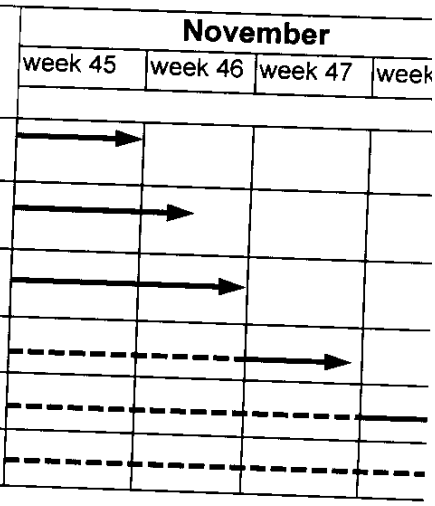
This last step is to validate the 3D demonstrator and provide documentation about the using of it.

CONCLUSION

The specifications sent to Matra from ITGE have to be studied in more details. Matra and Beicip Franlab are working together on the 3D modelling and Matra is waiting for Beicip to work on it. At different steps of the 3D demonstrator development, an analysis from geologist will be necessary. Technical meetings will be planned between ITGE and MDTV.

The status of this task is at the beginnig and this progress report have to be completed during november.

Actions			November			
			week 45	week 46	week 47	week
step 1	validation of 3D data	MDTV				
step 2	Analysis of specifications	MDTV				
step 3	3D model building	MDTV - BF				
step 4	Analysis of the 3D model	MDTV - ITGE				
step 5	Functionnalities development	MDTV				
step 6	Analysis of the 3D Demonstrator	MDTV - ITGE				



PROYECTO ESPRIT 23802

GEOLOGICAL ELECTRONIC INFORMATION EXCHANGE SYSTEM (GEIXS)

3D MODEL

FERNANDO PEREZ
LUIS DELGADO

SEPTIEMBRE 1998

INDEX

1.- INTRODUCTION

This progress report summarizes the work done in tasks 009, 031 y 032, all related with the 3-D activities planned in the GEIXS project.

The demonstrator is now under development so this report cannot be considered as a final report.

Task 009: E-R diagrams in CASE tool formats of selected (demonstration) data sets in the geodata layer of the data triangle with mapping to table level of relational database management systems used with documentation notes, help files, computer aided training packages and e-mail based support. It is intended that the 3-D data from GEOMIST will be utilised here, together with a small number of other 3-D data suitable for inclusion as demonstrations of 3-D search and retrieve capabilities to support the development of 3-D GIS applications. (tasks T031 and T032).

Task 031-032: Specifications Documents leading to installed capability for the end user searching of 3-D geodata using demonstrator data and software imported from on-going developments in GEOMIST and OMEGA. Technical and end-user documentation. Developments based on the CAS.CADE toolkit being undertaken within OMEGA; to act as an demonstrator for future services and capabilities of the 3-D GIS software functions running over the Internet.

2.- 3-D GEODATA

First of all, some general considerations about 3D Geodata must be done. To adequately define standards for 3-D data, we must define more precisely what we mean by 3-D geo-objects. The subject has been elaborated thoroughly, but a good reference is still found in "Three-dimensional modelling with geoscientific information systems", 1989, NATO asi series, c354, editor A. Keith Turner. For our purposes we may consider the objects, from the point of view of the 'raw' geoscientific data use to 'construct' the geo-objects. Another approach is to consider the objects from the point of view of one of multiple modes of its representation (mostly as surfaces, volumes, etc or as variations of properties in space with somewhat 'fuzzy' geometric boundaries).

In the first case we must describe the different types of 'raw' data, needed to create the geo-objects. Obviously a point or line will not qualify, but sections, although 2-D, main constitute building blocks. In general N non-coplanar tuplets with associated lithologies, known or inferred are a minimum requirement. However this is in general a derived product, the starting point being in general 2-D GIS datasets and a number of related tables, appropriately described by the metadata. In the second case a whole new ensemble of classes: faults, layers, bodies, etc. must be developed as part of a 3-D object oriented development environment.

For GEOMIST Project several geoinformation sets have been prepared and they include the main aspects needed for the 3-D geomodelling.

2.1. Planimetric Data

The base map includes rivers, dams, first order geodesic points, railways, roads and villages, and toponimia. Origin of the data is internally maintained geographical base, digitised from 1:200.000 series of IPCC, refined locally with 1:25.000 maps from IGeoE and additional documents, (maps from local surveys, airphotos -1:15.000, etc), with toponimia according to release of 1996 of IGeoE. This dataset as all the others use the following spatial reference system: Gauss projection, Hayford Ellipsoid and Lisbon Datum. Provision for UTM-ED50 transformations will be given at a later stage, as the whole FPI, will also be available in such a projection.

The seven layers of geographic information are organised in ArcView themes, as a subset of national information systems as described above, with bounding zone limited by co-ordinates: -12000; -183000 and 12000,-200000:

- Mainroad (Polyline;{mainroad_i}): National Roads
- Road (Polyline;{road_i}): Composed by Regional Roads crossing the area
- Trainvia(Polyline;{trainvia_i}): Railways
- Dam (Polygon; {dam_i, description, area, perimeter}): Water dam
- River (Polyline; {river_i}): River banks and stream waters
- Geodesic (Point; {geodesic_i, description}): Trigonometric point from National Geodesical Network
- Village (Point; {village_i, description}): Villages and small towns

2.2. Digital Elevation Model

Based on elevation contours from topographic 1:25.000 cartography of Instituto Geográfico de Exército (IGeoE) -9.995 points, refined with altimetry from gravity stations.

The information is organised in a shape file (elevation.shp) recognised in ArcInfo, ArcView or ArcExplorer environment. Additionally there is a Triangulated Irregular Network (TIN created under ArcInfo (elevatin.e00) and ArcInfo grid (elevagrid.e00) and finally a Tagged Image File Format (elevtiff.tif, *.tfw).

2.3. Geological Cartography

A raster file from 1:200.000 geological cartography, which is georeferenced with text file geology.tfw, is included. As can be seen from this raster the joining of map sheets 1:200.000 n.7 and n.8, which takes place along a North-South line in the middle of the image is inconsistent. Also rock classifications, namely the Supergroup - Group-Formation - Member, hierarchy, must be consistent in the drill-hole data tables and in the surface geology coverage, which is not yet the case. Detailed cartography at 1:5.000 scale for small areas within the study area are available, along with 1:25.000 for the whole study area. One of the problems faced is that some of the digital products are pure CAD products. Typically this is the situation encountered with data received from mining companies.

2.4. Boreholes including physical properties

The boreholes included are the ones drilled for mining purposes in the study area. All data is organised in a point shape file as described in the data model above, and with a total of 125 points.

There is a Virtual Reality Modelling Language (VRML) file borehole.wrl, readable on a web browser with that plugin to vizualise the drillings.

2.5. Geophysics

- **Ground data - Electrical**

  A number of geo-electrical surveys, both resistivity and electromagnetic were conducted, but the data is not yet available. Because of time constraints only a few samples will be included, at a later stage, so as to cover the widest types of data, as possible . Most of it is point data (vertical electrical soundings) and may be treated as the drill- hole data. Combination of this information yields 2-D sections, which will be discussed below.

- **Gravimetry**

  Another type of ground geophysics is gravity. Its use in the area has been to target massive sulphide bodies, but it also reflects, in the form of maps of the Bouger anomaly the strong density contrasts between the soft tertiary cover and the hidden Palaeozoic hard rock basement, as long as the latter presents a topographic relief. By the use of appropriate packages, constrained inversion may be attempted, helping to construct a 3-D model mainly by filling in the gaps between drill-holes. This will be attempted later. This data set is not presented according to the metadata standards established for gravity data, but it does not affect its utility. The data set includes data from several vintages that have been merged and validated.

  This is a pre-homogenised dataset, organised in a point shape file (gravimetric.shp), as described in the data model, and with a total of 24,616 points. As part of the homogenisation process underway, a properly IGSN71 tied data set, conformed to the established metadata standards will be provided. It will then be a subset of the FPI national gravity database. At that stage terrain corrections will be provided. Those are incorporated in the Bouger anomalies for the various densities, which may be used as a work around at this moment.

- **Airborne Magnetics**

An airborne magnetic survey was flown in the area. Specifications are as follows: Traverse line spacing 200m, control line spacing 2000m, nominal terrain clearance 100m, navigation GPS, traverse line direction NE-SW, control line direction NW-SE, nomila measurment spacing 8.75m, fixed wing aircraft, sensor Scintrex H8 optically pumped cesium split beam sensor in tail stinger configuration.

The magnetic map will mostly reflect the presence of (magnetic) basic volcanic rocks, as part of the volcano-sedimentary sequence (VS), either buried bellow Tertiary cover or outcropping. Axis and trends of the volcanis emerge. Subtle features, such as faults, show up as disruptions in linear patterns, line the NE-SW Messejana (or Plasencia) fault. Although a dam is present geological units may be followed across it. By the use of suitable packages on the hands of a knowledgeable interpreter, structural information for building the 3-D model may be obtained. As a result of such exercises new layers will be added. Further work must be done on the inclusion of such information. Examples will be provided later.

Data is organised in a point shape file (magnetic.shp), described in the data model above. Please note that this data set is being merged with two other surveys, so as to be included in the national FPI aeromagnetic database. It will then be a subset of the FPI national magnetic database.

- **Geological/Geophysical sections**

Sections constitute an important source of information, and must be considered in any 3-D modeling package. It may be argued that this is a derived product that may be inferred from drill-hole data or geophysical data. But the problem is that given the same data two interpreters will end up with different models, at least in their details, so this is an authoring process; also, sometimes the process is time consuming (geophysical inversion) and it is this important to save the results. This must be a class by itself, included in the Cas.cade/Omega geosciences development toolkit. No further elaboration will be possible before results from OMEGA are known and the GEOMIST team starts working cas.cade. At that point based on the ground EM/resistivity, seismic profile data and sections drawn by geologists, which are already available, will be incorporated in the model.

2.6. Mining data

Mining data exists for the area but it was deliberately ignored because of confidentiality. Namely the drill-hole and geophysical data of the Aljustrel concession (with orebodies) was taken out. Eventually it may be included if EDM, the owner of the concession, agrees upon it.

In the Anenexes of the October 1997 to April 1998 GEOMIST progress report are described the Data Dicitonaty, Data Model and Metada of the information sets detailed above.

3.- 3-D MODEL USER PERSPECTIVE

Examining the 3-D models issue from several viewpoints

User perspective

Omega targets the application developer and not the end-user, but attempts to understand the latter's needs to enhance its toolkit and also as a guidance for development. Omega focus on the oil industry while Geomist has strong roots in the mining industry and atempts to bridge the gap with the environmental, geotechnical and land planning GIS users.

The Omega deliverables D1.b cover the needs in a sufficiently broad way to be applicable to Geomist. In this regard, while 3-D development will be a minor aspect in Geomist, some development must take place to address the needs of its users. In fact a toolkit by itself is of no interest to the end-users.

So we attempt to define here the Geomist users, in regard to GIS and 3D functionality.

1) Minning companies, already engaged in the FPI or potentially interested in doing exploration here
2) Local and Central administrative bodies for the environment and land planning
3) Internal geological survey users
4) Universities and research institutions with interest in the geosciences.

We could say that the vast majority of the users would be satisfied if Geomist included only 2-D capabilities, because more basic needs like reliable catalogues, metadata servers and quick data access are not yet in place. 3-D is seen as an added benefit, but not as a priority. However we know from our own experience that this development must take place, because in the typical daily working scenarios of the afore-mentioned categories of GIS users a lot of 3-D analysis takes place. Let us explore some of those scenarios.

Scenario 1

A user (explorationist) wants to sketch a geological section across two arbitrary points within the FPI (it is irrelevant if it covers Spain or Portugal or both), or to construct a "cube" and picks the origin and gives lengths for the 3-axis. The reason might be because the user holds a permit, made a new gravity survey, found an anomaly and wants to drill it. In this way he plans a drilling project for his management. The system gathers the surface geology, the DTM and shows spatially the existent data (geophysics, bore-holes, etc), together with a simplified base map for the area of interest. Some previously defined models created by experts may also be available and a brief description of them is presented, as well as their location within the area. (This is provided through the catalogue and meta-data servers). Other data might be available elsewhere within the system. The user might for example search the reports from mining

companies for appropriate keywords and tables of contents and end up with a list of documents of interest. (Note that a lot of documents will be off-line and in paper form, at least in the lifetime of the project). The user might then consult those documents (off-line) and gather more information. According to the type of user, its background and experience very different synthesis will result. Two situations exist: a) the data is too sparse to construct any kind of *earth_model*; b) the data is considered sufficient and the user wants to proceed, through an automatic generated model, which he wants to further refine with the new information. He/she will want to control the way the initial model is generated.

Scenario 2

Land planning and environmental authorities are dealing with a situation whereby a landfill is being closed and action is taken to seal it and they want to prepare the work for evaluation of nearby land contamination. The contracter has a digital orthophoto map of the area with the location of the landfill. He/she will request from the Geomist server any detailed geological cartography, which he will superimpose on his georeferenced raster image. He might be able to feed a DXF or DGN file with a DTM to the server, as well as the orthophoto image. He might them inquiry from nearby boreholes, the depth to the water table, location of aquifers, and results of chemical analysis, nature of upper geological formations, and of bedrock, any geological faults. He may tend construct a simple 3-D representation, which will help him plan a local survey for example to fill in a gap of information about depth to bedrock and to know about the geometry of the contamination plume. (He/she will be invited to register the information in the metadata and catalogue entries for future reference). He might further want to feed in permeabilities, and hidrological data from other servers and run a simulation, about the flow of water.

Scenario 3

A geothecnical engineer in charge of a road project that traverses Spain and Portugal and is contained within the FPI, has three different alternatives to examine. Part of the decision has to do with the costs to remove the surface materials (rippability). He has probably used a GIS to construct the alternatives, but this is not always the case.

His primary interest is to get a geological profile along each of the three alternatives with depths to bedrock and nature of the uppermost layers especially characterized in terms os velocity of P waves. His interest will be in the uppermost 15 metres. He will be happy with a depth, so if the road is assumed to lay in flat terrain even if it does not that will not bother him. We speak of 3D, because it envolves the Z-coordinate and the road may bend, but this basically drawing a section. In any case the search through the catalogues and metadata will proceed as in scenario 1. He will then want to build a simple earth_model, for each of the 3 alternatives. He will further want to quantify and make graphs for each of them.

Converting the scenarios into earth views

When we speak about 3D we must clarify which applications we are referring to. Of course we have the geoscience user in mind, but this is too broad a category. For example the 3D representation of the surface of the terrain, the draping of gridded data on the terrain or the representation of underground objects like tunnels or boreholes are functionalities that have been incorporated in GIS software in recent times.

View 1
Geology draped on the corresponding DTM, together with static views of geological cross sections, and representation of boreholes (geological logs).

View 2
To the previous view we might add borehole geophysical logging as an aid to separate lithologies and geophysical estimates of depths of physical contrasts that might be interpreted as lithological boundaries.

View 3
Geophysical imagery. Results of processing, inversion and forward modelling. The model might be described by a partitioning of the volume in blocks with associated physical properties, which might tentatively be associated with lithologies. Might assume other forms like triangulated surfaces enclosing volumes or layers with associated physical properties, or seismic_features.

View 4
Geochemical distributions, or concentrations such as for an ore body. The distributions are in a volume so by some statistical criteria and by establishing bounds delimiting surfaces may be drawn.

View 5
Stochastic models and simulations, mostly to obtain parameter distributions and time evolution of those distributions. Aquifer dynamic modelling and reservoirs are good examples.

Hopefullly we want to combine all the views in an image of the earth, keeping in mind that our main users are concerned with processes in the subsurface, shallower than 1 Km. In turn Omega's end-users of theis users are interested, for instance in basin analysis which will encompass much larger depths. The study of global earth processes like plate tectonics, geomagnetism, paleomagentism, seismic tomography, earthquakes, heat flow, which are the object of solid earth studies although of interest to users 4) are not covered by Geomist.

4.- THEORETICAL 3D MODEL FRAMEWORK

The main goal of the 3-D model is to rebuild the structure and lithologic composition of the subsoil.

Firts the spatial domain and the main elements composing the subsoil have to be defined.

The spatial domain is defined as follows

Upper Limit: Topographic surface, water masses botton
Lower Limit: Arbitrary surface
X, Y Limits: Defined by the extension of the data avialable

Concerning the elements, the adopted definitions have followed CEN/TC 287 and GEIXS definitions. Therefore three main type of elements, among more than 20 currently used, have been defined.

1. Geological objects
Representation of an entity (spatial real world phenomenon) related with the composition and morphology of the Earth.

Two different types of geological objects can be distinguished.

i) **Tangible Rock Bodies** with net limits either geological (geological contact, faults, topographic surfaces) or arbitrary (limit of the area of study).

These objects can be described either as unique and continuous bodies or as separated blocks and their main attribute is its lithologic composition.

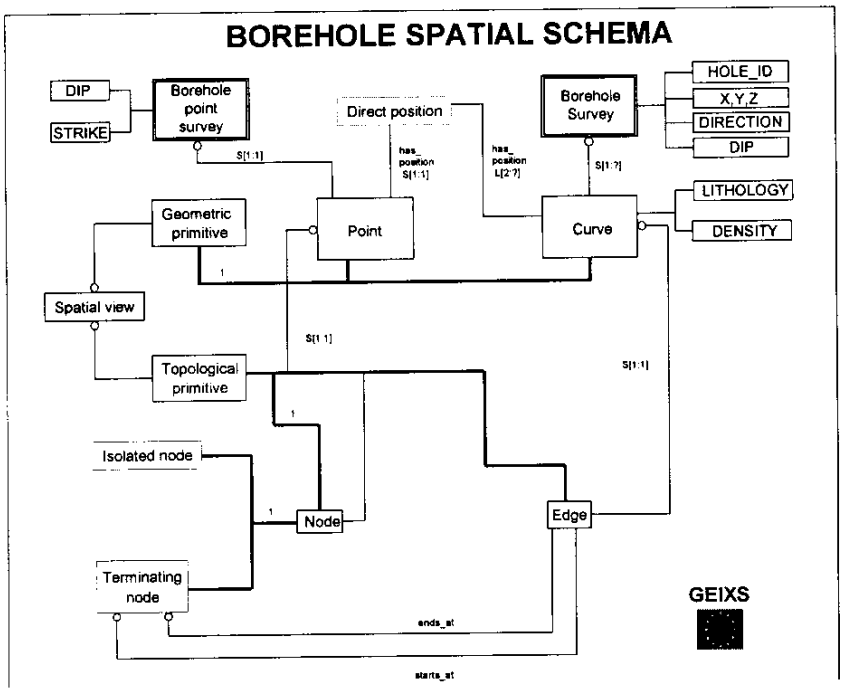
ii) **Inferred Geological Objects** resulting from the characterisation of rock bodies when one or more attributes have the same value. These inferred objects can be either discrete, defined through discrete observations, i.e. an aquifer or continuous when the attributes have a continuous range of values, i. e. mineral occurrences.

2. Surveys
Observations of spatial points in which the shape, extension, position, limits, value or type of a part of the Earth is measured.

Either point, line or surface surveys are possible and in all the cases the observations are composed of the three spatial coordinates x, y, z of the point of observation plus parametric or non parametric measurements p1, p2, p3, ... to represent the measured or evaluated properties or geological attributes.

Illustration 1 shows the borehole spatial schema.

3. Methods
Techniques applied to estimate (interpolate) geological attributes at non observed points to rebuild geological objects.



Relationship Between Geological Element

The relation between the three main type of elements allow to rebuild the geological objects.

Firts to model a geological object an observation is made, then the application of methods of interpolation or interpretation of these observations produces sections that after the application of new methods allow to modelize the geological objects.

Data Model of the Selected Area

This theoretical framework has been applied to the selected geodata subset, resulting in the 3-D data model of the selected area.

The model focus on rock bodies described as volumes divided in one or more blocks limited by either arbitrary or geological surfaces.

The associated attributes to the rock bodies are

* Lithology
* Age
* Density

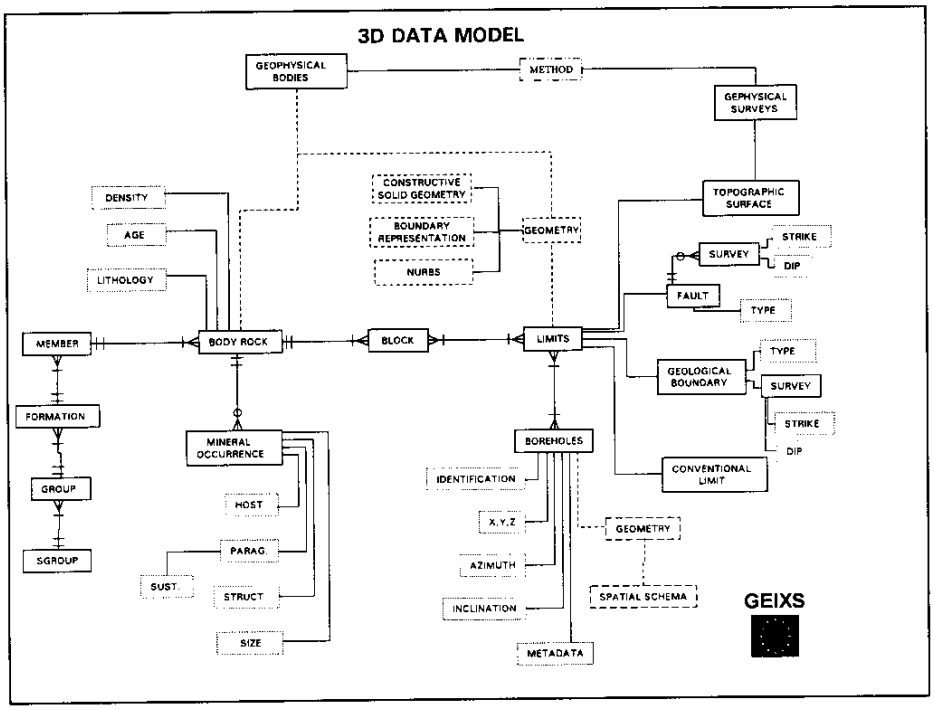
* Mineral Composition
* Grain Size
* Texture

These objects are grouped in hierarchical categories

* Members
* Formations (categorie used in the demonstrator)
* Groups
* Supergroups

The limits of the blocks and rockbodies are

* Geological contacts
* Faults
* Topographic surfaces
* Arbitrary limits



The spatial description can be done either by vector on raster models. In vector models the volumes are described through their limit surfaces, defined with facets, geometrical bodies or NURBS.

Mineral occurrences are very closely related with rockbodies, their main attributes are:

* Host Rock
* Paragenesis
* Structure
* Size

Boreholes (linear observations) are in principle related with their limits, describing the start and end of each geological object. Their main attributes as generic entities are:

* Initial coordinates
* Direction
* Inclination
* Testification

In the 3-D model the geophysical observations have been related with the topographic surface.

5.- 3-D DATA SUBSET

For the development of the 3-D demonstrator the Scenario 1 and View 1 of listed above will be used. However the scope of view 1 will be extended to a dinamyc geomodelization of rock bodies.

In order to built up the demonstrator following data sets have been selected.

Digital Terrain Model (DTM) of the study area as a grid ascii file.

Geological Cartography with lithological information and boundary classification, available in Arc/Info export format, shape file or DXF file. This data give us information about formation unit in the surface.

Boreholes of the study area. Lithologies have been gropued by Formations. In this file there is information about the coordinates of the boreholes top, deep, inclination, beginning and end of each formation unit in ASCII delimited or fixed length format or in tabular format, ACCESS format or ORACLE format, distributed in fields and columns. Each borehole is identified by its HOLE_ID.

A records examples:

HOLE_ID	X_utm	Y_utm	COTA	AZIMUTH	INCLINATIO	FORM_UNIT	FROM	TO
FD-1	587069.642	4201842.5178	67.8	225	-60	TE-SB	0.9	153.4
FD-1	587069.642	4201842.5178	67.8	225	-60	VS-VB	154.4	192.21
FD-1	587069.642	4201842.5178	67.8	225	-60	VS-S	194.4	197.64
FD-1	587069.642	4201842.5178	67.8	225	-60	VS-VA	200.85	260.39
FD-1	587069.642	4201842.5178	67.8	225	-60	VS-ST	260.54	857.58
FD-13	588096.398	4203437.2902	83.87	225	-60	TE-SB	151.45	172
FD-13	588096.398	4203437.2902	83.87	225	-60	VS-S	181.7	200.8
FD-13	588096.398	4203437.2902	83.87	225	-60	VS-VA	202.7	283.15

6.- 3-D DEMONSTRATOR SPECIFICATIONS

6.1.- INTRODUCTION

The main object of this chapter is to settle preliminary rules about the characteristics required (in order) to develop a system to manage and display in three dimensions geological and mining information. These aspects refer to data capture, 3D modelling, data query and data display options.

These are preliminary notes and will be modified after the results obtained by the first modelling.

3D modelling within GEIXS project has as primary objective the reconstruction of subsurface composition and the lithologic structure.

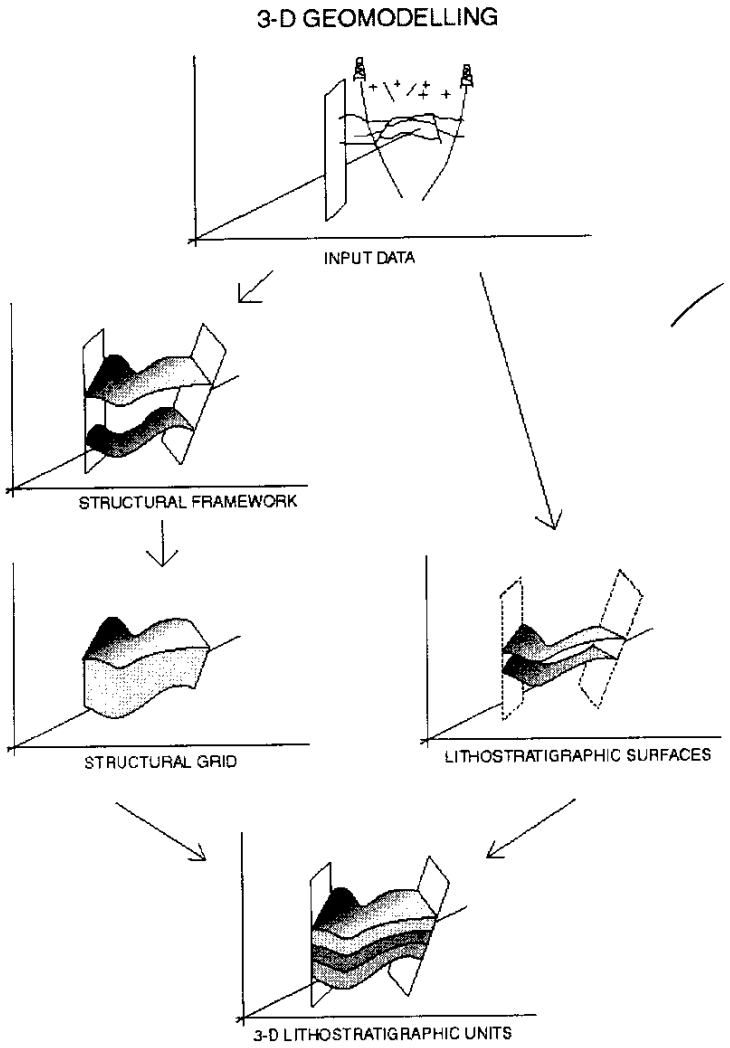
The modelling process, which has borrowed ideas from the Omega Project, begins with the capture of 3D simple ASCII format data, directly obtained from current available data. From these we will build up a series of geological objects of variable complexity susceptible of different queries, and multiple-view display either from the outside or within the object.

6.2.- GENERAL PROCEDURE

From basic entities such as points, lines, vectors, curves and surfaces three different types of intermediate geological objects will be constructed:

1. Structural framework or limiting surfaces, made up from all those surfaces limiting blocks.
2. Structural or block grid, consisting of solid objects defined by the previous type, without any attribute associated to its interior or limiting surfaces.
3. Lithostratigraphic surfaces, surfaces limiting lithologies.

The intersection among the structural grid and lithostratigraphic surfaces will enable the generation of 3D Lithostratigraphic Units whose attributes will be stored in a data base from which they can be queried.



As 3D volumes (or 3DLU) will be generated from the limiting surfaces, all those data pertaining 3DLU inside loci can be used to verify modelling consistency.

Three different types of surfaces can be considered:

Discontinuity surfaces of geological origin
Zone limits
Lithostratigraphic surfaces

Intersection between the first two will generate the so defined blocks, considered as independent spatial units on which the 3DLU will be modelled without regard to neighbouring blocks.

6.3.- INPUT DATA

Input data will always be direct observations or interpretations obtained from them, and will be described as non, one or two dimensional space locations on which one or several properties and/or definite values are verified or assumed to be.

The basic information unit will be the **point**, determined by its x, y, z coordinates to whom several attributes can be associated. These points will be introduced in ASCII format, each line containig the coordinates followed by the values associated to each of them:

x,y,z,v1,v2,...

Attributes associated to points will be classified at least in three different classes according to their meaning:

Attributes that identify points belonging to surface entities, i.e. a geological contact or a fault.

Attributes which identify points belonging to 3D spatial entities, i. e. a lithology.

Attributes related to parameters which not enable any immediate association to a specific geometrical body.

These attributes must be perfectly differentiated as they will be used to build up the different 3D objects.

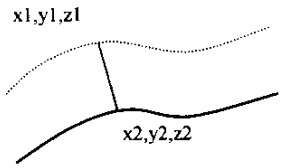
Points can follow three main distribution patterns:

1. Isolated points distributed at random whose spatial relations are not determined by any distribution rule. These might be surface or subsurface samples such as values of mineral content obtained through drills.
2. Net shaped regular distribution of points. In this distribution distance between consecutive points is constant along both plane axis, being the z-value variable for each of them.
3. Lined-pattern points consisting of points following a distinctive line-shaped direction, with irregular spaced separation between lines.

In all cases provided we are dealing with surface points, the system must be capable of generating a digital terrain model which can be used as reference frame to other basic surface elements lacking z value, as this could be obtained from the dtm. Further on, points without any known z-value can be introduced as this value can be automatically obtained once the dtm is superposed.

As a second source of information we have **lines** or bi-dimensional elements which can be classified in two different shapes: vectors and curves.

Vectors are defined by two end points. Information can rest either on these end points or, optionally, along the line define by them.



x1,y1,z1: concordant contact
x2,y2,z2. Fault

vector x1,y1,z1-x2,y2,z2: lithology

In this case two point elements will be defined, on which the type of contact will be defined (and afterwards be used to generate surfaces) and a second implicit segment on which lithology will be stored.

On this segment only one value can be linked for each variable.

Spatial location of different vectors that make up the drills can be done in two ways, either directly or indirectly.

In the first case the from and to coordinates of each vector are determined by the spatial reference system chosen i.e. UTM zone 29. In the second case the origin of coordinates is situated on the origin of the drill and the origin and end of the vector are thus relative coordinates.

Curves are finite sets of contiguous vectors and they keep the same structure, though two cases are possible:

a) All of the points of the curve belong to the same element. i.e. a fault.
b) The curve gets through different types of elements, i.e. a drill

Surfaces make up the third type of information item from the point of view of its geometry. Surfaces can be defined by their boundaries or by a function generated from n known surface points.

In the former case the curves and vectors that define their limits will be registered, as cross sections or geological maps. Surfaces can also be generate from scattered points.

Each of the surfaces has its attributes in a related data base.

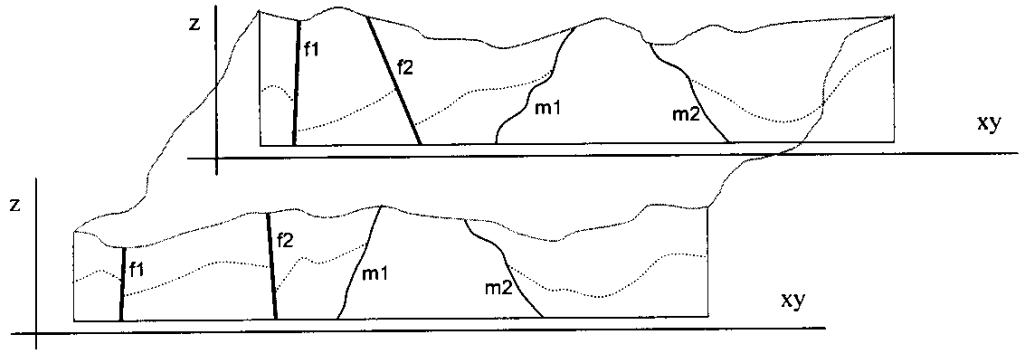
According to 3D Geomodelling curves can be classified in three categories:

a) geological break surfaces as faults and intrusive contacts.
b) Conventional limits as the limits from the study area, or the topographical surface.
c) Inside surfaces that limit different 3D objects. In our case this will be lithostratigraphic limits.

6.4.- 3D GEOMODELLING OBJECTS

Each of the registered elements must have as many identifiers as possible in order to avoid uncertainties and errors during modelling process.

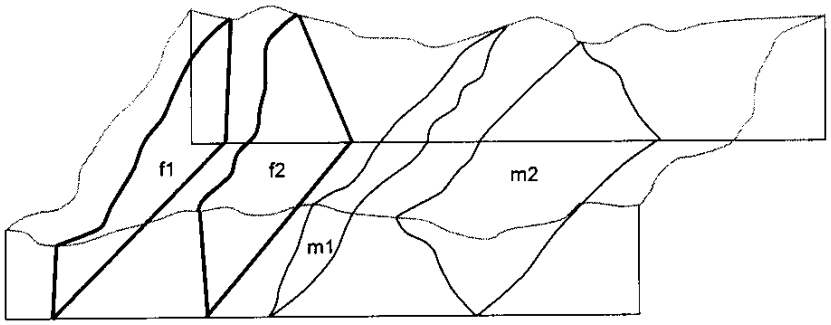
The following drawing shows a theoretical example of curve identification in which each element is identified even if they belong to the same type of element.



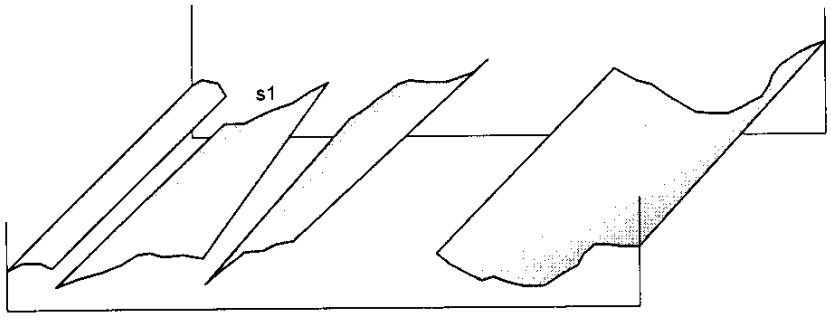
As a first stage of geomodelling, two objects will be created:

1. Lighostratigraphic surface
2. Brake surface

By means of the break surfaces and conventional limits two other objects will be make up: structural framework and structural grid (both these objects come from the Omega Project).



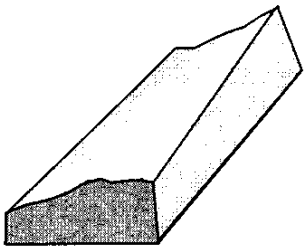
The above diagram shows several break surfaces f1, f2, m1, m2 which combined with the topographic surface and the boundaries of the study area will generate blocks. Inside these blocks, lithostratigraphic units will be geomodelled.



The above diagram shows an example of lithostratigraphic surfaces.

Finally, the intersection among structural grid, structural framework and lithostratigraphic surfaces must produce 3D lithostratigraphic units 3DLU. These three 3DUL as well as the rest of the elements defined in the model must have their attributes in a related data base.

3DLU



One of the capabilities of the system must be the union of different 3DLU by means of the use of attributes common to each of them, such as their age, in which case new 3D objects will be generated.

6.5.- VISUALIZATION CAPABILITIES

The visualization applications of the demonstrator must include following cases:

3D data points visualization using attributes values for the representation with different simbology.

3D data vectors and curves visualization using attributes values for the representation with different simbology.

3D visualization of the surfaces created by the modellization, different shades must be applicables.

3DLU solid visualization using different colors.

In all cases point of view, orientation and distance must be changed interactivily

2D secctions of the solid models must be done.

All the drawings on the screen must be plotted in an graphic output device.

6.6.- DATA QUERY

The system must support the following types of query:

Thematic query:
Nominal specification (where is lithology A?)
Logical condition (where are boreholes with lithology A?)

Spatial query
Spatial domain specification (what is at point x,y,z?)
Spatial condition (what lithologies are below lithology A?)

The results of the queries must be drawn in the screen in three different ways:

Highlighting selected objects or elements.
Drawing only the selected objects or elements.
Drawing only the objects or elements not selected.

6.7.- SPECIFICATIONS FOR THE IBERIAN PYRITIC BELT AREA

The Iberian Piritic Belt data set is divided in three groups: boreholes, surface geological map and DTM.

Boreholes data are stored in an ASCII file and each record or line of the file contains de data of one vector. These data are:

Borehole identifier (HOLE_ID)
X coordinate of the start point of the hole (X_utm)
Y coordinate of the start point of the hole (Y_utm)
Z coordinate of the start point of the hole (COTA)
Borehole azimuth (AZIMUTH)
Borehole dip (INCLINATIO)
Lithostratigrphic Unit or Formation intersected (FORM_UNIT)
Sart point of intersection (distrance from the start point of the borehole) (MinDeFrom)
End point of intersection (distance from the start point of the borehole) (MaxDeTo)

Values of HOLE_ID to INCLINITAO are identical for al vectors of same borehole.

The limits of the vectors are refered to the start point of the borehole, so real coordinates (UTM zone 29) must be assigned to those vectors.

Geomodelling shall follow next steps:

1. Borehole data input and real coordinates assignement.

2. Identification, classification and codification the different type of vector limits (start point and end point) using the FORM_UNIT codes. (For instance a point wich separates FORM_UNIT VS-TF from VS-S wil be coded as VS-TF_VS-S).

3. Vector limits codification using the codes defined in point 2. Vector codification using FORM_UNIT codes.

4. 3D boreholes visualization using different color for each FORM_UNIT. Differents points of view and queries may be availables.

5. DTM data input.

6. Geological map data input as curves.

7. Z coordinate assignement to each point of the geological map using the DTM.

8. Geological boundaries codifications using codes created at point 2. Geological surfaces codification using FORM_UNIT.

9. 3D geological map visualization, alone or with boreholes.

10. Lithostratigraphic surfaces modelling.

11. 3D Lithostratigraphic surfaces, alone with boreholes and the geological map.

12. Formation geomodelling as solids.

13. 3D formation visualization.

14. Atribute assignement to 3D formations. (These atributes may be fictitious and it vill be used at point 16).

15. Cross-sections visualization.

16. 3D formation aggregation using common item values.

17. Geomodelling monitorization adding new data. (fictitious data)

18. All the graphics seen in the monitor will be drawn by a plotter.

7.- 3-D DEVELOPMENT ALTERNATIVES

The development of a 3-D geomodelling, visualization and query applications using the MDTV is not an easy task due two questions:

CAS.CADE objects libraries doesn't include geological objects.

There is no user friendly application to use anyone CAS.CADE librarie.

So it is neccesary to look for the knowledge derived from other related projects like GEOFRANCE 3D (BRGM) and OMEGA (BEICIP).

Three alternatives are now under study.

GEOFRANCE 3D:

The BRGM is working in the called Geological Editor using CAS.CADE classes. This work is focused in the definition of geological classes and the development of 3-D geological objects viewer. The software uses ORACLE to the storage all the information in BLOB fields, including surface topology, and ASCII files to storage the surface primary keys. Now is available on SUN and Silicon Graphics UNIX workstations and soon shall be ported to Windows NT and Windows 95. (Migration to Pc computers is responsability of MDTV). This application needs a SDE and a MDTV licenses.

Input data may be done by three different ways:

Geological maps in DXF files or by digitization with the application, maps must be scanned and geological features may be digitized in the screen using the image as background. Three different boundaries are defined: normal boundaries, faults and overthrusts.

Cross sections derived from boreholes or surface interpretations.

Structural information defined as points placed in geological boundaries or faults with defined strike and dip.

BRGM will develop the geological model, the specific modules for data input and storage and the visualization and retrieval applications usisg the Geological Editor.

The estimated effort is 30 days for a BRGM technician an 15 days for a geologist specialixed in the area under study.

Visualization through Internet may be done by an VRML file. This is a simple method to see the model in a WEB page but information retival is not allowed.

MATRA DATAVISION

This option requieres the development of specific software using the different classes defined in CAS.CADE. The development shall be carried out by MATRA with an ITGE collaboration on data preparation.

The lack of a input data module is the first problem which should be resolved as soon as possible. After that an specific module of geological data interpolation and modellization is requiered.

The result of the MATRA developments will be a VRML file. This file may be seen through Internet.

Data input is not a problem from the point of vew of formats, DXF or ASCII files are readables by the system. Problems arise from the file contents.

For instance, MATRA data input module for DXF files reads this type of files if it contents one or many surfaces which describes a solid. So, space is divided in two parts: the inner and the outer of the solid. But geological data are structured in arcs which describe various surfaces with different properties. Solids (or 3-D lithostratigraphic units) will defined from these srufaces.

In the same type of file two different approachs, the former is now available but the later is required for geological data.

OMEGA

From the CAS.CADE classes specific modules for the constuction, representation and analysis of 3-D geological data models have been developed. This work is focused in oil exploration. Among others, surface and solid modelling modules have been developed.

However, specific geomedelling is no ready yet, but from borehole data different surfaces may be defined and volumen generation may be done by the solid modellization of those surfaces. These volumes may handle as body rocks.

Three different data types are readables: borehole, points and Grids. Each type requiered and specific format and a part of the selected data set must be translate to these formats.

The Digital terrain Model may be input as a Grid file. The geological map must be restructured with the assistance of a skilled geologist in the study area.

As in MATRA option the resut wiil be an VRML file, but information retrieval will not be allowed.

After a technical evaluation of the three alternatives by a group of geologists an engineers of the ITGE the use of OMEGA developments have been selected.

INDEX :

PROYECTO ESPRIT 23802

GEOLOGICAL ELECTRONIC INFORMATION EXCHANGE SYSTEM (GEIXS)

DATA LOAD TOOLS & STRUCTURE

DENIS BONNEFOY

FEBRERO 1998

Task T014 *Applications software capable of populating the tables at the metadata and index layers with data to be supplied by national surveys using the data models and harmonization tools supplied as deliverables from T006 to T011; technical and user documentation.*

Status: This task is current. End of this task is planned for March 15. Today, Geological Organizations are testing the input application and documentation.

Task T015 *Applications software for building a unified data catalogue from the metadata layer; technical and user documentation.*

Status : This task is completed. Mechanism of consolidation from local level toward European level are implemented.

Task T016 *Creation and implementation of triggers required by task T014; technical and user documentation.*

Status: Triggers and control of integrity of entered data are done. They have been developed and incorporated in the input application.

Introduction

Workpackage 2 (WP2) aims to set up the technical infrastructure making it possible to collect the metadata in the various geological organizations of Europe. WP2 constitutes a key stage preliminary to the loading of the data.

The text hereafter details the work completed in Workpackage 2. It focuses on important points like the general architecture of the GEIXS system, the documentary system, the choices made as regards cartographic projection. It explains the various data flows between the geological organizations and the GEIXS server. Lastly, it presents the various technological choices made.

All technical documentation are available in the appendices.

Architecture

The GEIXS server is made up of:

- databases (metadata) describing the various data files available in the national geological surveys,
- an application for metadata capture,
- a Web application for searching according to geographical and/or thematic criteria,
- an application for addition and modification of common terms (lexicons).

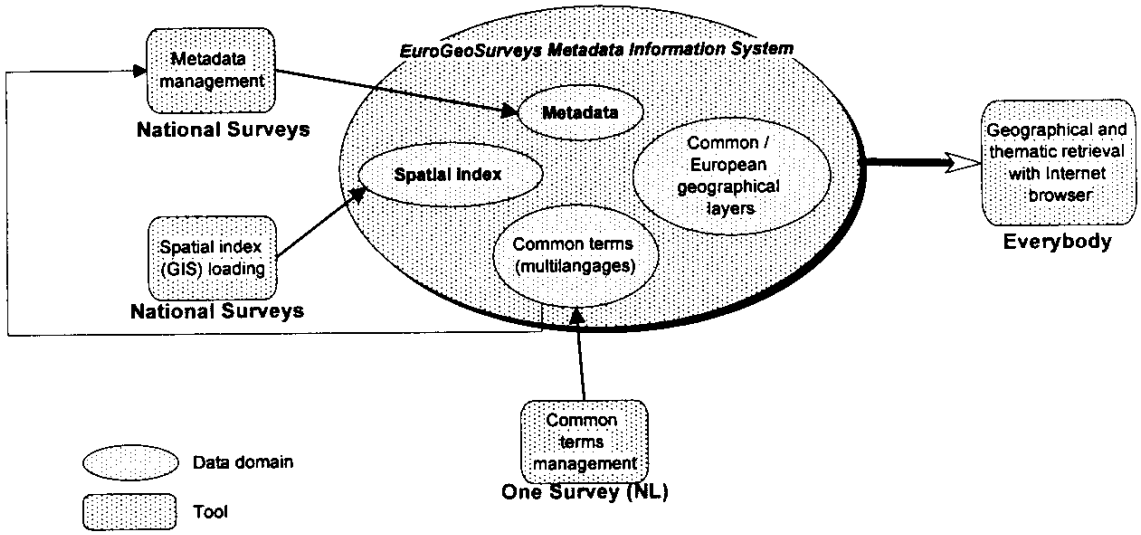
The GEIXS information system contains the following information fields:

- metadata,
- spatial indexes (GIS),
- topographic backgrounds for spatial location.

Applications active on this system are:

- a metadata editor allowing addition or modification of a data file,
- a geographical and thematic browser usable through a Web navigator (Netscape or Explorer),
- an editor of lexicon terms,
- a loader of spatial indexes

The following diagram presents the various modules constituting the GEIXS system.



Tasks T014-T016 correspond to the creation of databases (metadata) and applications for data loading named on the above diagram "Metadata management" and "Spatial index loading".

Geographical and thematic retrieval will be done in Work Package 5. Note: The development of this retrieval Web application is already started (see http://eurogeosurveys.brgm.fr).

Input application

A unified metadata loading application was developed and is today being tested in the national geological surveys. Each survey will thus use the same application and the same key words to describe its metadata.

The input application is multilingual. All data must be loaded in English. The user can also load data in other European languages.

Common dictionaries and lexicons have been used in the input application with triggers and control of entered data. These tools will ensure as far as possible data integrity. A detailed quality plan has been developed comprising: a general document describing the GEIXS system, and in addition documents describing specific procedures. All these documents and applications are beta versions.

The installation kit for this application and the associated documentation can be downloaded from the prototype GEIXS Web site (http://eurogeosurveys.brgm.fr).

After the data loading test period, a meeting to synthesise the responses was held in Orleans on 16/17 February 1998. This meeting was held with the NITG team in charge of data loading and the BRGM team in charge of development.

The final updated version of the data loading application, taking account of users' remarks, and associated documentation will be distributed at the beginning of March to each survey through the Web or by CD-rom.

Documentation

The documentation of GEIXS applications has been done in English.

GEIXS user's guide (Appendix 2)
GEIXS001: Installation of the metadata input application (Appendix 3)
GEIXS002: Metadata input (Appendix 4)
GEIXS003: Updating of the GEIXS dictionaries (Appendix 5)
GEIXS004: National consolidation from regional metadatabases (Appendix 6)
GEIXS005: European consolidation from national metadatabases
GEIXS006: Preparation and loading of a spatial index
GEIXS007: Use of GEIXS Web navigator

Today beta versions of the GEIXS user's guide, and reports GEIXS001 to GEIXS004 are available. They are presented in annexes 2-6 and at adress http://eurogeosurveys.brgm.fr.

Cartographic projection

In order to simplify the loading of the spatial data and to take into account the very diverse needs of the various European geological surveys, geographical data are stored in geographic coordinates or in a projection indicated during data entry. These spatial data can be automatically visualized in another projection chosen by the Web user. The list of geographical projections will be limited to the following:

MGI(Ferro) WestMGI(Ferro) Central
MGI(Ferro) East
Belge Lambert 50
Belge Lambert 72
Danish System 34 Jylland-Fyn
Danish System 34 Sjaelland
Finish KKJ Zone 1
Finish KKJ Zone 2
Finish KKJ Zone 3
Finish KKJ Zone 4
NTF/France 1
NTF/France 2
NTF/France 3
NTF/France 4
DHDN/Germany 1
DHDN/Germany 2
DHDN/Germany 3
DHDN/Germany 4
DHDN/Germany 5
GGRS87
GGRS87
Italy Zone 1
Italy Zone 2
Netherlands Nat Grid
Portugese Nat Grid
Swedish Nat Grid
British National Grid OSGB 1936
British-OSGRS80

The geographical data are used in:

- Topographic backgrounds,
- Bounding areas,
- Spatial indexes.

Lexicons management

A multilingual system for management of common terms was developed. Each term is translated into each European language.

The GEIXS lexicons are:

1. Lexicon of organizations,
2. Lexicon of administrative units (obtained in SABE at Megrin),
3. Lexicon of categories,
4. Lexicon of detailed keywords,
5. Lexicon of status,
6. Lexicon of media,
8. Lexicon of access controls,

The general terms are managed by the Geological survey of the Netherlands.
This service:

- Co-ordinates translations of common terms into various European languages,
- Adds and modifies the common terms,
- Maintains the common database of lexicons.

This database of lexicons is on the GEIXS web server and it can be download by the user and introduced into the GEIXS metadata loading application.

Data flows

The data flow adopted is for information from the regional level (if it exists) to flow up to the national level and then data from the national level to flow up to the European level.

Data entry and modification may be carried out only at the lowest level. A higher level may not modify information gathered at a lower level. These two principles mean the original version of data will always be with the person in charge of those data.

Each geological organisation collects the metadata and the spatial indexes from the different data owners. It enters them in a local database that is transmitted regularly to the level immediately higher (national or European). If changes are necessary or if data are not valid, the author of the data is the only person entitled to carry out modifications.

Consolidation at the national level

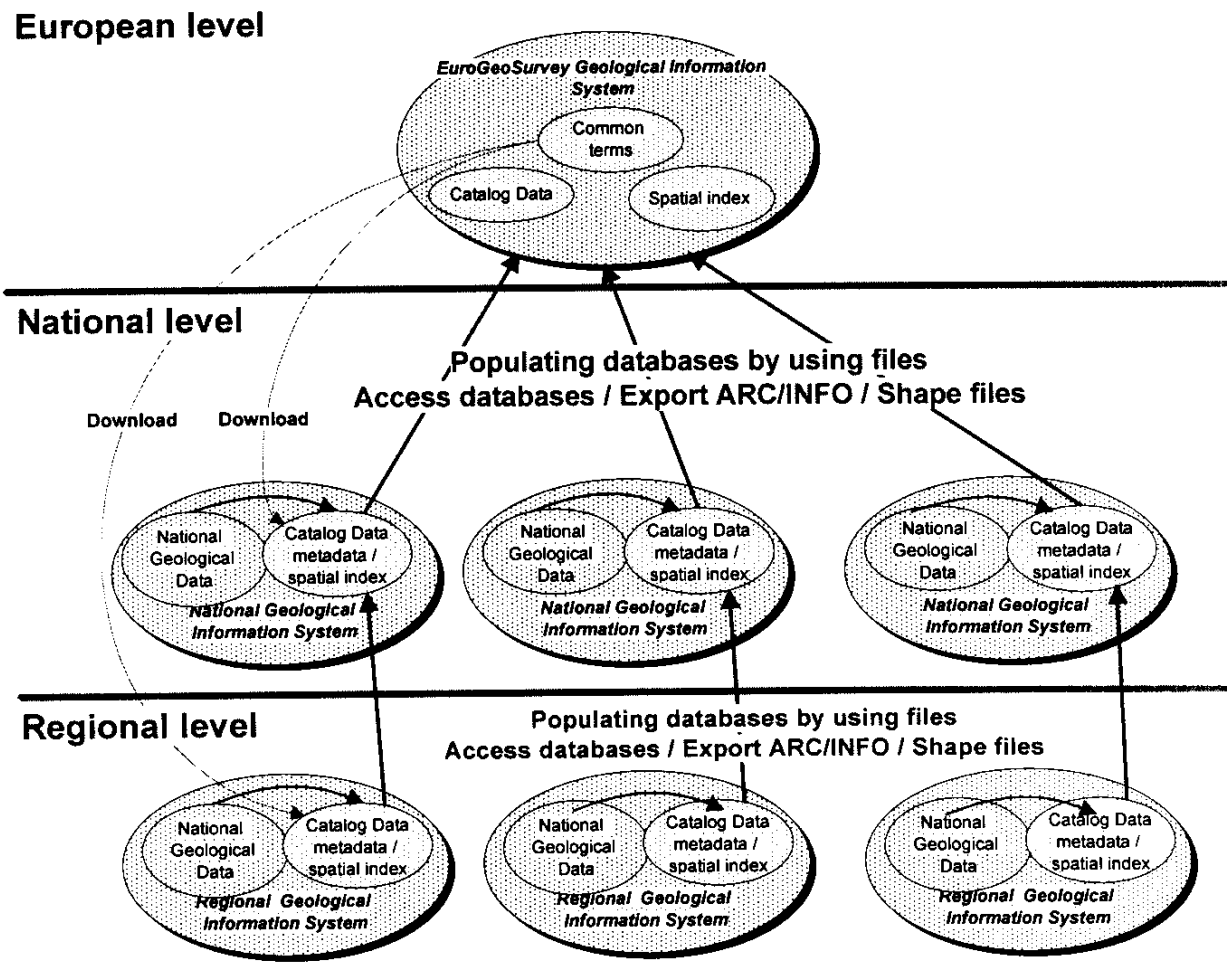
The consolidation functionality of the regional data (ACCESS database) into the national data (ACCESS database) is included in the data entry application.

Electronic messaging, ftp or magnetic medium are used to transmit Access files (MDB) between the various levels. The national database is the fusion of the various regional data bases, if they exist, and of national metadata.

Consolidation at the European level

The geological survey of the Netherlands, in charge of loading the data, receives the various national metadatabases and loads them into the GEIXS database, held in an Oracle system, using ODBC facilities.

The consolidation functionality of the national data (ACCESS database) into the GEIXS European database (ORACLE database) is included in the data entry application.



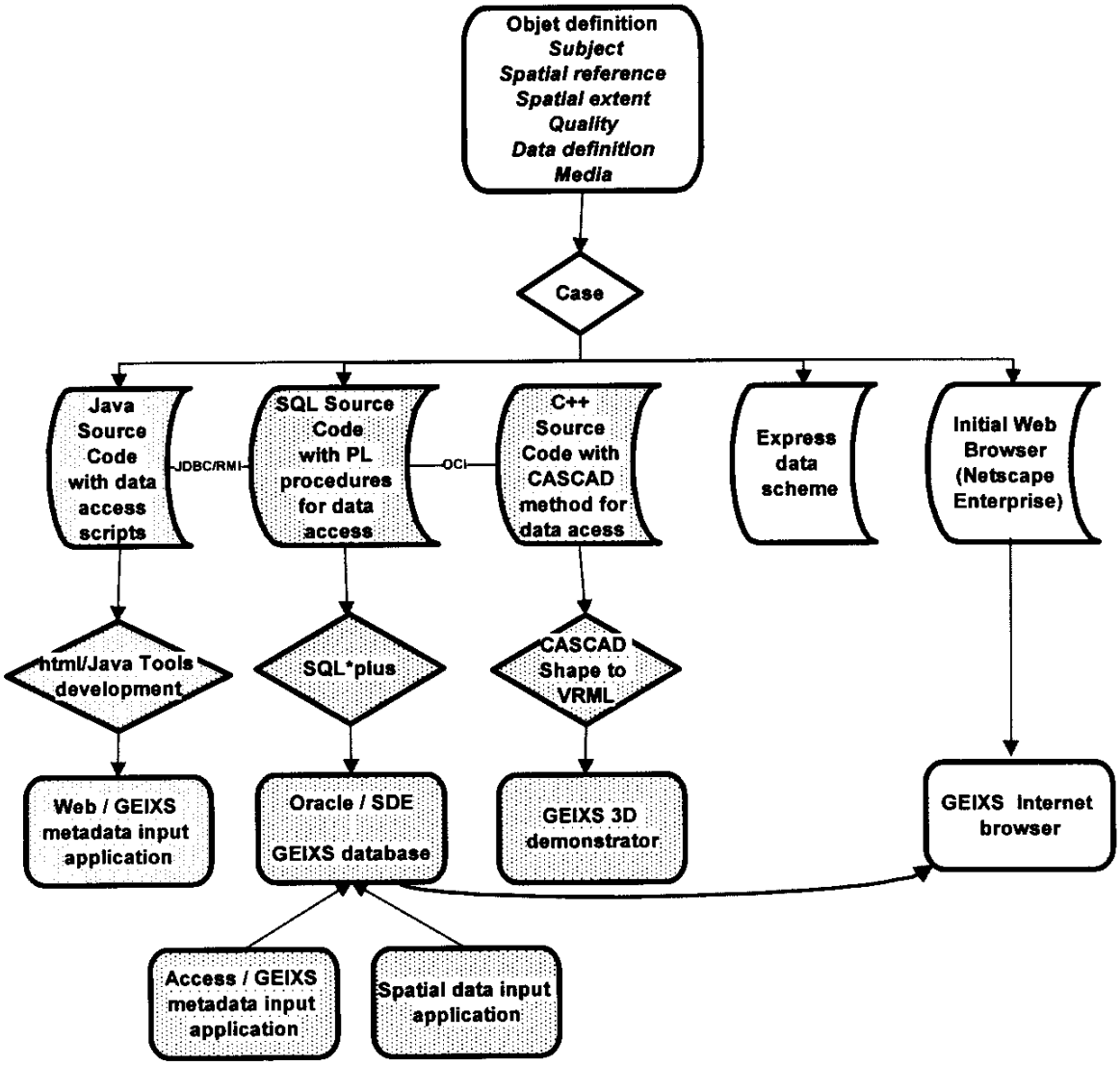
Technologies used

Technical implementation

The diagram below describes the technologies used to develop the GEIXS system.

From the description of GEIXS objects in the data model, the "puts" tool makes it possible to generate:

1. SQL table creation scripts; PL/SQL procedures for reading and writing the attributes of each object,
2. The source code of the Java classes which encapsulate PL/SQL procedures (use of JDBC),
3. The source code of the CAS.CAD classes which encapsulate PL/SQL procedures (use of OCI),
4. A basic WEB server metadata retrieval, using Java scripts,
5. An EXPRESS TRAIN file describing the GEIXS data model.



GEIXS' technical choices

Basic technology

The metadatabase will be managed using the Oracle system, version 7.3.

The spatial indexes (GIS) will be managed using ESRI Spatial Dated Engine (SDE V3.0) software.

The metadata loading application will be implemented using Microsoft ACCESS.

Co-ordinate transformations will be carried out by SDE V3.0, Projection Engine package.

Image Engine software will be used to translate geographical requests returned by SDE into GIF images.

Screens for thematic and geographical retrieval will use html and Java 1.1 technologies.

The link between Microsoft Access and Oracle will be through ODBC and SQL*net.

Editor of metadata

Metadata entry will be carried out by an Access "runtime" application that will operate locally on a PC. A function is provided to update the Oracle database on the GEIXS server through an ODBC link.

Thematic and geographical browser

This application will be developed in HTML and Java.

PROYECTO ESPRIT 23802

GEOLOGICAL ELECTRONIC INFORMATION EXCHANGE SYSTEM (GEIXS)

2D AND 3D RETRIEVALS

DENIS BONNEFOY
LUIS DELGADO

FEBRERO 1999

Purpose : To specify, develop and build the applications for end-user 2D-GIS based retrievals at the meta data / index layer and for demonstration 3-D retrievals at the geodata level.

Task T029 - T030 *Specification documents leading to installed software for 2-D GIS based retrievals of meta data index layer data, based on modifications of existing BRGM and BGS Geoscience Index System, linked to OMEGA and GEOFRANCE projects, using ESRI SDE links to Oracle tables delivered to the public in format compatible with available Web browser. Technical and user documentation, on-line help files, support to end users by e-mail.*

The development of the GEIXS site has been completed. All the experience of the different geological surveys has been used. The functionality of the GEIXS server is:

- Presentation of GEIXS project,
- Partners and links toward DGIII/DGXIII, national geological surveys and EuroGeoSurveys,
- Thematic search,
- Geographic search,
- Project tools including documentation, data entry application, administration tools.

The address of the GEIXS site is http://www.eurogeosurveys.org.

The GEIXS site is translated into six European languages.

Task T031-T032 *Specification documents (responsibility of E) leading to installed capability for end user searching of 3D geodata using demonstrator data and software imported from ongoing developments in GEOMIST and OMEGA. Technical and end-user documentation. Developments based on the CAS.CADE toolkit being undertaken within OMEGA; to act as a demonstrator for future services and capabilities of 3D-GIS software functions running over the Internet.*

The decision to realize the 3D demonstrator by using VRML files created in others projects was made in a previous meeting. The way used to describe a 3D model in GEIXS is to associate the model to one metadata record. The 3D geological model is described in terms of a process of acquisition, thematic quality, spatial extent etc, as in "normal" metadata. The 3D VRML file is stored in the sample part of the metadata base. A special keyword has been added to make available the 3D model with retrieval tools.

A geological model in three dimensions is described in a VMRL format file which can be visualised by " plugins " with the Internet Netscape or Explorer browsers.

The 3D model is created by a three-dimensional geological modelling application using tools such as CAS.CADE or others. These applications are developed in other national or European programs (GEOFRANCE3D, OMEGA, GEOMIST for example).

ANNEXE

This report describes the Web browser and spatial indexes parts of GEIXS. The other parts (metadata model, input application, common terms) have already been described in previous reports.

Introduction: Architecture of GEIXS system

This section describes the GEIXS system architecture.
The GEIXS system is made up of:

- data bases (metadata) describing the various data files available in the national geological surveys,
- a metadata entry application,
- a Web application for retrieval by geographic and/or thematic criteria,
- an application for the addition / modification of the common terms (lexicons).

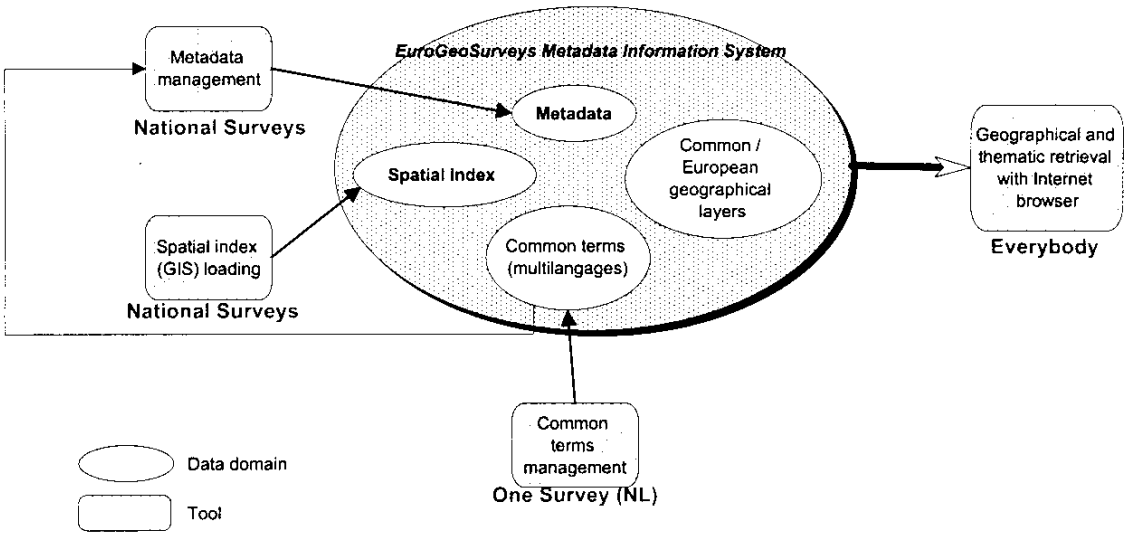
The GEIXS information system describes the following information:

- metadata,
- spatial indexes (GIS),
- links towards the geodata,
- topographic backdrops for user location.

The GEIXS applications are:

- a metadata editor allowing the addition or modification of the characteristics of a data file (characteristic of the data + detailed position + links with the source data),
- a geographical and thematic browser usable by Netscape (version 4 or higher) or Internet Explorer (version 4 or higher),
- an editor of the terms contained in the lexicons.

The diagram below shows the different modules constituting the GEIXS system.



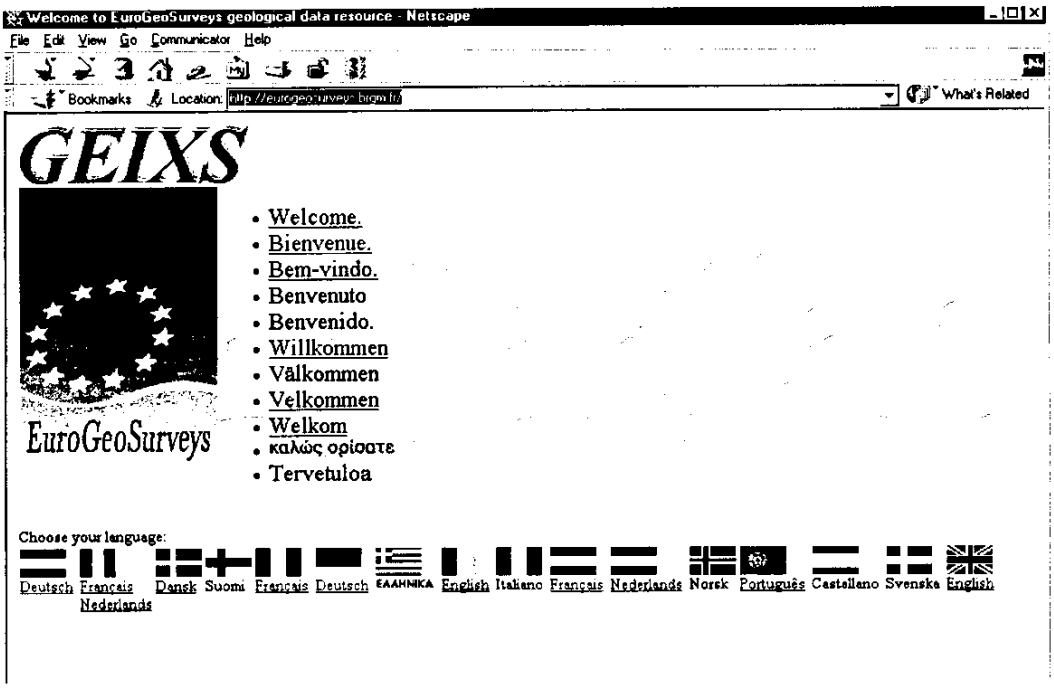
The GEIXS Internet Web server

The GEIXS http address

The http address of the GEIXS server is:
http://www.eurogeosurveys.org

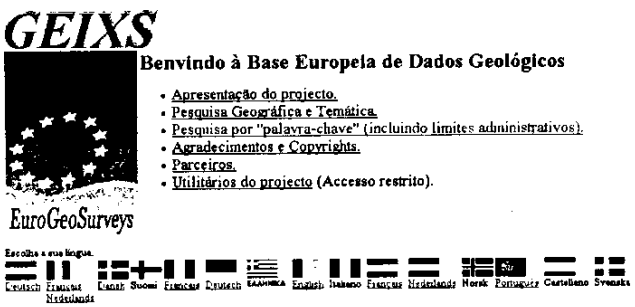
Home page and Presentation of GEIXS

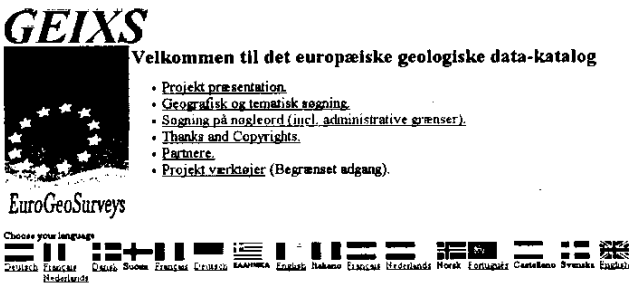
The home page is shown below. It allows the selection of the language of the other pages.



At present the English, French, Portuguese, German, Dutch and Danish languages are available.

These two pages are examples of the second home page of GEIXS in Dutch and Portuguese.





Description of available items

Six items are available from the GEIXS home page.

1. Project presentation,
2. Geographic and thematic search,
3. Thematic search,
4. Thanks and copyright,
5. Partners,
6. Project tools.

Project presentation

This item presents, very briefly, the GEIXS project.

- What is GEIXS?
- Why use it?
- Who is it for?
- How to use GEIXS?
- Who has produced GEIXS?

Thematic Search

This functionality allows the metadata to be queried in alphanumeric mode.
The user can select category, keyword, usage, access conditions and/or name of administrative units (from SABE). He obtains in a results window the list of metadata retrieved according to the filtering conditions.
By clicking on the dataset title, he can obtain the full description of the metadata. He can also obtain a map of the spatial extent.

Geographic search (2D and 3D)

This functionality allows metadata retrievals using a GIS approach. This retrieval can be refined by filtering on category, keyword and usage.

The user is helped by the SABE topographic backdrop. This topographic backdrop appears according to a scale factor: at European level, only countries' borders appear, while at the maximum zooming factor the detailed administrative limits appear. The user can change the projection system.

A request to the metadata base is made by clicking on the map (an area of influence is associated with the cursor, 10 km square is the default). The result of the request is a list of metadata. If detailed information is associated to the metadata, the user can display it on the map (display of spatial index).

> The spatial index is a geographical layer (GIS) associated with the metadata. It describes using points, lines or polygons, the detailed position of the source data. The spatial index is not obligatory at present: it is optional.
>
> *Example of spatial index for* ***the Subsurface Data Bank*** *France:*
> *It is a geographical layer made up of 400 000 points with attributes X, Y, N ° of mining, natural code of the work, depth reached, geological presence of cut, presence of piezometric measurements;*
>
> *Example of spatial index for the data of the series* ***of the geological maps with 1/50 000 scale****:*

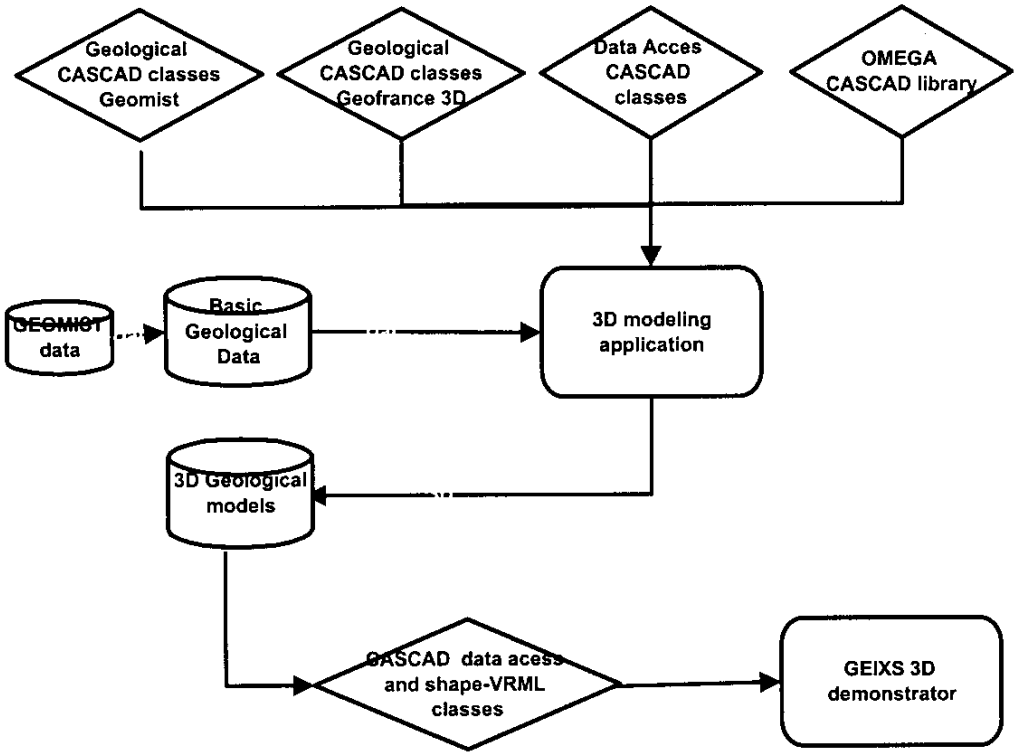
It is a geographical layer made up of 1028 polygons (N corners of the map) with attributes state of the survey, author(s), date of edition, numerical availability in the form of scan, availability in the form of vector;

Example of spatial index for the data of ***the geological map with 1/1000 000 scale:***
No spatial index.

The way used to describe a 3D model in GEIXS, is to associate the existing 3D model to one metadata record. The 3D geological model is described in terms of process acquisition, thematic quality, spatial extent etc, as in "normal" metadata. The 3D VRML file is stored in the sample part of the metadata base. A special keyword has been added to make available the 3D model with retrieval tools. The 3D retrieval tool is the same as the 2D retrieval tool. To locate a 3D geological model, the user chooses in the category/keyword at least the term "3D model". The subsequent operations are similar to those for normal metadata.

The 3D models are previously created with three-dimensional geological modelling applications using tools such as CAS.CADE or others. These applications are developed in other national or European programs (GEOFRANCE3D, OMEGA, GEOMIST for example). The result is one geological model described in a VRML file which can be visualised by "plugins " with the Internet Netscape or Explorer browsers.

The process of creation of a 3D model is presented below.



Thanks and copyright

This items presents a list of all external actors who have contributed to the development of the GEIXS system. We can find in this list the National Mapping Agencies who have provided through Megrin, the administrative limits of Europe.

Partners

This is an Internet list of the home pages of all the partners of the project.

Project tools

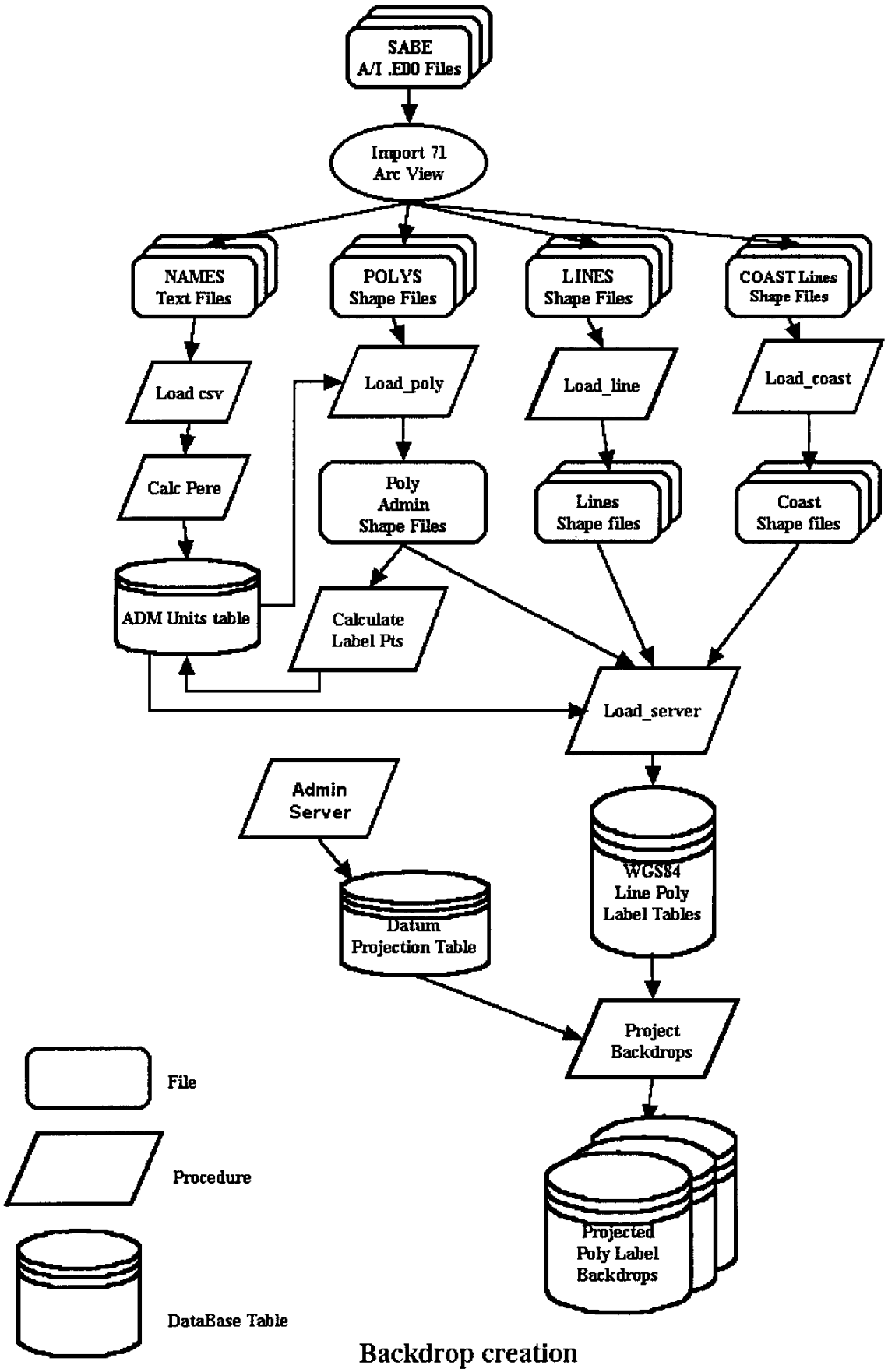
The project tools entry allows access to :

- Tools documentation,
- Data entry application,
- BGR co-ordinate transform routine,
- Metadata count and list by provider,
- Web server administration

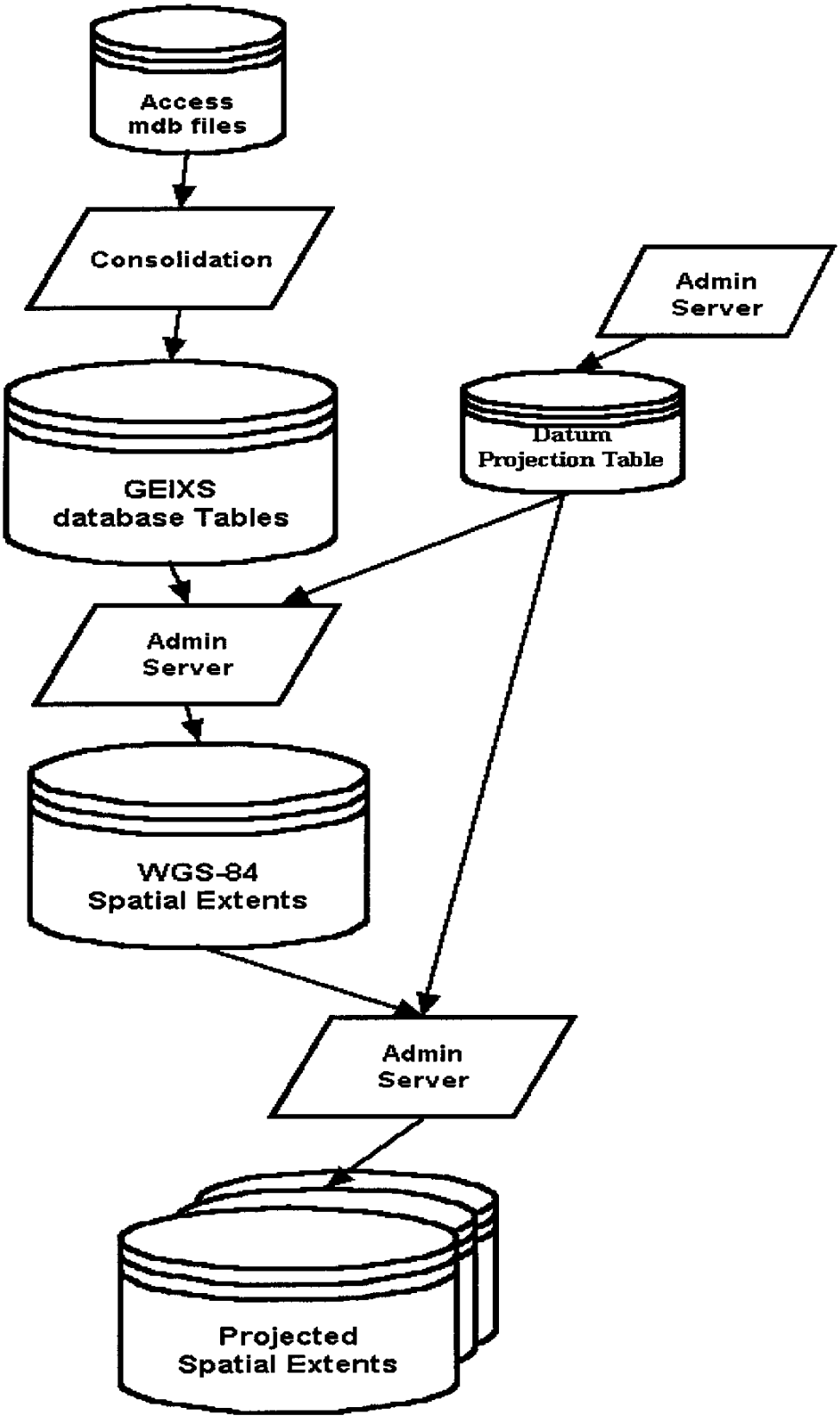
The access to Web server administration is reserved to the GEIXS administrator. In this menu, the administrator can :

- List existing datum and create a new datum ,
- List existing map projections and create a new map projection
- Consolidate in the European database from the national databases,
- Convert all the spatial extents to a unique projection system (WGS 84),
- Projection of backdrops,
- Projection of spatial extent,
- Load spatial index and modify characteristics,
- Produce Web server statistics.

The two diagrams below explain the different steps for backdrop creation and spatial extent consolidation respectively.



Backdrop creation

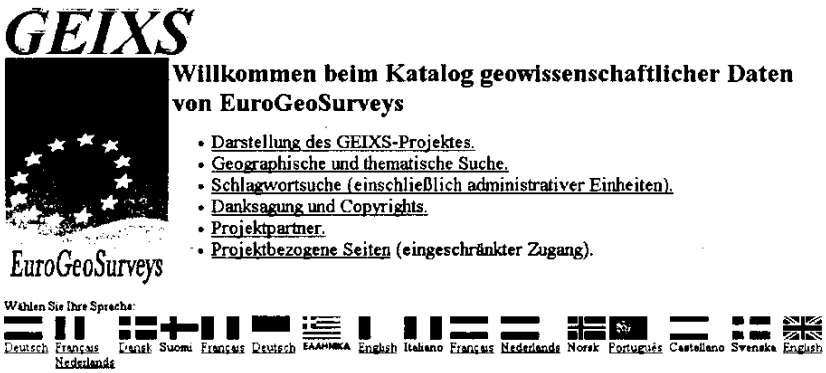


Spatial Extent Consolidation

Screen copies of web pages

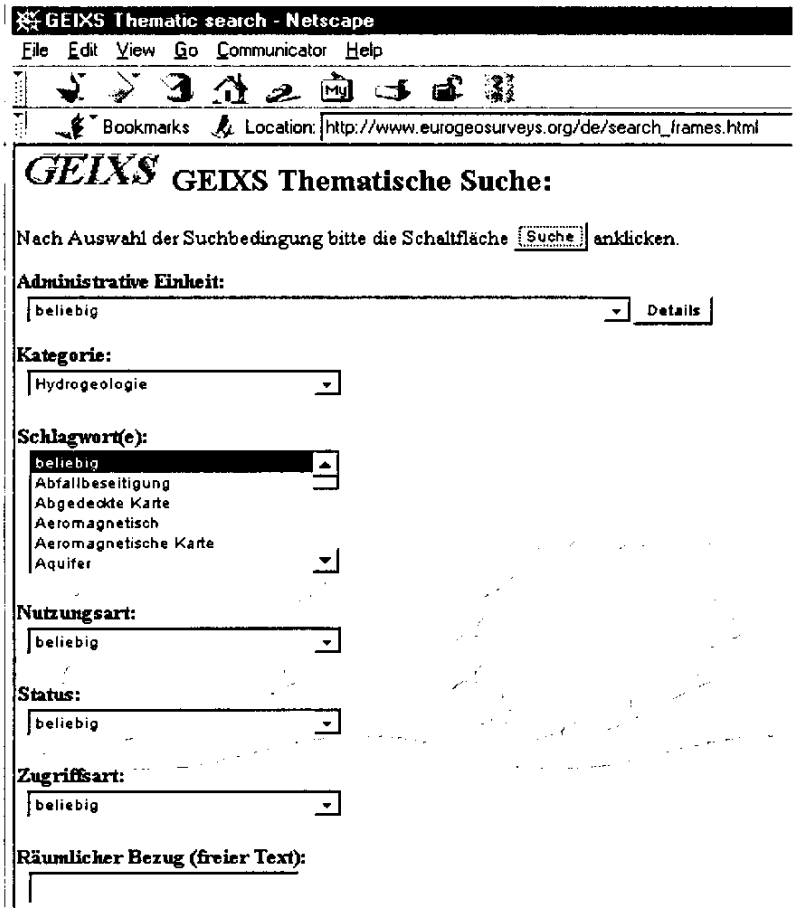
This chapter illustrates the main functionality available on the GEIXS site.

Home pages



Thematic search

Copy of the page used to prepare the query.



Result of the query:

GEIXS

Ergebnis der thematischen Suche

- Fachabteilung Hydrogeologie - Dokumentation
- Umweltgeologie und Kontaminationsrisiko oberflächennaher Grundwasservorkommen
- Geohydrologische Detailuntersuchung an Karstquellen und Grundwasservorkommen im Raum Ybbsitz-St. Georgen-Hollenstein (N.Ö.)
- Laborjournale
- Investigación de las aguas subterráneas y su gestión
- Banque de données des Eaux Souterraines
- Réseau piézométrique du bassin Seine-Normandie
- National groundwatermodel
- Groundwater Extraction Points
- Groundwaterprotectionzones
- Locations of groundwaterpollution
- Archive of Reports related to Geotechnical and Groundwater Wells and to Mineral Exploration
- Hydrogeological Map of Portugal at 1: 1 000 000 scale
- Hydrogeological Map of Portugal at 1: 200 000 scale
- Hydrogeological Map of Algarve at 1: 100 000 scale
- Archive of Hydrogeological Work and Studies Reports

Datensatzidentifikation

Fachabteilung Hydrogeologie - Dokumentation (HYDROARCHIV)
Metadatensprache: Deutsch.
Verwandte Datensätze: ÖK 50 mit Punktsignaturen.
Datensatzsprache: Deutsch.
Erfassungsdatum: 31-MAR-1998

Datensatzüberblick

Kurzbeschreibung: Sammlung von hydrogeologisch relevanten Unterlagen (Bohrprofile, Ausbaupläne von Brunnen, Wasseranalysen, hydraulische Daten)
Erfassungsziel: im Rahmen der geologischen Landesaufnahme

Abstract: collection of hydrogeological important materials (profiles of bores, plans for extension of wells, water analyses, hydraulic data)
Overview: collection of hydrogeologic data is a part of the geoscientific mapping programme of Austria

Nutzungsart(en):

Nutzung	Kommentar
Baugrund	
Umwelt	

Dokumentation: ÖK 50 mit Punktsignaturen.
Datensatz-Kategorie(n): Hydrogeologie.
Stichwort(e): Bohrung. Geochemische Untersuchung. Hydrogeologie. Mineralwasser. Thermalwasser. Geothermal. Grundwasser.

Genauigkeitsangaben

Datenherkunft: Sammlung verschiedenster hydrogeologisch relevanter Unterlagen
Räumliche Genauigkeit: verschieden
Thematische Genauigkeit: verschieden
Zeitliche Genauigkeit: verschieden

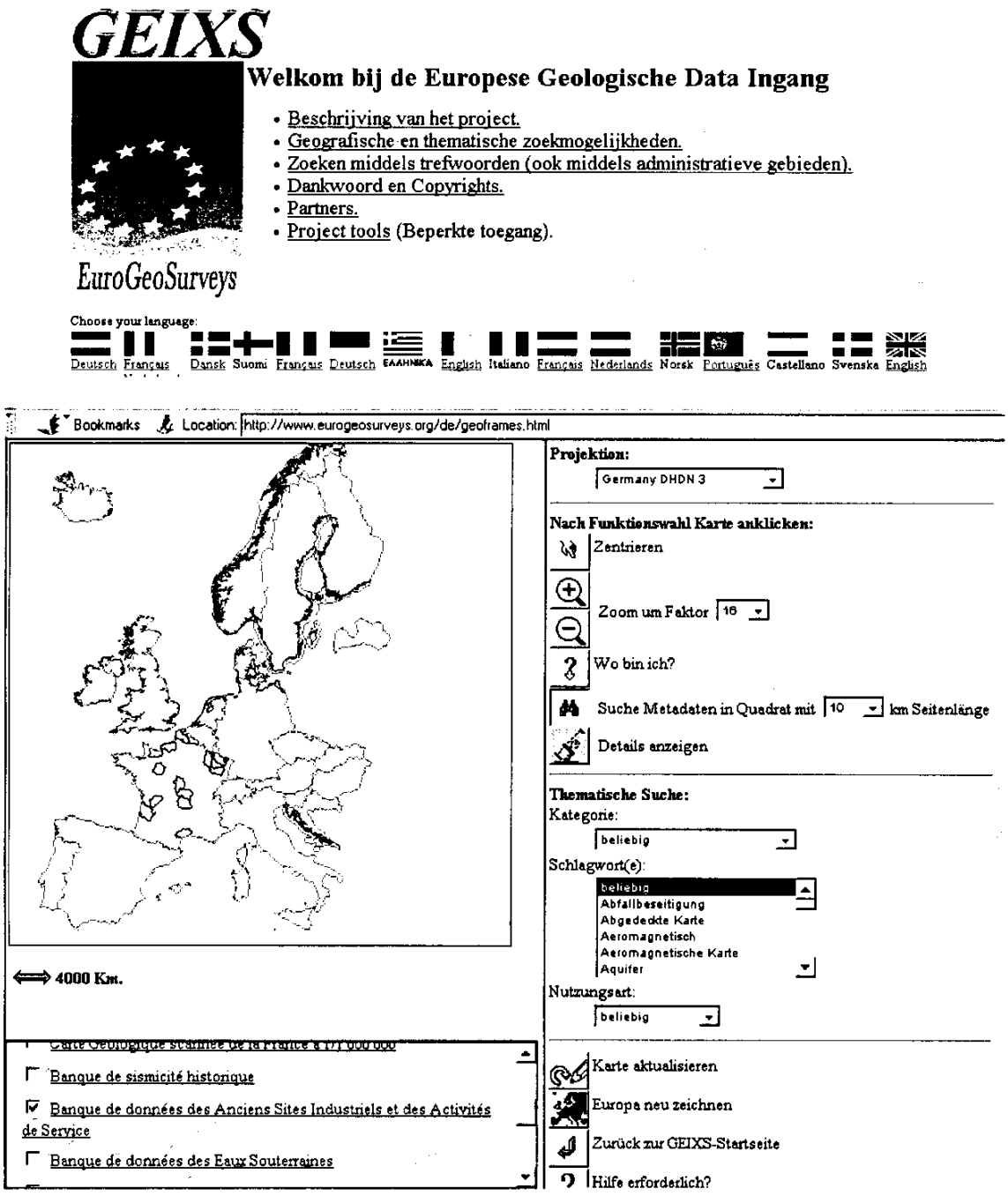
Data Origin: collection of various hydrogeologic data of importance
Positional Accuracy: various
Thematic Accuracy: various
Temporal Accuracy: various

Räumliche Ausdehnung

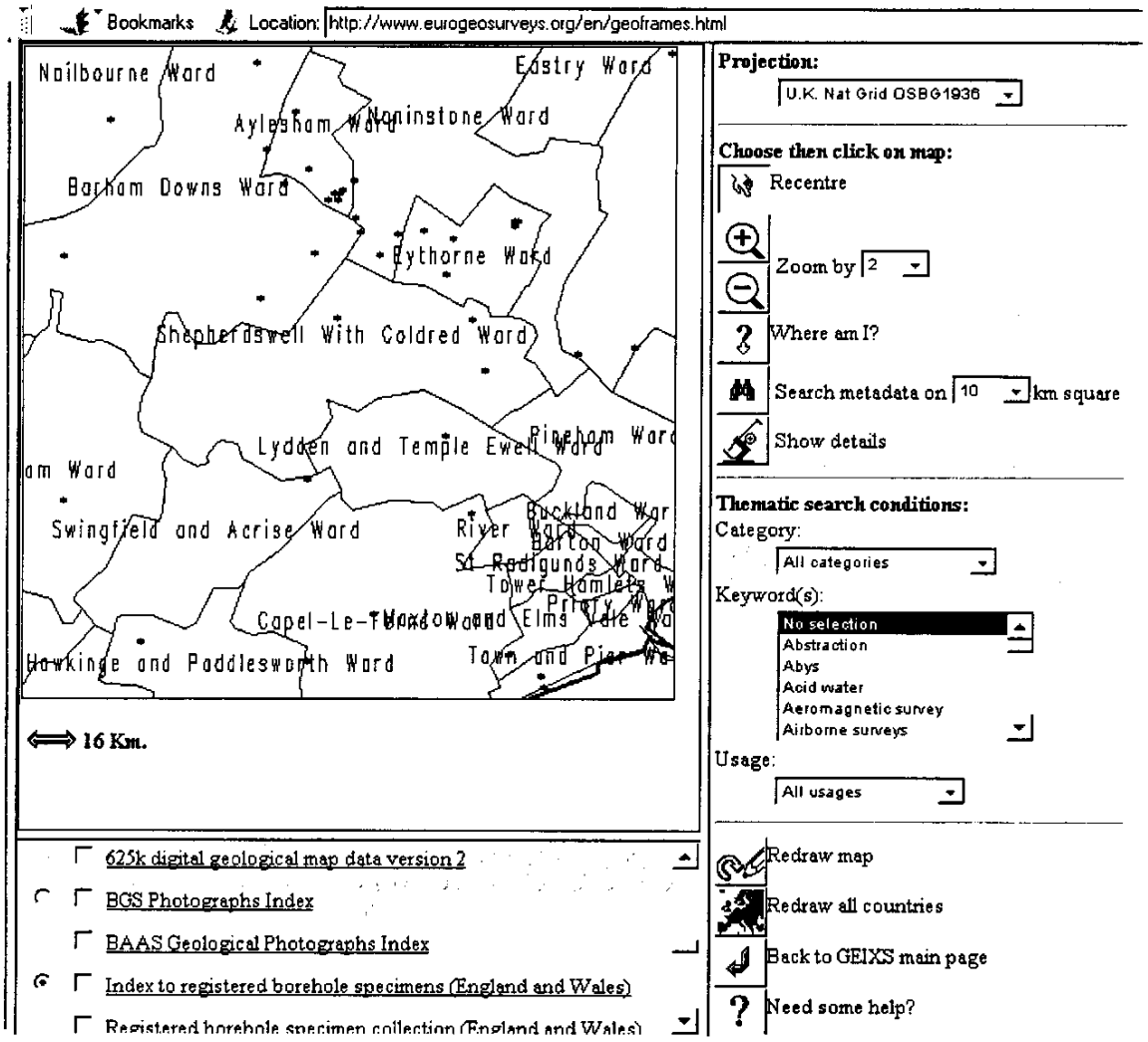
Statusdatum: 30-APR-9
Datensatzstatus: geplant
Räumliches Referenzsystem: Longitude-Latitude (+/- DDDMMSS.SSS) WGS84

Example of map obtained by clicking on blue button (spatial extent of data)

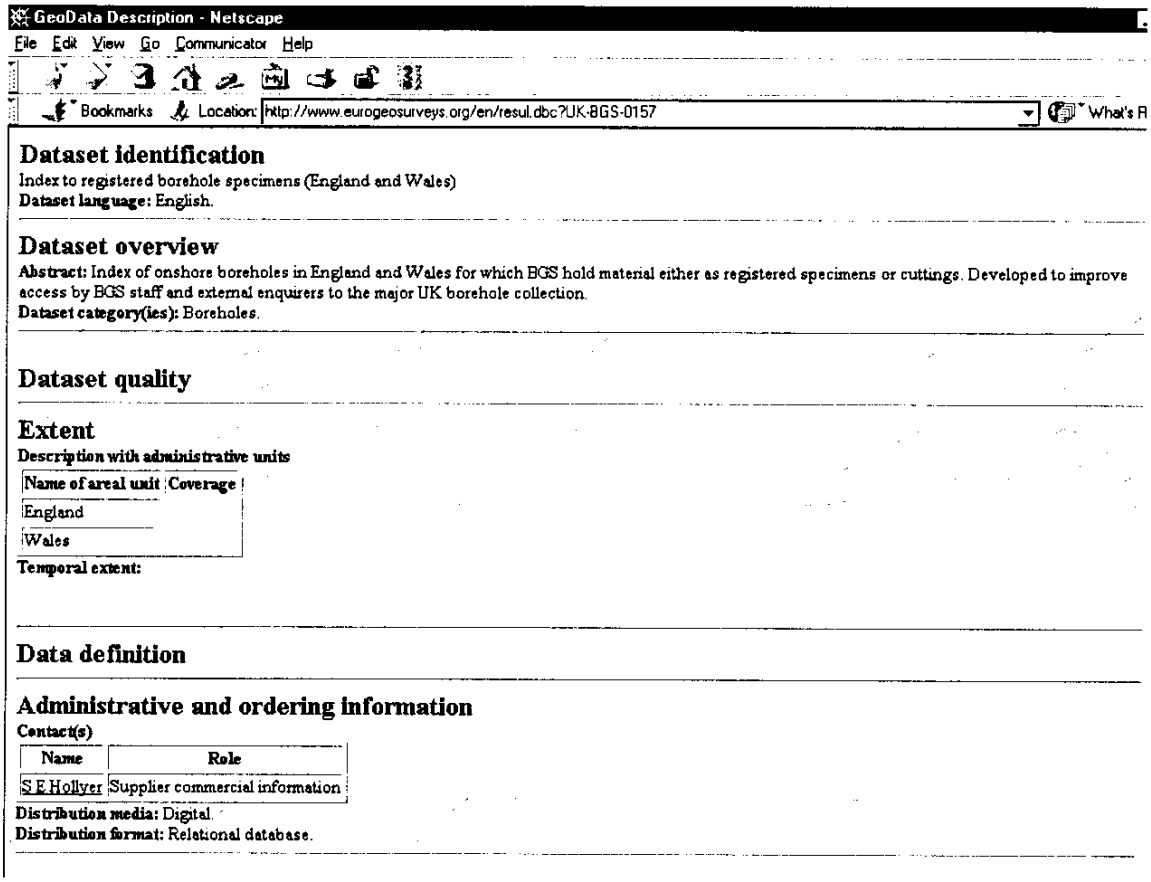
GIS search - 2D retrieval tools



Starting map of Europe (nb: on this screen, the user has asked to retrieve the data available in France and to display the spatial extent of one dataset).



After zooming into an area of England. The user has asked to see all datasets available in this area. He asked also to see the spatial index (borehole location).

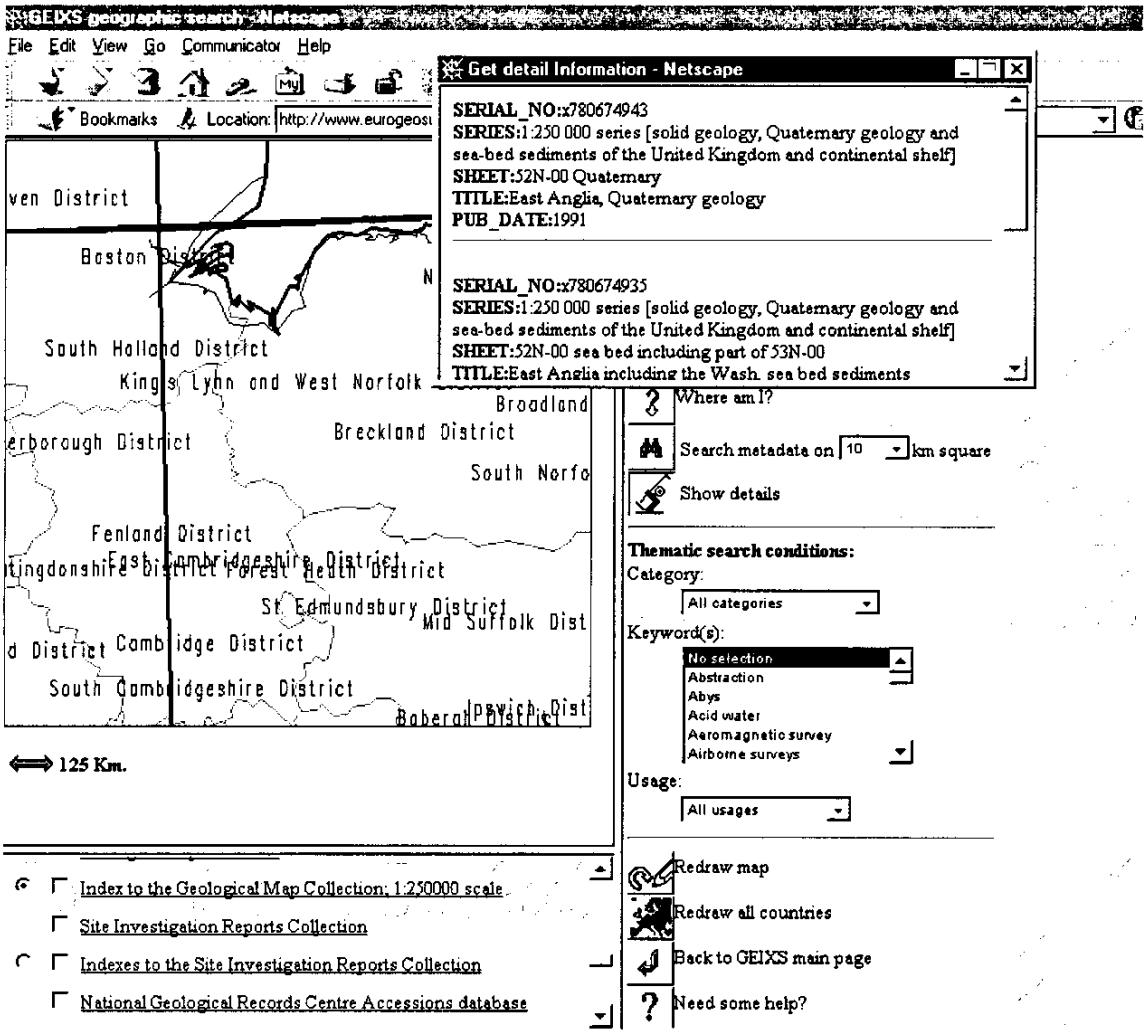


This is the description of the "Index to registered boreholes specimens".

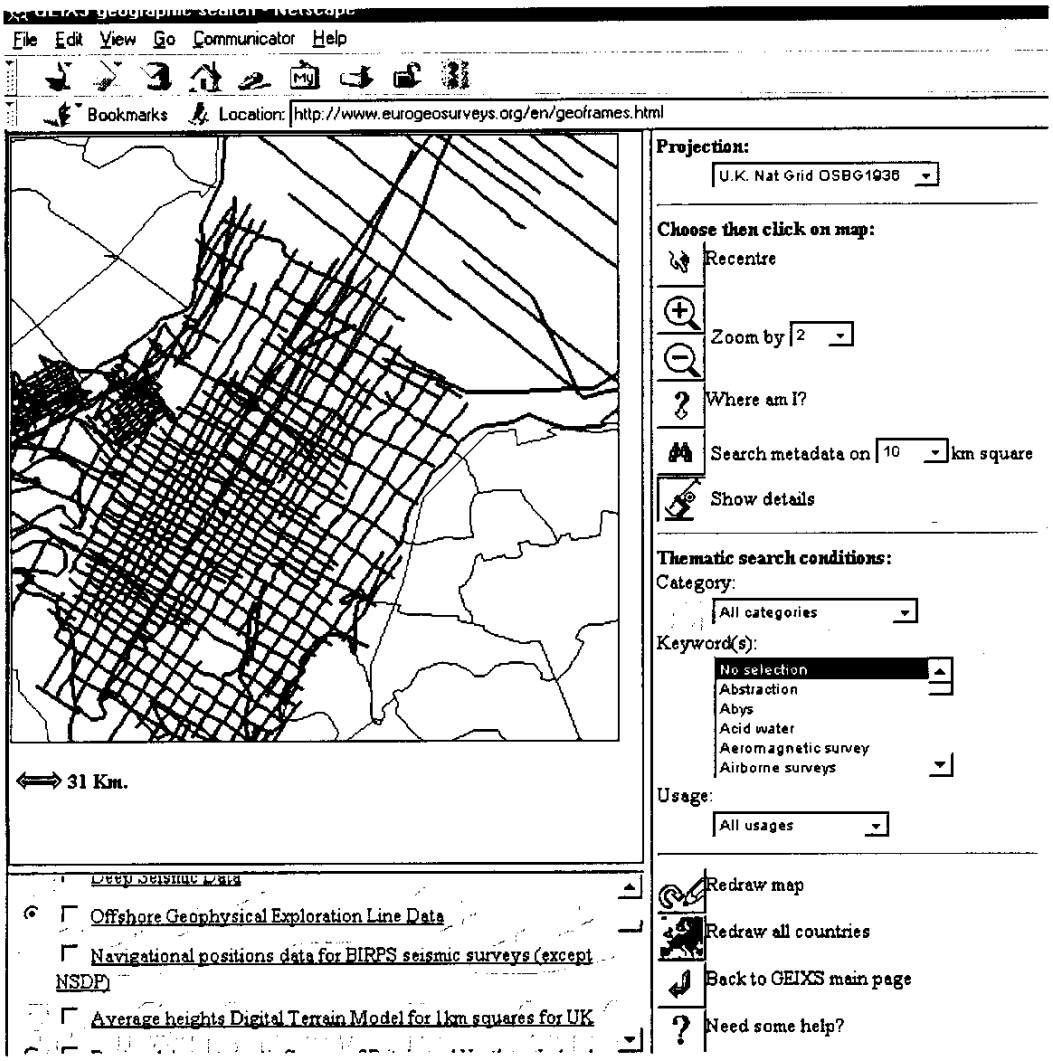
Spatial index

These two examples illustrate the spatial index:

- a map sheet. Each sheet has attributes.



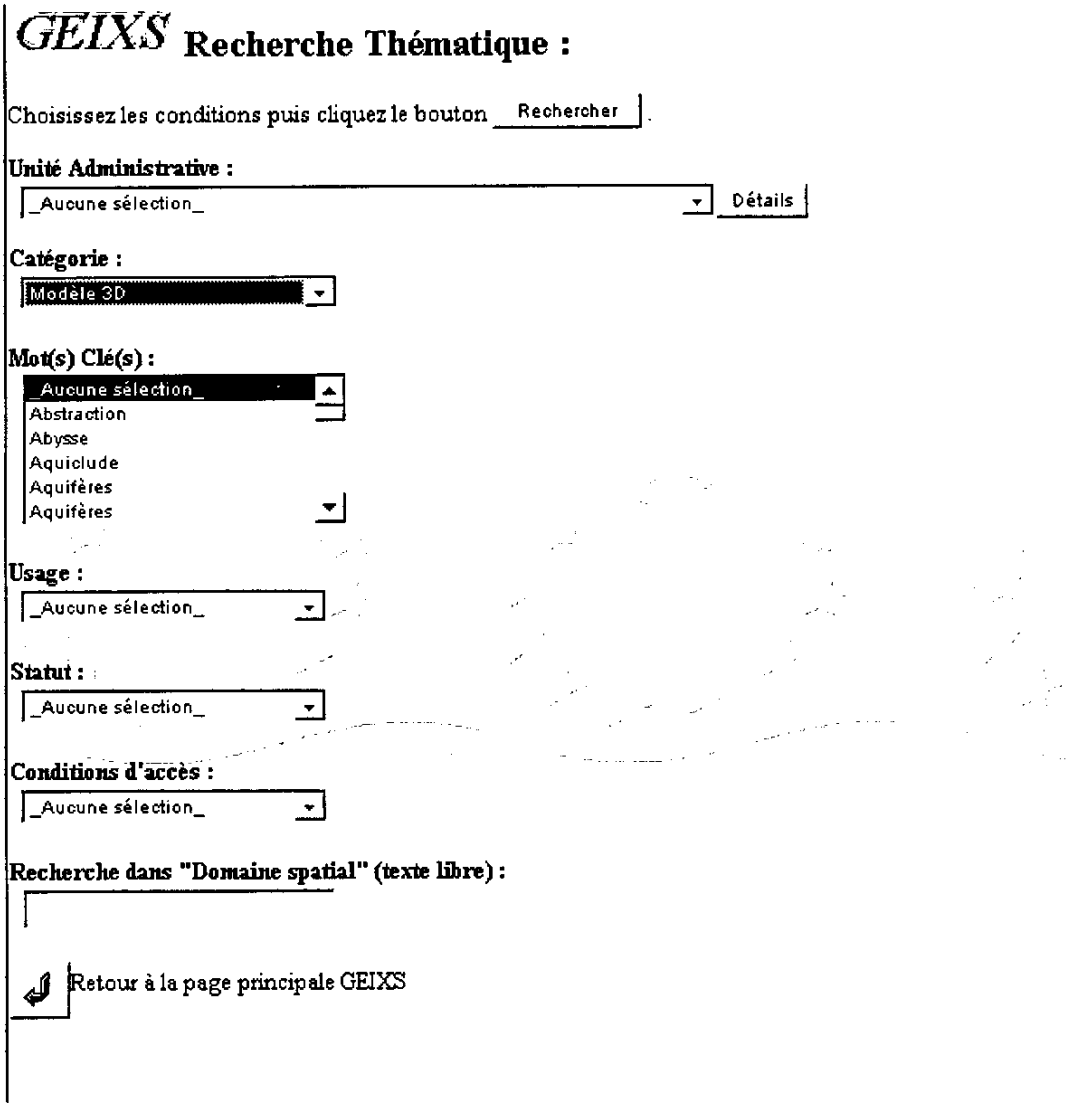
- one for "Offshore Geophysical Exploration Line Data".



GIS search - 3D retrievals tools

Demonstrator 3D

To access a 3D model, the user selects the category of data "3D-model".



He will obtain a list of 3D metadata and by clicking on the title, he obtains characteristics of the geological model . He can also access the VRML files over the Net (direct link to Géofrance 3D)

GEIXS

Résultat de la recherche thématique

Modèle 3D du massif de l'Aiguille des Morges

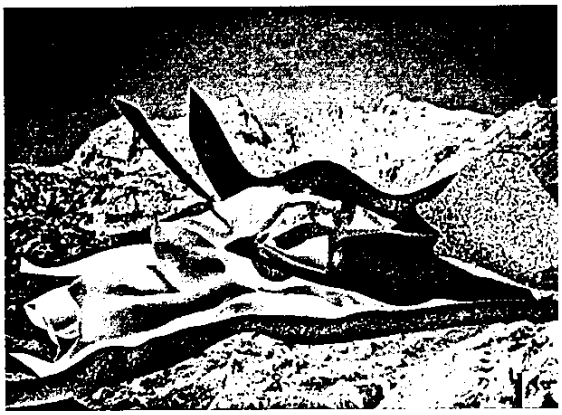
Geological Map of the Netherlands scale 1:500.000

Cliquer sur le nom de la géodata pour obtenir sa description.

Cliquer sur pour voir la zone couverte.

MODELISATION GEOMETRIQUE TRIDIMENSIONNELLE DU MASSIF DE L'AIGUILLE DE MORGES

(ALPES OCCIDENTALES FRANÇAISES)



Résumé français

English abstract

Fichiers VRML

Project tools

This is a copy of the project tools page.

GEIXS Tools.

- System GEIXS User's guide
- Installation of Metadata Input Application
- Metadata input
- Update of the Geixs dictionaries
- National Consolidation from the regional Metadatabases
- Spatial Index Preparation
- Ms ACCESS installation kit (16bit Zip)
- Ms ACCESS installation kit (32bit Zip)
- Ms ACCESS lexicons
- BGR Coordinate transform routine
- Metadata list ordered by provider
- Web Server administration

Statistics / metadata

From this menu, the user can list the amount of metadata by organisation.

BE-BGD (12 description(s))

- **BE-BGD-0001** GEOLOGICAL MAP OF BELGIUM AND NEIGHBOURHOOD, DEPOSITS UNDER THE LOAM
- **BE-BGD-0002** GEOLOGICAL MAP OF BELGIUM : DEPOSITS UNDER THE LOAM AND THE CAMPINIAN SANDS
- **BE-BGD-0003** Geological map of Belgium 1 : 1/40000
- **BE-BGD-0004** Database 1 Underground Belgium
- **BE-BGD-0005** Aeromagnetic map of Belgium - Luxembourg : Residual Total Field Image : scale 1/300000 & 1/500000
- **BE-BGD-0006** Spectrometry : Uranium Count Image
- **BE-BGD-0007** Aeromagnetic map of Belgium - Luxembourg : Residual Total Field Reduced to Pole : scale 1/300000 & 1/500000
- **BE-BGD-0008** Spectrometry : Thorium Count Image
- **BE-BGD-0009** Spectrometry : Potassium Count Image
- **BE-BGD-0010** Spectrometry : Total Count Image
- **BE-BGD-0011** Spectrometry : U Th K Synthesis Image
- **BE-BGD-0012** Geological map of Belgium, Flemish Region : scale 1/50000

DE-BGR (19 description(s))

- **DE-BGR-0001** Earthquake Information System
- **DE-BGR-0002** Earthquake Database of Phase Readings and Earthquake Parameters
- **DE-BGR-0003** Seismological Waveform Data of the GRF Array and the GRSN
- **DE-BGR-0004** Reflection Seismic Profiles from the German Sector of the Baltic Sea
- **DE-BGR-0005** Catalogue of Topographical Maps and Borehole Locations at Berlin Branch Office
- **DE-BGR-0006** Organic-geochemical Data from Basin Studies
- **DE-BGR-0007** Geogenic background values for organic compounds
- **DE-BGR-0008** Catalogue of Citations about Naturally Occurring Halogenated Organic Compounds
- **DE-BGR-0009** Catalogue of the Geoscientific Maps of the BGR Branch Office Berlin
- **DE-BGR-0010** Catalogue of Header Data of Geological Outcrops
- **DE-BGR-0011** Stratigraphic Revision Upper Jurassic in Boreholes in the Lower Saxony Basin
- **DE-BGR-0012** Lithostratigraphic Revision of Keuper in NW Germany
- **DE-BGR-0013** Description of Underground Structures in NW-Germany
- **DE-BGR-0014** Catalogue of the Collection of Spore and Pollen Originals
- **DE-BGR-0015** Documentation of the drill cores in the different depots
- **DE-BGR-0016** Documentation of the drill core sample collection of NLfB/BGR in Hannover
- **DE-BGR-0017** Catalogue of macro and micro fossils (description of scientific originals of NLfB/BGR in Hannover)
- **DE-BGR-0018** Inventory of Micro Paleontological and Palynological Analysis Results
- **DE-BGR-0019** Digital Archive Catalogue of the BGR

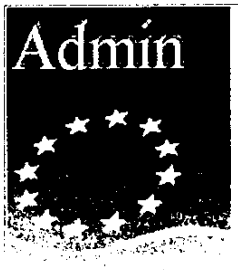
DE-GGA (5 description(s))

Administration of the GEIXS server

Many functions are available from this menu.

Datum List

This entry gives a list of known datums in GEIXS.



Aide en Francais

Create a new datum
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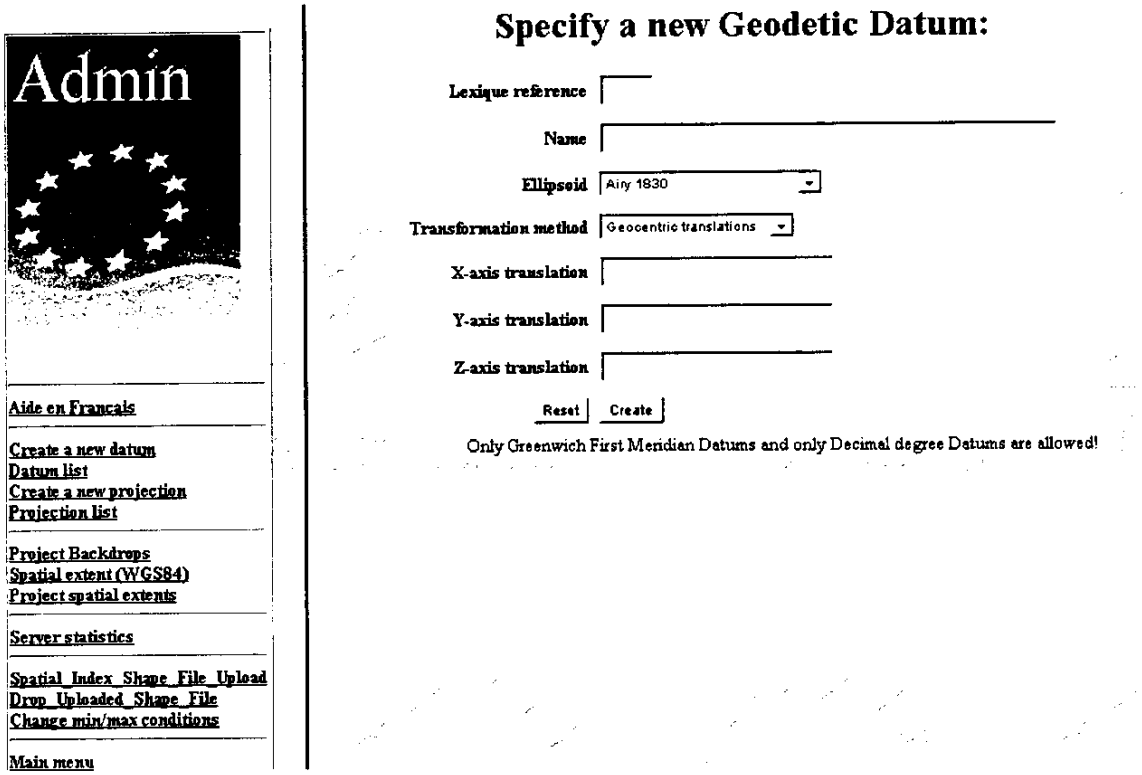
Main menu

Datum list.

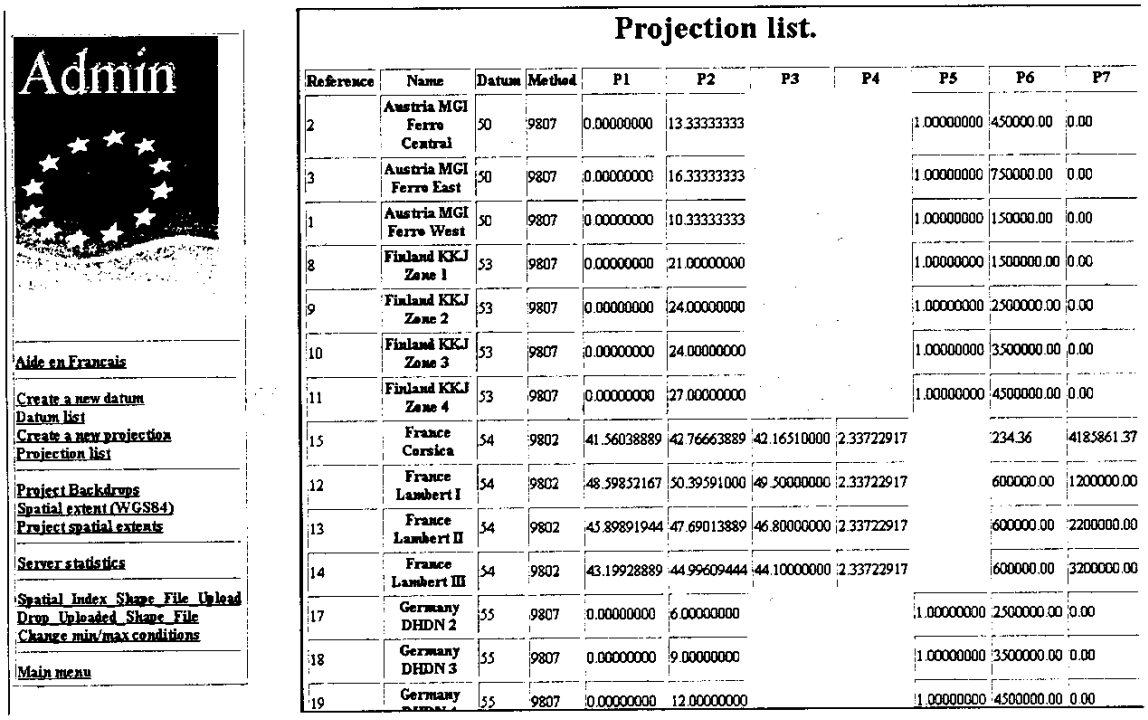
Reference	Name	Ellipsoid	Method	P1	P2	P3	P4	P5	P6	P7
59	Amersfoot (Netherlands)	7004	9606	593.16	26.15	478.54	-6.3239	-0.5008	-5.5487	4.0775
55	DHDN (Germany)	7004	9606	586.00	87.00	409.00	-0.5200	-0.1500	2.8200	9.0000
56	GGRS87 (Greece)	7019	9603	-148.00	136.00	90.00				
53	KKJ (Finland)	7022	9606	-89.61	-104.63	-118.24	-4.2240	-0.2480	0.8520	1.1000
61	Lisbon (Portuguese)	7004	9603	504.10	-202.90	563.00				
50	MGI Ferro (Austria)	7004	9603	594.00	84.00	471.40				
58	Monte-Mario (Italy)	7022	9603	0.00	0.00	0.00				
54	NTF (France)	7011	9603	-168.00	-60.00	320.00				
63	OSGB 1936 (U.K.)	7001	9603	375.00	-111.00	431.00				
62	RT90 (Sweden)	7004	9606	-424.00	80.00	-613.00	-4.4000	1.9900	-5.1800	0.0000
67	System 42/83 (Germany)	7024	9606	24.00	-123.00	-94.00	-0.0200	0.2500	0.1300	1.1000
57	TM65 (Ireland)	7002	9603	506.00	-122.00	611.00				
65	WGS 1972	7026	9606	0.00	0.00	4.50	0.0000	0.0000	-0.5540	0.2270
64	WGS 1984	7030	9603	0.00	0.00	0.00				

Create a new datum



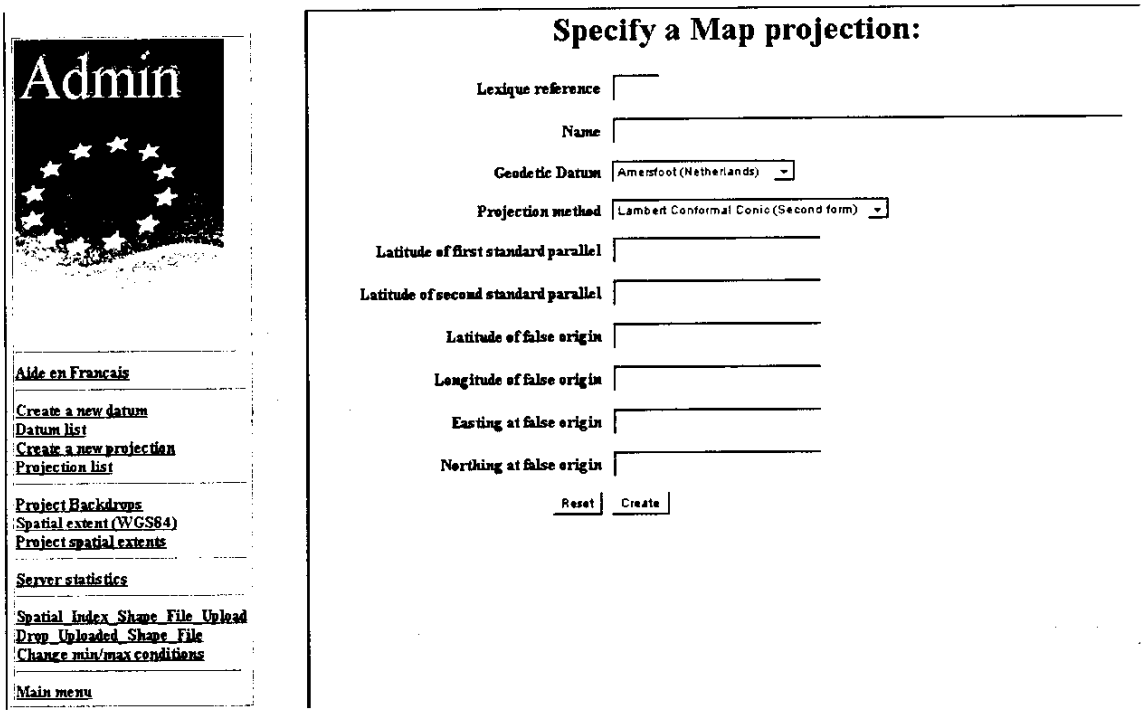
Projection list

This item gives a list of existing projections.



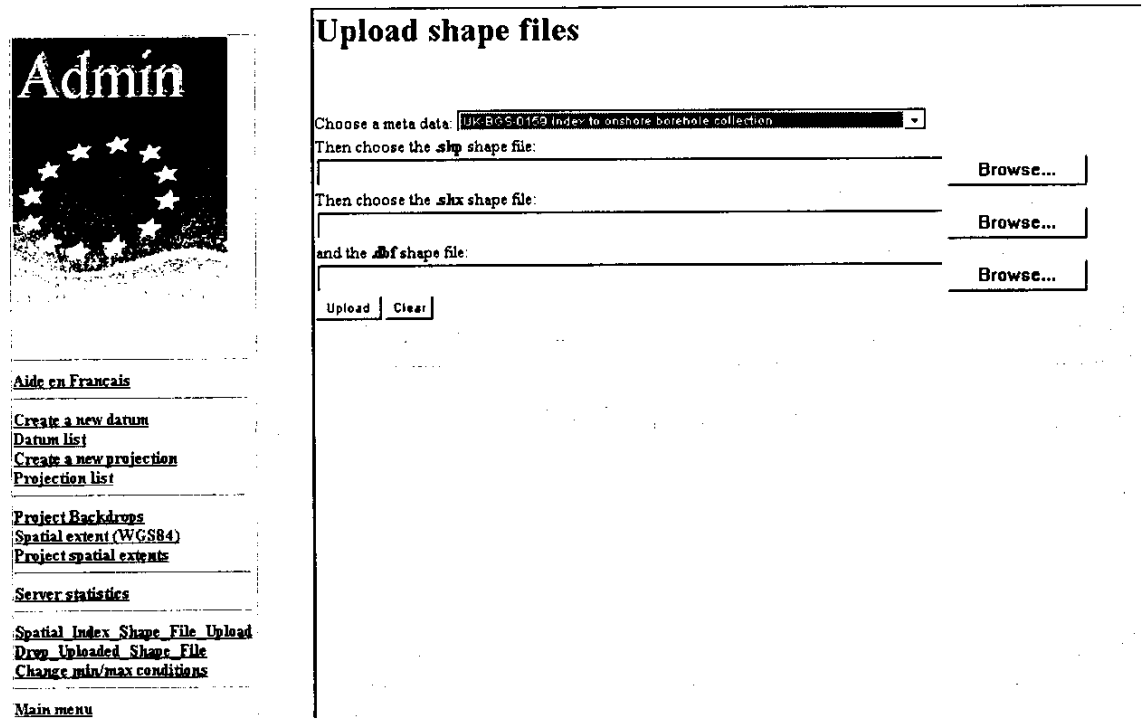
Reference	Name	Datum	Method	P1	P2	P3	P4	P5	P6	P7
2	Austria MGI Ferro Central	50	9807	0.00000000	13.33333333			1.00000000	450000.00	0.00
3	Austria MGI Ferro East	50	9807	0.00000000	16.33333333			1.00000000	750000.00	0.00
1	Austria MGI Ferro West	50	9807	0.00000000	10.33333333			1.00000000	150000.00	0.00
8	Finland KKJ Zone 1	53	9807	0.00000000	21.00000000			1.00000000	1500000.00	0.00
9	Finland KKJ Zone 2	53	9807	0.00000000	24.00000000			1.00000000	2500000.00	0.00
10	Finland KKJ Zone 3	53	9807	0.00000000	24.00000000			1.00000000	3500000.00	0.00
11	Finland KKJ Zone 4	53	9807	0.00000000	27.00000000			1.00000000	4500000.00	0.00
15	France Corsica	54	9802	41.56038889	42.76663889	42.16510000	2.33722917		234.36	4185861.37
12	France Lambert I	54	9802	48.59852167	50.39591000	49.50000000	2.33722917		600000.00	1200000.00
13	France Lambert II	54	9802	45.89891944	47.69013889	46.80000000	2.33722917		600000.00	2200000.00
14	France Lambert III	54	9802	43.19928889	44.99609444	44.10000000	2.33722917		600000.00	3200000.00
17	Germany DHDN 2	55	9807	0.00000000	6.00000000			1.00000000	2500000.00	0.00
18	Germany DHDN 3	55	9807	0.00000000	9.00000000			1.00000000	3500000.00	0.00
19	Germany	55	9807	0.00000000	12.00000000			1.00000000	4500000.00	0.00

Create a new projection

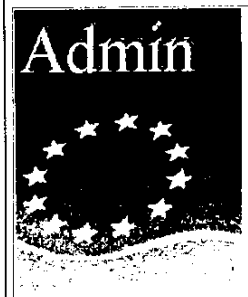


Spatial index tools

In this entry, the administrator can load and manage spatial indexes.



Screen used to fix the display conditions of spatial indexes.



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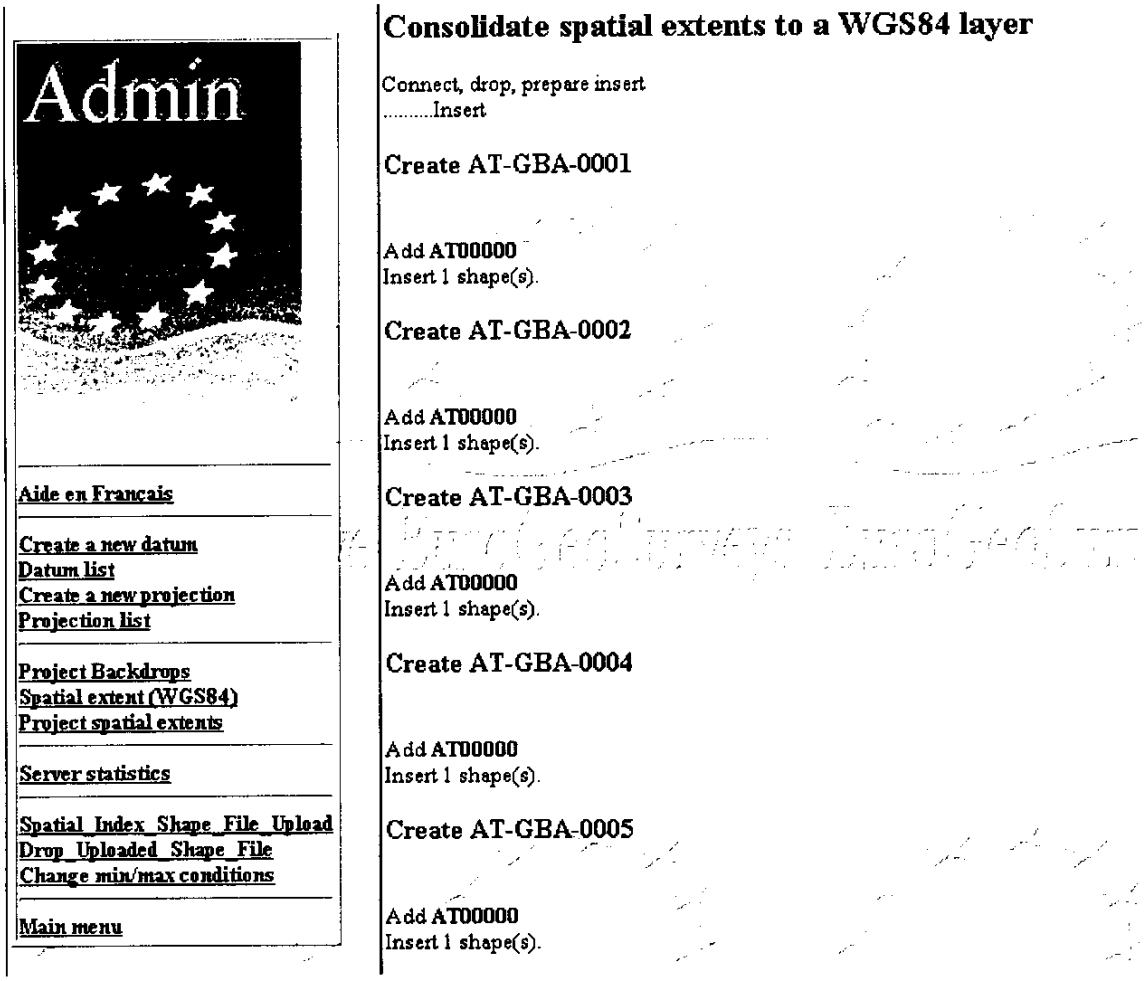
Change SI conditions

Press to change	Min visible	Max visible	Title
UK-BGS-0019	0	100	Local geophysical surveys index
UK-BGS-0020	0	100	Marine Geochemical data
UK-BGS-0023	0	100	Marine sample station data
UK-BGS-0029	0	100	Offshore Geophysical Exploration Line Data
UK-BGS-0033	0	50	Regional Aeromagnetic Survey of Britain and Northe
UK-BGS-0034	0	50	Regional gravity data for UK
UK-BGS-0045	0	400	Mineral Reconnaisance Programme (MRP) geochemical
UK-BGS-0046	0	50	GSP samples: locational and geochemical database
UK-BGS-0124	0	400	Mineral Exploration and Investments Grant Act 1972
UK-BGS-0154	0	100	BGS Photographs Index
UK-BGS-0157	0	50	Index to registered borehole specimens (England an
UK-BGS-0159	0	50	Index to onshore borehole collection
UK-BGS-0166	0	50	Single Onshore Borehole Index
UK-BGS-0169	0	400	Index to the Geological Map Collection, 1:250000 s
UK-BGS-0170	0	100	Indexes to the Site Investigation Reports Collecti

Spatial extent projection in WGS84

This entry allows the conversion of all spatial extent descriptions from national geographic projections into European WGS84, the unique projection.



This is the same example, but some errors have occurred: no spatial extent is described in metadata from Niedersachsen.

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Add rectangle boundary.

Create DE-GGA-0004

Add rectangle boundary.

Create DE-GGA-0005

Add rectangle boundary.

Create DE-NI-0001

Warning: No spatial extend for DE-NI-0001!

Create DE-NI-0002

Add rectangle boundary.

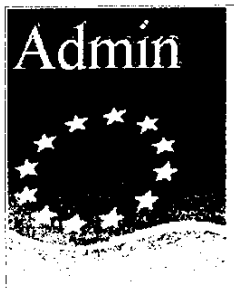
Create DE-NI-0003

Warning: No spatial extend for DE-NI-0003!

Create DE-NI-0004

Warning: No spatial extend for DE-NI-0004!

Web server statistics



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Main menu

Analog form interface

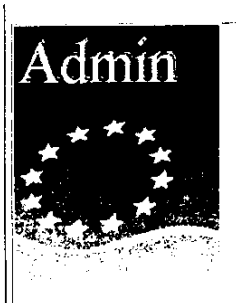
1. Report choices

See the analog home page for the meanings of the various reports.

Which reports do you want to see?

- [On] [Off] General Summary
- [On] [Off] Monthly Report
- [On] [Off] Weekly Report
- [On] [Off] Daily Summary
- [On] [Off] Daily Report
- [On] [Off] Hourly Summary
- [On] [Off] Domain Report
- [On] [Off] Host Report
- [On] [Off] Directory Report
- [On] [Off] File Type Report
- [On] [Off] Request Report
- [On] [Off] File Size Report
- [On] [Off] Referrer Report
- [On] [Off] Browser Summary
- [On] [Off] Browser Report
- [On] [Off] Status Code Report

You can now run the program: Produce statistics



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Web Server Statistics for GEIXS server

Program started at Wed-10-Feb-1999 10:44.
Analysed requests from Thu-12-Nov-1998 08:41 to Wed-10-Feb-1999 10:44 (90.1 days).

General Summary

(**Go To**: Top: General Summary: Monthly Report: Daily Summary: Hourly Summary: Domain Report: Directory Report: File Size Report: Request Report)

(Figures in parentheses refer to the last 7 days).
Successful requests: 10,231 (959)
Average successful requests per day: 113 (136)
Successful requests for pages: 1,930 (81)
Average successful requests for pages per day: 21 (11)
Failed requests: 783 (82)
Redirected requests: 27 (7)
Distinct files requested: 1,731 (284)
Distinct hosts served: 10 (3)
Data transferred: 47,443 kbytes (3,157 kbytes)
Average data transferred per day: 539,294 bytes (461,861 bytes)

Monthly Report

(**Go To**: Top: General Summary: Monthly Report: Daily Summary: Hourly Summary: Domain Report: Directory Report: File Size Report: Request Report)

Monthly Report

(**Go To**: Top: General Summary: Monthly Report: Daily Summary: Hourly Summary: Domain Report: Directory Report: File Size Report: Request Report)

Each unit (▬) represents 20 requests for pages, or part thereof.

```
   month: pages:
--------: -----:
Nov 1998:   382:
Dec 1998:   828:

Jan 1999:   613:
Feb 1999:   107:
```

Busiest month: Dec 1998 (828 requests for pages).

Daily Summary

(**Go To**: Top: General Summary: Monthly Report: Daily Summary: Hourly Summary: Domain Report: Directory Report: File Size Report: Request Report)

Each unit (▬) represents 15 requests for pages, or part thereof.

```
day: pages:
---: -----:
Sun:     0:
Mon:   604:
Tue:   306:
Wed:   291:
Thu:   361:
Fri:   368:
Sat:     0:
```

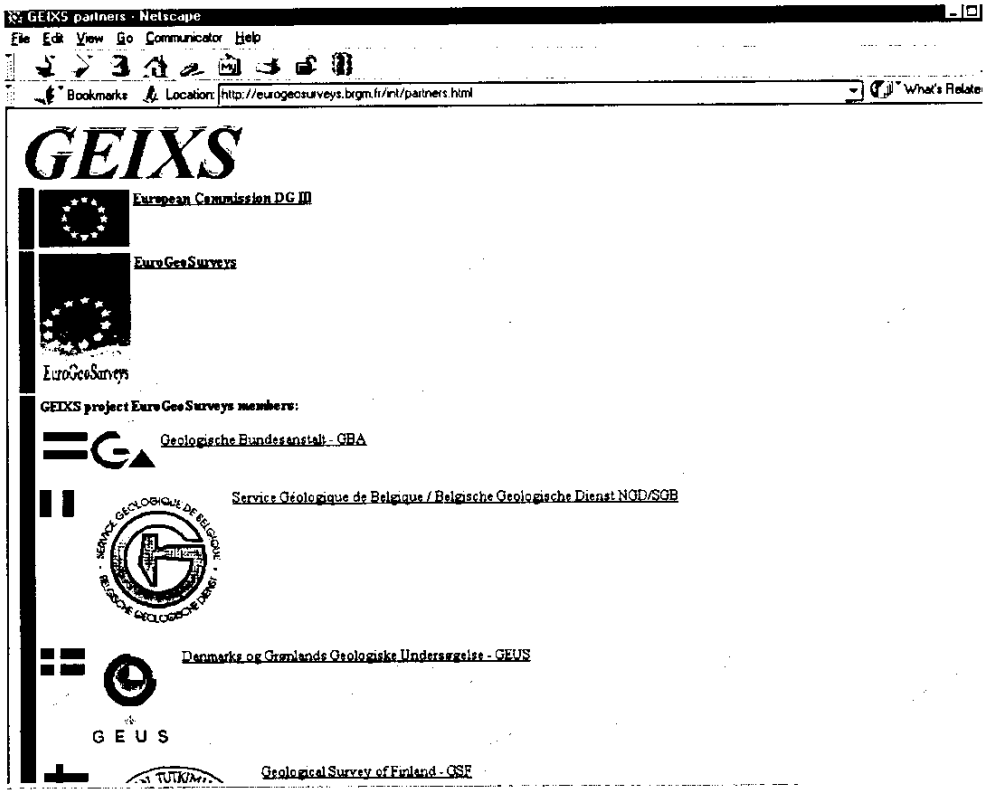
Hourly Summary

(**Go To**: Top: General Summary: Monthly Report: Daily Summary: Hourly Summary: Domain Report: Directory Report: File Size Report: Request Report)

Each unit (▬) represents 6 requests for pages, or part thereof.

```
hr: pages:
--: -----:
 0:     0:
 1:     0:
 2:     0:
 3:     0:
 4:     0:
 5:     0:
 6:     0:
 7:    41:
 8:   182:
 9:   226:
10:   165:
11:   212:
12:    83:
13:   250:
14:   204:
15:   239:
16:   313:
17:    13:
18:     2:
19:     0:
20:     0:
21:     0:
22:     0:
23:     0:
```

Partners


GEIXS partners - Netscape
File Edit View Go Communicator Help
Bookmarks Location: http://eurogeosurveys.brgm.fr/int/partners.html
GEIXS
European Commission DG III
EuroGeoSurveys
EuroGeoSurveys
GEIXS project EuroGeoSurveys members:
Geologische Bundesanstalt - GBA
Service Géologique de Belgique / Belgische Geologische Dienst NGD/SGB
Danmarks og Grønlands Geologiske Undersøgelse - GEUS
GEUS
Geological Survey of Finland - GSF

On line documentation

GEIXS

EuroGeoSurveys

GEIXS Recherche Géographique : Page d'aide.

La page de recherche Géographique est divisée en trois parties :

- Haut gauche : la fenêtre "Carte"
- Bas gauche : la fenêtre "Résultats"
- Droite : la fenêtre de contrôle

Vous pouvez modifier la carte et les résultats à l'aide des contrôles de droite.
Ceux-ci se séparent en trois groupes:

- **Action differée :** Un : **Choisissez** l'action, le bouton s'illumine. Deux : **cliquez** alors dans la carte
  - **Recenter :** Utilisez ce bouton pour vous déplacer dans la carte
  - **Grossir :** Utilisez ce bouton pour GROSSIR la carte
  - **Réduire :** Utilisez ce bouton pour Réduire la carte
    Pour ces trois boutons, l'endroit du click deviendra le centre de la nouvelle carte. Pour les boutons de zoom, le facteur de grossissement/Réduction peut être modifié grâce au contrôle : 16
  - **Où suis-je ?** Utilisez ce bouton pour obtenir la liste de toutes les entités administratives situées à l'endroit du click. La hiérarchie apparaîtra dans une petite fenêtre indépendante.
  - **Rechercher :** Utilisez ce bouton pour rechercher les géodata. La zone de recherche est un carré. Le coté peut être changé avec le contrôle : 10 Vous pouvez aussi ajouter des critères thématiques. Voir ci après

PROYECTO ESPRIT 23802

GEOLOGICAL ELECTRONIC INFORMATION EXCHANGE SYSTEM (GEIXS)

PROJECT MANAGEMENT

JOHN LAXTON

FEBRERO 1999

Task T002 *Maintenance of overall project plans showing task outlines, resource outlines, scheduled dates, work breakdown charts, milestones set and reached, critical and non-critical paths, resources used, budget reporting, attention to conflicts, reporting to EU. Also maintenance of links/liaison to related projects GEOMIST and OMEGA to ensure complementarity and shared developments.*

Key points

The sixth meeting of the GEIXS Steering Committee was held in Brussels on 28/9/98.

The third GEIXS Review Meeting was held in Brussels on 29/9/98.

Good progress has been made with Work Package 3 (Data Loading) and this activity is largely completed. Communication has improved with the National Surveys of Greece and Luxembourg with some data input for these countries, but there has still been no progress from Italy.

Good progress has been made with Work Package 5 (Retrieval tools) and tasks T029-030 (2D Retrievals) have now been completed.

For the 3D demonstrator, task T031 (3D Retrieval Specification) has been completed. Task T032 (3D retrieval tools development) is ongoing. A decision has been made to use OMEGA project tools for developing the 3D model and data is being prepared for this format and validated. The 3D model has been built and is now being validated by geologists. The 3D demonstrator is under development.

The GEIXS extension was agreed by the Commission in December and the contract has been signed. The contract was signed two months later than originally intended and so the proposed completion date of GEIXS has also been put back two months, to the end of December 1999. A request for a contract variation will be drawn up to formalise this.

The signing of the extension contract has allowed a start to be made with Work Package 7, although in fact many of the new partners started earlier in anticipation of the GEIXS extension being agreed.

A Matra representative, Olivier Dolley, attended the 3Rd GEIXS Review Meeting. Subsequent to this a meeting was held at Matra's offices in Les Ulis to define the company's rôle in Work Package 6, with particular reference to the 2nd GEIXS Workshop. As a result of this Matra provided a report with some useful ideas on the organisation of the Workshop.

Matra have since decided that they no longer wish to continue as an active GEIXS partner, although they will remain a passive partner. The impact of this decision will be discussed at the 7th GEIXS Steering Group meeting on 10/3/99.

Two meetings have been held between members of the GEIXS steering group and representatives of the EUMARSIN project. EUMARSIN, a two-year Concerted Action project, aims to establish a metadatabase of marine sediment information and

has amongst its partners all EU Geological Surveys from EU countries with a coastline, along with EuroGeoSurveys. The meetings sought to establish how the highest level of the EUMARSIN metadatabase could be made compatible with the lowest level of the GEIXS metadatabase. This will allow EUMARSIN to act as a deepening extension of GEIXS. Procedures for this have been agreed and metadata from EUMARSIN will be added to GEIXS.
An entry for GEIXS was made to the PROSOMA project database, another EU funded project tasked with 'helping turn innovation into business'.

The EuroGeoSurveys Executive have agreed to fund the maintenance and upgrading of GEIXS after EU support ends, to provide and fund metadata updates from individual surveys, and to fund the central merging operation.

Discussions have taken place on the possibility of a 'GEIXS2', extending and developing GEIXS beyond the maintenance for which EuroGeoSurveys have agreed funding. Proposals have been made and this will be a major agenda item at the Steering Group meeting on 10/3/99.

GEIXS has been publicised extensively and there is a continuing high level of interest in it from users and providers of geoscience information.

Summary of work carried out

A Gantt chart illustrating project progress is included as Appendix 2.

Task T019

- Some more terms were added to the lexicon, including the translation to all other languages. In line with a more fundamental approach, the main categories were renamed to geo-disciplines. To prevent contradictions during searches, the detail-keywords were also related to these disciplines.
- It has been our experience that industry and government are accustomed to using a different terminology from that of geo-scientists. For example specialists will use words like groundwater or grainsize-analysis, while outside the geological institutions customers are looking for terms such as groundwater and sand. The use of more popular terms will increase the accessibility of the datasets. A discussion on this point was held on January 20 1999 in Orleans between NITG-TNO and BRGM
- Supporting the data-entry process. Many questions were answered by E-mail. All experiences as a result of this were compiled in a report and distributed to the existing partners. The new partners of Eastern Europe will also use this report.
- Further data was received from Denmark, Finland, Ireland and Greece. New versions were received from Germany, France and the United Kingdom.

Task T020

Work carried out:

1. **Austria (GBA):**
   Completed.

2. **Belgium. (GSB)**
   Twenty datasets were received. The situation in Belgium is quite complicated as the GEIXS partner, the National Survey (GSB), has become less powerful, while the Flemish and Wallonian Surveys which are taking over some of GSB's role have not yet completed their databases or started producing map series.

3. **Denmark**. (GEUS)
   By August six datasets were finished. By December the other datasets were received.

4. **Finland (GSF)**
   The Finnish datasets were converted and translated from an internal database. This procedure is efficient and could be used for other countries as well.

5. **France (BGRM)**
   Some more datasets were added, while existing datasets were improved.

6. **Germany (BGR):**
   Although the data loading phase for GEIXS was finished by October 1998, BGR has continued at its own cost to input new metadata as they came in from different projects since October. The last version of the input application module with an updated list of categories and keywords was used for input. The total number of datasets referenced in the GEIXS meta database is 198 now (full input by 1. March 1999).

   The new version of the input application module from BRGM has been installed on 2 PCs after downloading from the GEIXS server. Data from BGR (the Federal Institute for Geosciences and Natural Resources) are kept separately from the Lower Saxony data, collected in the NLfB (Geological Survey of Lower Saxony). For these data, the given information of data set title, abstract, purpose, data definition, and data set distribution (as shown in the computer forms) have been translated into English. Some additional work to harmonise the descriptions was necessary.

   Some corrections to the metadata already entered were also necessary. The wrong format of co-ordinate descriptions was replaced, which gives access to correct georeferencing now. In addition to the data descriptions, several index maps have been produced to be included into the meta databases for geographical reference of single map sheets or subsets of cartographic databases.

   New efforts were taken to overcome the problems of federal structures in Germany, as the responsibility for geological surveying is with the state Geological Surveys, where useful data collections are reported. BGR has offered all necessary help for metadata input, hoping that in addition to the data descriptions from the Geological Survey of Lower Saxony most of the other surveys will also contribute to the GEIXS metadata collection. An application to the directors of the state Geological Surveys will be discussed and hopefully

accepted on their next annual meeting in March 23-24. It is expected that another 100-200 dataset descriptions will then be available.

6. **Greece (IGME)**
   Several ArcView files were received in February, but GEIXS metadata has not yet been sent.

7. **Italy (DSTN)**
   No progress reported

8. **Ireland (GSI)**
   About 25 datasets were received

9. **Luxembourg (SGL)**
   Contact with Luxembourg was established. Jan Jellema (TNO) visited SGL for two days to assist with data-entry. About fifteen datasets were entered.

10. **The Netherlands. (NITG-TNO)**
    Describing the datasets is an ongoing process, which will also continue in the future. Most datasets were already available in the Dutch language, so it was not necessary to set up a new project-organisation. Only the manual translation to the English language and the subsequent checking by the data-managers was time-consuming. At present 35 datasets are available.

11. **Portugal** (IGM)
    All data have been received. Some datasets were updated.

12. **Spain (ITGE)**
    All datasets were received in August.

13. **Sweden (UGS)**
    All datasets have been received. There has been some difficulty with the polygon dataset, which still needs to be worked out.

14. **United Kingdom (BGS)**
    A large number of datasets have been entered at the Quick Input metadata level. In addition 26 spatial indexes were added containing detailed information on most of the primary datasets. In the future it is hoped to complete the most important datasets at the Full Input metadata level as well.

Overview of all countries

Country	No of datasets	Estimated man-days	
Austria	155	60	
Belgium	10	20	
Denmark	45	50	
Finland		25	
France	50	55	
Germany	37	100	
Greece			
Ireland	20	25	
Italy			
Luxembourg	15	5/5 (Assist. NL)	
The Netherlands	35	40	
Norway	20	20	
Portugal	40	50	
Spain	45?	50	
Sweden	40	50	
United Kingdom	120	70	

The estimated man-days are mainly based on informal information received from the data-entry project-managers. Some countries have been estimated.

Task T021

In February a copy of the GEIXS database was received from BRGM. This will be installed at NITG-TNO, so it will be possible to make statistics on the use of keywords and the presence of basic maps like oil and gas or mineral resources.

Upon arrival dataset errors have been reported back to the sending country. The first general analysis on content has been performed, and it appeared that keywords like "maps" are used so differently by the countries that they should be discarded. Other keywords were added. The procedure for editing these terms has been discussed at a meeting between BRGM and NITG-TNO on January 20 in Orleans.

The next step will be the harmonization of attributes, especially for geological maps. These maps are the basis for many other studies, and for European exchange it is helpful if meta-information for them is as comparable as possible. A list of the number of datasets available for each country is continuously updated and statistics on the content are in preparation.

Task T025

The application software, both for populating the meta databases and for displaying the data in a Web browser, is developed by BRGM. As the quality of the user interface is strongly dependent on acceptance by the user, the GEIXS Web Site has to support the main European languages. BGR has done the translation of the user interface into German and also commented on functionality and given hints for

improvements. The Web Site's HTML pages and the database search interface are available in German now.

Tasks T029-032

These tasks are described in the accompanying 'Report 11: WP5 2-D and 3-D retrievals'.

Task T037

This task is not scheduled to start until near the end of the project, in November 1999 if the two month delay as a result of the late start of the GEIXS extension is allowed for. However, as this task is concerned with analyzing feedback from the GEIXS Workshops with a view to the future commercial exploitation of GEIXS, it was considered sensible to initiate the task to provide input to the planning of the 2nd Workshop (Task T036).

Matra were scheduled to play a significant role in this task and a meeting was held in November between John Laxton and Olivier Dolley (Matra) to discuss how Matra could contribute to Task T037 in general, and to the planning of the 2nd Workshop in particular. It was agreed that the earlier report written by Olivier Dolley on general commercial and marketing issues, would be extended by the addition of a section on workshop organisation and feedback analysis. This report was subsequently produced and ideas contained within it will be used when planning the 2nd GEIXS Workshop.

Unfortunately Matra have now dropped out of an active role in GEIXS and will therefore not contribute further to Task T037. How the task will be taken forward in the absence of a commercial partner will be discussed at the GEIXS Steering Group meeting on 10/3/99.

Tasks T039-040

Work Package 7 – contents

Task T040 – To be performed by the 9 non-EU National institutions:
Digital data in agreed media to the specifications set out with supporting documentation.

Task T039 – To be performed by Denmark:
Co-ordination of data entry. Work flow records. Support to partners. Validation routines on loaded data, production of test results, notification of errors, progress reports.

Partners

The GEIXS Extension to the East now has the following nine partners:

- Armenia Institute for Informatics and Automation Problems;
- Bulgaria Technical University of Sofia - Programming and Computer Systems Applications (PIIS) Department;
- Estonia Geological Survey of Estonia – Tallinn;

- Hungary Hungarian Geological Survey – Budapest;
- Latvia State Geological Survey of Latvia – Riga;
- Lithuania Geological Survey of Lithuania – Vilnius;
- Norway Geological Survey of Norway - Trondheim;
- Poland Polish Geological Institute – Warsaw;
- Russia North-West Regional Geological Centre - St. Petersburg.

Organisation

The co-ordination of the extension (task T039) has been taken over by the Geological Survey of Denmark and Greenland (GEUS).
The Geological Survey of Austria is 'assisting co-ordinator' for Armenia, Bulgaria, and Hungary. The Commission will not reimburse the co-ordination.

Co-ordination

7/7/98: Extension partners were informed about the status of the extension proposal.
7/8/98: To extension partners: (1) *System GEIXS - User's guide*, (2) Draft status report for comment.
25-26/8: Syd-Norden Programme Committee / Geological Survey Deputy directors meeting in Copenhagen. Directors were informed about the GEIXS extension project and urged to support the project work.
27/8/98: Nordic Geological Survey Directors' meeting in Espoo, Finland. Directors were informed about GEIXS. They endorsed the set up of the project. However, they were not prepared to support economically the co-ordination of the work of non-geological institutes outside the FOREGS circles.
2/9/98: Syd-Norden Programme Board meeting in Warsaw. Directors endorsed the work plan. Austria agreed to assist Denmark in the co-ordination of the Hungarian, Bulgarian and Armenian contributions.
29/9/98: 3rd. Review meeting in Brussels.
7/10/98: Extension partners were informed about the outcome of the 3rd Review meeting. Armenian and Bulgarian partners were asked to confirm that they will co-operate with the geodata holders in their countries. The Armenian partner is a representative of the Academy of Sciences that is in charge of all relevant bodies. The Bulgarian extension partner reported back difficulties with the Bulgarian Geofund and promised to seek to have co-operation arranged (see below).
3/12/98: Access to data input module requested by extension partners.
7/12/98: Manual for GEIXS Data-Entry, version 2 received from Jan Jellema.
4/12/98: Contract draft amendment received from the Commission. Signed and returned 7/12/98.
4/12/98: An informal meeting of Armenian and Bulgarian GEIXS members and the Austrian co-ordinator, Dr. Udo Strauss, was arranged in connection with the ITS'98 in Vienna. The Hungarian member was invited but could not stay. Three other colleagues from HGS and its institutes were attending the meeting.
18/12/98: The Data-Entry manual was distributed to all Extension partners together with an updated list of addresses.
25/1/99: Receipt of the Manual was confirmed by all partners. A few changes to the list of addresses was received. Some of the partners have got new bank accounts.

9/2/99: The Technical University of Sofia (TUS) informs Ulrich Boes and Erik Stenestad about the talks with the Bulgarian Geofund (see below). Details on the new bank account in EURO were received.

Activities and State of the Extension data loading work

Most of the Extension partners started up activities in the autumn of 1998 before the contract was signed.

Armenia:
Status: In autumn 1998 major issues were believed to include software for GIS and database management, and standards of data entry forms. These problems may have been overcome by now. Recent hardware problems will hopefully be solved very soon now allowing a re-start of the work in the near future.
Problems: No other problems have been recorded.
Planned activities: No details available.

Bulgaria:
Status: The geodata holders (i.e. the "National Geofund and Geology" / Ministry of Environment and Water) have recently expressed the opinion that they should be the main partner from Bulgaria, and sign the contract with the European Commission. The present partner (Technical University of Sofia, TUS) should rather be a sub-contractor. TUS suggests that an official letter be sent to the Bulgarian Minister Mrs. Evdokia Maneva inviting the Ministry to participate in the GEIXS project as a main partner (contractor) for Bulgaria.
Problems: No other problems have been recorded.
Planned activities: Pending.

Estonia:
Status: It was found difficult to start the data loading in 1998 because of other obligations and because of the lack of money to employ the necessary extra staff. The User's Guide was studied. The data entry program has now been downloaded, and preparation of databases for access to data input module has started.
Problems: The time plan for data input will presumably be influenced by the release of payment. A date for the completion of the data entry cannot be set until the financing plan is better known.
Planned activities: Input of the more important data starts now.

Hungary:
Status: A working group of experts of the Hungarian Geological Survey, and the two research institutes within the Survey (the Geological Institute of Hungary, the Eotvos Lorand Geophysical Institute) has been established. A common survey of existing geological data sets/ resources was carried out; priorities were defined, co-ordinated lists for metadata processing and loading were drawn up in order to guarantee the proper sharing of the Hungarian contribution to GEIXS.
The organisational work for the GEIXS Awareness Rising Workshop to be held in Budapest, October(?) '99 has been started
Problems: No problems have been recorded.

Planned activities: GEIXS dictionaries will be translated into Hungarian. Regular data entry will start very soon. The Austrian co-ordinator will be asked for a consultation as soon as a considerable „test" data input is completed.
The fulfillment of the data loading is planned in accordance with the proposed time plan.
As a part of the preparations for the GEIXS Workshop in Budapest a detailed consultation with the project leader/management is planned (at BGS, early March).

Latvia:
Status: No information was received by 12 February
Problems: No problems have been recorded.
Planned activities: No information available.

Lithuania:
Status: A working group has been established (co-ordinator, archive and GIS specialists, data input staff). Several meetings were held on topics such as management and organisation, data set identification and listing of data, and methodology in the preparation of data. A working plan was drafted. Staff were appointed for the tasks. GEIXS input application was downloaded. The Manuals were translated. GEIXS User's guide was studied.
Problems: The Lithuanian Lexicon could not be downloaded. Data input cannot start until this problem has been solved.
Planned activities: Entry of data to be performed March – June (or September).

Norway:
Status: On request NGU sent some material to Jan Jellema. An ACCESS catalogue / database giving an overview over all NGU maps and map series may be transferred directly to the GEIXS system provided it can be converted to the projection used by GEIXS. NGU's WWW pages (in English and Norwegian) contain more information that the GEIXS system is designed to offer. NGU suggests that "flags" (hyperlinks) might in this case be considered the more advisable solution as the links will guide users from the GEIXS directory directly into the NGU database? The NGU catalogue has successfully been transferred to Jan Jellema.
Problems: No problems have been recorded.
Planned activities: Remaining tasks to be done as scheduled.

Poland:
Status: The Polish Geological Institute (PGI) performed an analysis of current PGI geological metadata resources in order to establish their compatibility with GEIXS requirements. PGI also started to translate GEIXS dictionaries into Polish. Some minor problems were encountered in obtaining the new dictionary of administrative units, which has recently been changed. An official version of the dictionary was expected to be published in January by the Polish Central Statistical Office.
After conclusion of the preparatory analysis of the metadata, PGI concluded that the present metadata resources need further completion to meet GEIXS' requirements. The appropriate sections in the Warsaw office and at the regional branches are now being involved in the process. To avoid possible mistakes during the data input operation PGI is preparing some proposals and minor corrections for the GEIXS lexicon.
Problems: No other problems have been recorded.

Planned activities: A revised work plan is currently being developed: February: Organising and entering of data. March: Entry of data from Warsaw. Collecting data from regional branches. March-April: Entry of data from PGI regional branches and data obtained from non-PGI institutions. May-June: Validation of data at the National level. Mitigation of possible mistakes and deficiencies. Contact to data providers to collect supplementary information. End June: Completion of data entry.

Russia:
Status: The Institute has no questions on the Manual.
Problems: The Institute has not yet got access to the data input module, and the name of the Institute is not on the list of the data entry application. No other problems have been recorded. Some questions will probably arise when data loading is started.
Planned activities: The Institute is prepared to start data input when access to the data input module is established.

Tentative Work Plan

Work Plan: Tasks T039 and T040 are described in *GEIXS Technical Annexe , Part 2: Description of the project, 2.2.8 Work Package 7: Data loading by additional project partners* (page 12). The activities described in: *Deliverables* are listed below under the headings:

- Co-ordination of data entry
- Documentation of data flow
- Quality assurance
- Progress of work

The co-ordination of the GEIXS extension project will be based on this listing and on decisions made at the meetings of the GEIXS Steering Committee and the Review Meetings.

A. Co-ordination of data entry
A.1 Data flow, procedures and time plan to be agreed with all parties

- Data flow diagram
- Time plan

A.2 Contacts with data providers

- e-mail, fax, phone calls, letters
- meetings

A.3 Contacts with project officials

- Project leader (Ian Jackson)
- Data base administrator (Jan Jellema)
- Commission

B. Documentation of data flow
B.1 Log of data flow

- Data and background information received from data providers
- Data and background information sent to GEIXS data administrator

B.2 Journal

- Correspondence
- Progress reports

C. Quality assurance
C.1 Data
- Validation of data
- Test productions
- Errors and deviancies

C.2 Safety copies
- Production and storage

D. Progress of work
- Time plan
- Steering Committee meetings
- Review meetings with the Commission

Data flow: The nine project partners and the co-ordinators will use the network in the current exchange of information on problems and progress, and for the exchange of data.
In order to facilitate the GEIXS extension data loading process the data flow should be detailed. The co-ordinator is currently working on this.

Time Plan: A detailed Time Plan and Milestones for WP 7 activities is currently being discussed with the extension partners.

Awareness raising activities

Date	**Place**
2/10/98	EuroGeoSurveys EUMARSIN (MAST III) Steering Group, Brussels: Use of GEIXS structure in marine geology database project 1998-2000.
2-3/10/98	Meeting: EuroGeoSurveys and European Science Foundation-GEODE programme, Prague. Discussions on use of GEIXS for European mineral occurrence data.
5-6/10/98	UN Economic Commission for Europe, CIMM, Geneva: Briefing on GEIXS structure, progress and plans to industry and delegates from CEE and NIS countries.
4/11/98	EuroGeoSurveys International Group Information Day, Brussels, for DGs IA IM, IB and VIII.

	Briefing on possibilities for use of GEIXS in the countries of CEE, NIS, Africa, Caribbean, Pacific, Asia, Latin America and the Mediterranean.
26/11/98	EU Urban Forum, Vienna. Discussions with CEMR/CCRE, DG XI, DG XVI and MEPs on the application of GEIXS and GIS to geoproblems and risk management in European cities.
02/12/98	EuroGeoSurveys 9th General Meeting of Directors, Hannover. Report on GEIXS progress and plans.
02/12/98	Metadaten-Workshop InGeoForum, Darmstadt. Presentation and discussion of GEIXS within a working group.
15/12/98	DG III Raw Materials Plenary Group meeting, Brussels. Update for DG III, industry and national representatives on plans for future development of GEIXS in FP V.
15/12/98	BGR Hannover. First meeting of new EuroGeoSurveys GIFT network to plan production of low-focus thematic maps of EU geofeatures using GEIXS resources.
17/12/98	BGS Edinburgh. Joint meeting between GEIXS and EU-SEASED (EUMARSIN-EUROCORE) (MAST III) data managers to coordinate future interaction of the two projects.
22/1/99	*CEMR/CCRE Risk Managers Working Group-, Brussels. Presentation of potential use of GEIXS and GIS in geoproblem risk assessment in urban environments in Europe.
02/2/99	DG XIII TEN-TELECOM project planning workshop, Brussels, on "New applications and services supported by global communication." Update on future development of GEIXS in EU FP V IST key actions "Systems and services for the citizen" in the areas of environment and emergency management.
02-03/2/99	European Forum on the ESDP (European Spatial Development Perspective), Brussels. Discussions with DGs XI, XVI and participants on the use of GEIXS and GIS in future urban and rural spatial planning.
02/2/99	MARIS Rijswijk. Joint meeting between GEIXS and EUMARSIN data managers to coordinate future interaction of the two projects.
03/2/99	Joint meeting between ESMI project and GEIXS.
09-10/2/99	Interactive seminar between EuroGeoSurveys and Euromines (the European Association of Mining Industries, Metal Ores and

Industrial Minerals) Discussion of plans to incorporate "Natura 2000" and other environmental data into GEIXS to help planning by the EU mineral extraction industry.

*(Council of European Municipalities and Regions)

Metadata infrastructures and standards

At the 2nd GEIXS Review Meeting the need to establish links between GEIXS and the various National Spatial Data Infrastructures (NSDI) which are being developed throughout Europe was emphasised. There is also an INFO 2000 funded project to develop a European Spatial Metadata Infrastructure (ESMI) the objective of which is 'to establish a framework for the distribution of geographic information by creating a universal metadata service'. A presentation on GEIXS was made at the 1st ESMI Panel Workshop, organised by EUROGI, and contacts established with both the ESMI project and EUROGI. A subsequent meeting has been held in the Netherlands between Jan Jellema of the GEIXS Steering Group and the ESMI project. Much interest was expressed in GEIXS as the project has already addressed many of the problems with which ESMI is faced, particularly in the area of metadata standards. It was clear from the discussions that ESMI recognises that there are many existing metadata systems, such as GEIXS, and that ESMI's aim should be to provide a framework to link these together rather than attempt to replace or duplicate them. Such a framework will also link the various National Spatial Metadata Infrastructures.

Some of the GEIXS geological survey partners have links with the National Spatial Metadata Infrastructures of their own countries, for example BGS has developed links with the UK National Geospatial Data Framework (NGDF). However as GEIXS is a European project it is not considered appropriate for GEIXS to link directly to these national metadata initiatives, but rather indirectly at the European level through ESMI.

The ongoing development of various spatial metadata standards at the National, European, and International levels is being kept under close review. As discussed in GEIXS Report 6: Project Management (February 1998) it has been agreed that for the duration of the GEIXS project the draft CEN standard prEN 287009 will continue to be used, as it is not practical to revise the underlying data model during the project. However the issue of standards compliance was extensively discussed at the 1st GEIXS Workshop at which the general view was that the emerging ISO spatial metadata standard is the one likely to gain the widest acceptance. It was also noted that the CEN and ISO standards were likely to converge. A key part of the ISO standard will be a framework for the development of specific topic profiles. It was generally felt that there was a need to develop such a profile for the geosciences, and that as a result of the experience gained through GEIXS the Geological Survey partners were in a good position to provide significant input to this. The ISO standard will not be finalised during the timescale of the GEIXS project so such a development does not come within the scope of the project. However if a geoscience profile is developed in the future then GEIXS should be adjusted to ensure conformity with it.

The Position of Matra in GEIXS

On 18 December 1998, Alain Roumiguier (Matra Datavision) mailed Ulrich Boes in connection with the signing of the GEIXS contract extension. In that mail he stated that a major re-organisation at Matra Datavision would significantly effect its software activities and impact on the company's ability to stay involved in the project.

Alain Roumiguier went on to state that Matra Datavision recognised that their recent contribution had been virtually nil and that there was no reason to continue. He offered to stop Matra's active involvement, ie be a passive partner for the remainder of the project, being paid for any work done to date but making no further contribution to, or claim on the project.

This proposal was discussed by Ulrich Boes and Ian Jackson and was felt to be the most practical solution in the circumstances. Matra Datavision has been asked to formally state this position to the EC and the GEIXS project management team and have promised to do so in the next few days.

Without Matra Datavision's active participation the project has no industrial partner. As Michael Rotert intimates, the lack of a commercial perspective, especially in the exploitation elements of GEIXS, is a potential weakness. The technical and financial implications of Matra Datavision's decision will be discussed at the Steering Group Meeting scheduled for 10 March 1999 and the conclusions reported at the Review Meeting on 11 March 1999.

The Future of GEIXS Beyond the Current EC Funded Project

The future of GEIXS may be thought of as two issues :

1 **the maintenance and upgrading of the metadata system that GEIXS contract 23802 will deliver**

2 **the further development and enhancement of GEIXS**

1 The Maintenance and Upgrading of GEIXS

The EuroGeoSurvey's Directors considered this at their meeting in Hannover on 2 December 1998. They unanimously agreed that it was an essential central facility and that EuroGeoSurveys should sustain it.

The Directors agreed to :-

- Fund central maintenance and upgrading of the GEIXS system and hardware and software when EC support ends
- Provide and fund data updates from individual surveys

- Approve the EGS funding of the central data merging operation

Following clarification of a minor administration issue the Directors will formally ratify this agreement, thus ensuring that the GEIXS system will be sustained as a Pan-European facility.

2 Further Development and Enhancement of GEIXS

There has been considerable discussion about this topic and an action was agreed at the last Steering Group meeting to draft a proposal. A draft with a number of options was prepared by Denis Bonnefoy for comment. Horst Preuss has recently modified and extended this proposal and has circulated it for review. This is attached as Appendix 1 for information only - this topic will be a major agenda item at both the Steering Group meeting on 10 March 1999 and the Review meeting on 11 March 1999 and at present no decision has been made on how to proceed.

The Steering Group is also aware of a number of other complementary proposals which will exploit and "extend" the GEIXS "platform" which are being considered by individual surveys and groups of surveys.

It is likely that most of these proposals will be seeking support within the EC Fifth Framework Programme.

Appendix 1

GEIXS-2

A new proposal for the future of GEIXS

(proposed by H.PREUSS, BGR,
based on the proposal by D.BONNEFOY, BRGM)

Preamble

GEIXS is the **G**eological **E**lectronic **I**nformation **Ex**change **S**ystem of the European Geological Surveys. The GEIXS project is a R&D-project of the EC-DGIII in the frame of ESPRIT to develop a metadata system for the catalogue of European geological data. It supplies homogeneous descriptive and spatial information about the various distributed geological data sets via the Internet and uses a Web server for the meta databases. GEIXS does not make it possible to deliver the geodata themselves; this service is under the responsibility of each nation. The catalogue of GEIXS will be extended to the countries of Eastern Europe at the request of the Commission.

The GEIXS project will finish in October 1999. The success of the project is foreseen. All defined deliverables will be available at that time, including a demonstrator for displaying selected samples of 3D-geodata from the GEIXS Web server. The Steering committee of the GEIXS project is aware of the needs to the future of GEIXS. It is necessary to maintain the GEIXS Web server and to keep the matadata catalogues up-to-date. Both tasks will be continued and costs will be covered by the members of EuroGeoSurveys, the European Association of the Geological Surveys. Research and further development however will not be covered.

In order to follow the ideas of GEIXS and to open geological information not only for geological work but also for interdisciplinary tasks, further developments are necessary. The costs of these can only be covered by entering into a new project.

Proposal for a new project (GEIXS-2)

The Fifth Framework Programme (Acronym: FRAMEWORK 5C) of the EC has been agreed by the Council of Ministers on 22 December 1998. The programme shows the following activities (all figures set out in Euro):

EC Treaty 13,700m

FIRST ACTIVITY: Four Thematic Programmes 10,843m

- Theme 1: Quality of Life, Management of Living Resources 2,413m
- Theme 2: User-Friendly Information Society 3,600m

  Key actions:

  - **Systems and Services for the Citizen 646m**

    This covers five priority areas:
    - Health
    - Elderly and disabled
    - **Administrations**
    - **Environment**
    - Transport and tourism.

    These have draft action lines for:
    - Models for services to citizens
    - Systems for health professionals
    - Personal health systems
    - Telemedicine services

- Systems and services for independent living
- **Administrations in the information society**
- On-line support to democratic processes
- Environmental monitoring and management
- **Environmental risk & emergency management**
- Transport infrastructure and mobility
- Systems for intelligent vehicles
- Tourism.

- New Methods of Work and Electronic Commerce 547m
- Multimedia Content and Tools 564m
- Essential Technologies and Infrastructures 1,363m
  - RTD activities of a generic nature 319m
  - Support for research infrastructure 161m

- Theme 3: Competitive and Sustainable Growth 2,705m
- Theme 4: Energy, Environment and Sustainable Development

This theme is divided into two parts, as follows:

a) Environment and Sustainable Development 1,083m

Key actions:
- Sustainable Management and Quality of water 254m
- Global Change, Climate and Biodiversity 301m
- Sustainable Marine Ecosystems 170m
- The City of Tomorrow and Cultural Heritage 170m

- RTD activities of a generic nature 119m
- Support for research infrastructure 69m

b) Energy 1,042

Key actions:
- Cleaner Energy Systems, incl. Renewables 479m
- Economic and Efficient Energy 547m

- RTD activities of a generic nature 16m

SECOND ACTIVITY: Confirming the International Role of Community Research 475m

THIRD ACTIVITY: Promotion of Innovation, Encouragement of SMEs 363m

FOURTH ACTIVITY: Improving Human Research Potential 1,280m

For GEIXS-2 we consider the FIRST ACTIVITY of the Fifth Framework Programme as appropriate, especially the bold printed key actions of theme 2 (**Administrations in the information society** and **Environmental risk & emergency management**). These key actions fit well in the plans of further development of GEIXS and support the idea of extending GEIXS in width, i.e. more disciplines. The Geological Surveys are already contributors to environmental studies, often carried out by other agencies or private industry, but the role of geology is not very clear. In order to raise awareness of geology for the environment, geological metadata need to be transferred to the centres of environmental studies and their metadata systems.

1.Problems to be solved

The known metadata systems of the environment are based on different national developments of the early 1990s (e.g. UDK in Germany and ...), which are being redesigned for European purposes. Different projects support these modern developments (IRENIE and ...). They contribute to the setting up of several European Topic Centres for the Environment, where they manage their own metadata and catalogues (Catalogue of Data Sources, CDS). Co-ordinator is the European Environmental Agency EEA in Copenhagen.

As geological data sets need to be evaluated for many aspects of the environment (subsurface information: minerals, rock type, ground water, ..) and many purposes (land use planning, excavation recultivating, ...) there is a strong need to include the catalogues of these geological data sets. The problems are that the different structures of the meta databases do not allow to interface them with simple methods or querying.

The modern GEIXS developments for the management of metadata on the basis of the European standard CEN 287 would allow for an interface development and by this could contribute to the Catalogue of Data Sources for the Environment. Moreover, the methods of spatial data handling in geology using 3D data sets, will bring a "new dimension" to the environment.

2.Concerted approach

The interface to link the GEIXS metadata with the CDS can be developed in dialogue with the European Environmental Agency using the framework of EIONET. The geological surveys would bring the knowledge of the subsurface to the disciplines of the environment. An association with the EEA would make it possible for the geological surveys to affirm their position as a European environmental actor.
To bring a response to the needs of the users other than experts in geology, a transformation of GEIXS metadata into the CDS format has to be performed dynamically. An access to the basic geological data can be referenced. However, marketing of the basic data is not a question of this proposal.

3.Development of specialised products with added value

In addition to the development of interfaces and data transformation tools, the GEIXS database should be extended. More data sets of environmental relevance need to be explored and referenced in the meta databases. The Geological Surveys can contribute to the following sections of earth sciences, where problems of environmental planning occur:

1. Natural hazards / geological hazards (land slides, earthquakes)
2. Mineral resources exploration and mining
3. Underground water monitoring and protection
4. Urban subsurface stability investigation
5. Soil protection and climatic influences

Information on these fields is highly dynamic and needs specific treatment of updating and special evaluation and display methods, e.g. displaying the reference area graphically in 2D plane and 3D space. The generation of evaluation products, such as maps and block diagrams, could be based on common GIS tools and special three-dimensional display tools using VRML.

4.Standardisation

Data of European relevance have to be brought together in harmonised form in order to make them available for overall querying. This has already been stated for the metadata of GEIXS. It is necessary to use a standard for data set descriptions. GEIXS has adopted the European metadata standard CEN 287, although this standard is not yet approved. The newly developed ISO standard for metadata includes most of the CEN 287 but differs in some parts.

Contacts to the various committees of standardisation have to be established in order to follow the line of standardisation for the GEIXS metadata and to develop conversion tools, where necessary.

5.Improvement of data input

The users require an improvement of the procedures of loading metadata. Today, the loading is done using an autonomous local application. This one produces a meta database sent to the geological survey NITG/TNO that validates and harmonises information, and sends it to the BRGM for loading onto the GEIXS server.

The purpose of this improvement is to allow the modification and the addition of metadata directly by use of a Web navigator, since the national geological surveys are responsible for data input. The same evolution is wished for the management of the lexical terms. This development will simplify the loading and updating of metadata.

This work of data entry development can be developed in about two months by BRGM (18.645 Euro)

6.Technical basis

GEIXS-2 can easily be established by using the technical basis of GEIXS, which includes a Web server, database software with a spatial database engine, and Web application tools. Only upgrades of the existing software and some hardware expansions, e.g. to increase disk capacity, will be necessary. Also the Internet access line has to be modified for faster access.

7.Organisation

From the experience with the GEIXS project, the organisation of GEIXS-2 should be set up in a similar way: Applicant is EuroGeoSurveys (with 16 partner surveys). A steering group with representatives of those partner institutes, where most of the development is done, should be set up. One representative of the steering group has to be elected for project leader. The project leader has to co-ordinate the work of the different tasks, carried out by different partners, and to care for all administrative work (incl. financial treatment). This implies the allocation of an appropriate part of the total budget.

All partner institutes have to contribute to the central meta database; 4-5 partners share the development of methods; a third party partner could give contributions to the software development (e.g. FZI, Forschungszentrum Informatik, University of Karlsruhe: UDK/CDS-software development, http://www.fzi.de/v1/home_e.htm). EuroGeoSurveys maintains the Web server and organises the meetings of the steering group and workshops for all partners and guests. The dialogue with the EEA can be established through a contact person there.

Thematic administration

The thematic administration of the GEIXS meta database consists in ensuring the coherence of the metadata and making upgrading of the lexical terms. It is carried out by the geological survey of Holland and is estimated at 0,5 months per annum (xxxx ECUS).

Technical administration

The technical administration consists in ensuring the regular backups of GEIXS system and producing statistical reports on the utilisation of server GEIXS. It is carried out by the geological survey of France and is estimated at 0,5 months per annum (6215 ECUS).

Summary

GEIXS-2 is a proposal which follows the ideas of GEIXS to open geological information not only for geologically trained people in Europe but also for those purposes of interdisciplinary work, which is necessary for environmental studies. New developments of geological metadata input, metadata handling, and metadata display via the Internet are necessary and also new references to data sets with environmental risk and emergency data. Bringing together the national Geological Surveys in such a project will give new dimensions to a**dministrations in the information society.**

Appendix 2

The Gantt chart that follows illustrates the current state of project progress relative to that shown in the revised GEIXS technical annexe. A red bar indicates a variation from the original plan.

The variations in Work Packages 6, 7, and 8 are due to the late start of the GEIXS extension.

The only other variation is the overshoot of task T032. The completion date of end-April for this task is indicative and will be discussed in detail at the Steering Group meeting on 10/3/99.

Tasks T020-021 are shown as completed although data has yet to be received from Italy - this is because it seems unlikely this data ever will be received and so data entry is in effect complete. It should be noted the maintenance of the GEIXS database has also started so some additions and updates are taking place – this will continue after the end of the project.

PROYECTO ESPRIT 23802

GEOLOGICAL ELECTRONIC INFORMATION EXCHANGE SYSTEM (GEIXS)

PROJECT MANAGEMENT

JOHN LAXTON

NOVIEMBRE 1999

Task T002 *Maintenance of overall project plans showing task outlines, resource outlines, scheduled dates, work breakdown charts, milestones set and reached, critical and non-critical paths, resources used, budget reporting, attention to conflicts, reporting to EU. Also maintenance of links/liaison to related projects GEOMIST and OMEGA to ensure complementarity and shared developments.*

Key points

The seventh meeting of the GEIXS Steering Committee was held in Brussels on 10/3/99.

The fourth GEIXS Review Meeting was held in Brussels on 11/3/99.

The eighth meeting of the GEIXS Steering Committee was held in Brussels on 12/10/99.

Significant effort was put into obtaining metadata from the Greek and Italian partners. These efforts were successful and data entry is now complete for all EU partners.

Task T032 (3D retrieval tools development) has been completed in close conjunction with the GEOMIST and OMEGA projects.

The second GEIXS Workshop was held in Brussels on 13/10/99 and 14/10/99. Although fewer people attended than had been hoped for, there were industry representatives and good discussions on the future development of GEIXS took place.

Good progress has been made with Work Package 7 (Data loading non-EU partners). This has been the principal activity during the period under review. Although there have been some technical and administrative problems the Work Package is on schedule for successful completion.

The third GEIXS Workshop will be held in Budapest on 2/12/99 and 3/12/99. This is being organised in conjunction with the Hungarian Geological Survey partner and is particularly targeted at the Geological Survey Organisations of the CCE and NIS countries. There has been a good level of registration so far.

Following the agreement that Matra Datavision would become a passive partner in GEIXS, this arrangement has been confirmed formally. Matra Datavision will return the unspent element of the advance payment from the EC. Marketing will now be taken forward initially by BRGM and BGR.

A marketing requirement document has been drawn up. This identifies four 'product types' that could be marketed in conjunction with GEIXS. For two of these a marketing plan will be drawn up by a commercial organisation. The other two require further GEIXS developments and will be used to guide such developments.

A maintenance plan for GEIXS has been drawn up. This is designed to ensure the metadata is kept up to date and the software and hardware utilised is maintained. This will be funded by EuroGeoSurveys and the project partners.

A further meeting was held between a member of the GEIXS steering group and representatives of the EUMARSIN project. The meeting discussed the procedures for linking the EUMARSIN and GEIXS metadatabases.

Significant efforts have been put into developing proposals for the extension and development of GEIXS, but so far none of these have been successful.

GEIXS has been publicised extensively and there is a continuing high level of interest in it from users and providers of geoscience information.

Summary of work carried out

Task T003b – Operation of the Web Server

The GEIXS Web Server has been operated throughout the review period. Appendix 1 provides detailed web server statistics.

Task T019 – Coordination of data entry

Primary data entry for the EU partners has now been completed, but there is ongoing data coordination work related to the maintenance of the GEIXS metadatabase. This will continue after the completion of the projection as detailed in the section on GEIXS maintenance below. Also during the review period there was primary data coordination work related to the non-EU partners. Work carried out during the review period comprised:

- Some organisations and countries were added to the lexicon. This is a continuing process as addresses and organisations keep on changing
- The remaining work on the translated html-pages was carried out.
- Ongoing support of the data-entry process: several hundred questions were answered by e-mail, most of them from Italy, Greece, Poland, Lithuania, Armenia, Belgium, Estonia and Russia; the new partners of Eastern Europe were happy receiving and using the manual, compiled from the experiences in Western Europe.
- New versions of the metadata were received from Germany, Ireland and Finland.

Task T020 - Data entry (EU partners)

The following list gives the current status of metadata entry for the EU partners:

1. **Austria (GBA):**
   Completed.
2. **Belgium. (GSB)**
   completed.
3. **Denmark. (GEUS)**
   completed.

4. **Finland (GSF)**
   completed
5. **France (BGRM)**
   Some translation work to English has not yet been finished.
6. **Germany (BGR):**
   New updates were received
7. **Greece (IGME)**
   Completed
8. **Italy (DSTN)**
   Completed
9. **Ireland (GSI)**
   Completed
10. **Luxembourg (SGL)**
    Completed
11. **Netherlands. (NITG-TNO)**
    Completed
12. **Portugal (IGM)**
    Completed.
13. **Spain (ITGE)**
    Completed
14. **Sweden (UGS)**
    Completed
15. **United Kingdom (BGS)**
    Completed.

The following table indicates the number of datasets referenced in the GEIXS metadata for each partner (no distinction is made between 'full' and 'outline' level metadata). For completeness, information on the non-EU partners is provided as well:

EU partners:

Country	No of datasets
Austria	155
Belgium	12
Denmark	45
Finland	28
France	50
Germany	65
Greece	47
Ireland	225
Italy	40
Luxembourg	15
The Netherlands	35
Portugal	40
Spain	45
Sweden	40
United Kingdom	120

Non-EU partners:

Armenia	19
Bulgaria	20
Estonia	30
Hungary	15
Latvia	28
Lithuania	42
Norway	21
Poland	40
Russia	293

Germany (BGR):

As indicated above, ongoing metadata entry has been particularly active in Germany. Details of the work undertaken are given in this section.

The latest version of the input application module with an updated list of categories and keywords was used for further metadata input. Additional data from BGR (the Federal Institute for Geosciences and Natural Resources) have been entered separately from the Lower Saxony data, collected in the NLfB (Geological Survey of Lower Saxony). For these data, the information provided on data set title, abstract, purpose, data definition, and data set distribution (as shown in the computer forms) have been translated into English. Some additional work to harmonise the descriptions was necessary.

Some corrections to the metadata already entered were also carried out and several index maps have been produced to be included into the metadatabases for geographical reference of single map sheets or subsets of cartographic databases.

As the responsibility for geological surveying in Germany is with the state Geological Surveys, from where valuable data collections are reported, BGR has offered all necessary help for metadata input, hoping that in addition to the data descriptions from the Geological Survey of Lower Saxony most of the other surveys will also contribute to the GEIXS metadata collection. An application to the directors of the state Geological Surveys was accepted at their last annual meeting in March 23-24. An introduction to the GEIXS input application programme was given to the representatives of the state Geological Surveys during a meeting in Hannover in June 1999.

Further, the GEIXS Web site has been reviewed and reported to BRGM in November 1999.

Task T032 - 3-D Retrieval Tool Development

The development of the 3-D retrieval tools using demonstrator data and software imported from developments in GEOMIST and OMEGA has been completed.

A data set of 3D geo-data consisting of exploration drill holes, the digital elevation model of the territory and the geological map of a specific area within the Iberian Pyrite Belt was selected to develop the 3D geological model for the GEOMIST demonstrator.

The description of the geological objects and their attributes was made, by using interpolation methods and establishing the relations between the geological objects, as reported in the progress report on 3-D tools submitted to the Commission in October 1998. This theoretical framework was applied to the selected drill-hole data-set to build up the 3-D model. The modelling procedure started with the raw data either point, linear or surface observations. From these raw data and using methods of interpolation or interpretation, the structural framework, structural grid and lithostratigraphic surfaces were built.

Once the 3D development framework was defined, it had to be implemented into the 3D demonstrator of the GEOMIST Web Server. This was done by reusing results from the ESPRIT project OMEGA in order to develop tools to visualise OMEGA objects and exporting the OMEGA entities as VRML files that can be visualised through the Internet by standard Web browsers

Application programs were written to transform the GEOMIST geological objects into OMEGA objects with specified file formats that could be loaded into the OMEGA editor application. This generated boundary representations of the horizons, drill-holes and subsurface.

The development of the 3-D demonstrator tools was done using Java 1.2, CAS.CADE 1.5B and OMEGA products in order to visualise bore-holes, horizons and convex surfaces. Java was used for the graphic user interface and CAS.CADE and OMEGA to create and visualise the 3-D data model of the geological object. These developments are based on C++ and can be reused on personal computers.

A user guide for the 3-D demonstrator was prepared containing information on the implemented facilities for 3D representation and retrieval of geo-data:

- 2D and 3D Graphic representation of the 3D data model
- Computation of 2D cross section and level curves
- Volume and Surface analysis
- Information retrieval from graphical queries
- Generation of VRML files to visualise the 3D model through the Web
- Projection of 2D curves onto a surface
- 3D dynamic cursor co-ordinate

The VRML file to visualise the 3-D geological model of the selected drill-hole data set of the Iberian Pyrite Belt is now ready and implemented in the GEOMIST web server.

Task T036 – Workshop 2

The aims of the meeting were:

- To demonstrate to users how GEIXS and its potential have developed.
- To obtain feedback from users on GEIXS.
- To explore suggestions to:
  - ensure the continued improvement of GEIXS to fit user needs.
  - ensure the uptake of GEIXS after December 1999.
- To find additional partners to further develop and commercialise GEIXS after December 1999.

The meeting was planned to involve:

- Representatives of user groups/associations already detailed in the GEIXS progress reports and presentational material.
- People who had already expressed interest in GEIXS to EuroGeoSurveys.

EuroGeoSurveys advertised the meeting in advance on the CORDIS Web and sent out over 200 invitations, each including a brief technical outline of the GEIXS project. A wide group of potential users was thus informed of the scope of GEIXS.

Twenty-nine people registered for the Workshop which was a rather disappointingly low number. Nevertheless they represented potential user groups, as well as representatives from Geological Survey organisations in Eastern and Western Europe. Useful discussions took place and in particular Jussi Aarnisalo of the Finnish mining company Outokumpu provided a very useful critique of GEIXS from a user's perspective. The points he raised are being actively addressed.

The Workshop programme and registration list are given in Appendix 2.

Task T037 – Commercial exploitation and subsequent activities

This task was originally scheduled to be carried out by BGS and Matra. Following the agreement that Matra Datavision would become a passive partner in GEIXS, this task will now be taken forward initially by BRGM and BGR.

A meeting was held at BRGM, Orleans on 14/9/99 at which the overall marketing requirement was agreed. A key component of this was to determine what it is that we wish to market. Four types of 'product' were identified: services and systems for cataloging data sources (in effect selling our expertise in setting-up GEIXS-type systems which could be applied, for example, in other regions of the world); raw data from the GEIXS Geological Survey partners; existing added-value products from the Geological Surveys; services/solutions for decision making.

A marketing requirement report has been produced detailing these products and addressing some more general marketing issues relating to GEIXS, this latter drawing on earlier work carried out by Matra before their withdrawal from the project. This report is included in Appendix 3.

The first two of the four identified product types can be addressed now and will be the subject of a more detailed marketing plan. This will be drawn up by a commercial organisation on the basis of the marketing requirement report. The remaining two product types cannot be directly addressed by GEIXS in its present form and will not therefore form part of the marketing plan; they will however guide proposed further developments of GEIXS.

Tasks T039 – T040 – Data loading (non-EU partners)

These tasks are described in the accompanying 'Report 14: Data Loading (non-EU partners)'.

Task T041 – Workshop 3

This task is being organised in conjunction with the Hungarian Geological Survey partner and the Workshop will take place in Budapest on 2/12/99 & 3/12/99. Unlike the first two GEIXS Workshops, the primary purpose of this Workshop is to spread knowledge about GEIXS, and the techniques used in its production, to the Geological Survey Organisations (GSOs) of the CCE and NIS countries. To this end funding is being made available to assist attendance at the Workshop for representatives from these organisations.

Invitations have been sent out widely in both Eastern and Western European countries, it has been advertised on the CORDIS web site and a specific web site for the Workshop has been set up at http://www.mgsz.hu/geixs99/index.html. At the time of writing (10/11/99) there are 44 registrants of whom 26 are from CCE or NIS countries. In total 25 countries are represented so far. The current list of registrants and the draft programme are included in Appendix 4. Note that this programme will be revised and is included to provide a general indication of the topics and speakers.

Awareness raising activities

Date	Place
9/3/99	Meeting with Mr R Niessler (DG XVI –ESPON) to discuss use of GEIXS structure in supporting European Spatial Development Perspective and Urban Audit work.
18/3/99	Briefing on GEIXS project progress to Geological Survey of Finland in Kuopio and Espoo.
20/3/99	Briefing on GEIXS structure, progress and plans to Director, Geological Survey of Estonia and Ministry of Environment, Tallinn.
23/3/99	Briefing on GEIXS structure, progress and plans to Director General, EUROSTAT and staff, Luxembourg. Discussion of application of GEIXS to EUROSTAT data storage and transfer.
27/3/99	Promotion of GEIXS as an essential part of a planned Europe-wide seismic risk project in FP 5 EESD combining EuroGeoSurveys and EUROPROBE (universities, Academies of Science). ESF Strasbourg.
16/4/99	Briefing on GEIXS project and progress to DSTN Rome and members of industrial remote sensing sector (TELAER) in context of FP 5 EESD work on landslides and natural hazards.
26/4/99	EUMARSIN-EUROCORE marine geosciences workshop at MARIS, Rijswijk, The Netherlands. Briefing on progress of adoption of the GEIXS structure by EUMARSIN.
5/99	A publication was prepared and printed in GEOSPEKTRUM 3/99 on "GEIXS - ein Projekt der europäischen Geologischen Dienste" (in German)
28-31/5/99	Presentation of GEIXS project at PETRA '99 organised by DG IB, DG III and DG XIII, at Petra, Jordan. Discussion of extension of project to non-EU Mediterranean countries.
29/5/99	Written explanation of GEIXS sent to DG XIII E in EuroGeoSurveys response to the 1998 Commission Green Paper on "Public sector information: a valuable European resource."
6/99	BGR has reported on GEIXS and the status of metadata input during a meeting of the IT-Steering Group of the state Geological Surveys in Hannover. The minutes were sent to all partner institutes in Germany.
1/6/99	EuroGeoSurveys 10th General Meeting of Directors, Madrid. Report on GEIXS progress and plans.

2-3/6/99	Joint meeting of EuroGeoSurveys and (ASGMI) Iberoamerican Association of Geological and Mining Services), Madrid. Briefing on possibilities for use of GEIXS in the countries of Latin America.
14/6/99	The GEIXS project was presented to an audience of about 120 visitors at GeoSpektra 99 in Düsseldorf. About 20 overhead slides were shown during the presentation. A discussion followed.
18/6/99	EU-Russian Federation Sub-committee, Brussels. Briefing to Ministry of Natural Resources, Moscow on possible uses of GEIXS for mineral resource and environmental information in the Russian Federation and other NIS countries.
23/6/99	Briefing to ETRA (European Tyre Recycling Association, Paris) on possible uses of GEIXS for construction infrastructure and recycling issues in Europe.
7/99	Meetings and contacts set up by the EUMARSIN team to plan the application of a GEIXS system to an FP 5 extension of EUMARSIN into the Baltic, Mediterranean, Black and Caspian Seas.
5-9/7/99	1st Regional Technical SANGIS Workshop, Bangkok, Thailand. Paper presented and demonstration of GEIXS. GEIXS discussed as a model for a similar system in South-East Asia.
14/7/99	Report to Executive Director, European Environment Agency and senior staff on GEIXS progress and plans for use of the structure in present and future EuroGeoSurveys projects.
27/7/99	Meeting with Royal Museum of Central Africa, Tervuren (RMAC/KMMA) to plan a project to use the GEIXS structure to set up a geoscience metadata system on African geology.
3/8/99	Online marketing of GEIXS and 2nd and 3rd User Workshops on CORDIS.
17-22/8/99	The GEIXS approach and the Armenian participation was reported at a conference: "Computer Science and Information Technologies" during the Round Table 1 "International Scientific Collaboration Programs: Opportunities and Actions", held at the Institute for Informatics and Automation Problems, National Academy of Sciences of Armenia, Yerevan
29-30/8/99	Forum of European Geological Surveys Directors meeting in Vienna. Presentation on GEIXS as an example of geological surveys as Information Centres
15-18/9/99	Meeting of the Syd-Norden Group (Gdansk). Directors were urged to give high priority to the GEIXS project.

21-24/9/99 Umwelt 2000 - Geosciences for Society Conference, Halle. GEIXS poster presented

23/9/99 Paper entitled 'The GEIXS Project: National and Regional Importance of the Portuguese Participation' presented at the Regional Based Geographic and Geologic Information Systems Meeting, Beja (Alentejo, Portugal).

11/99 A general presentation of GEIXS was made at DAT'98 (Annual Conference of the Hungarian Association of Database Suppliers, Budapest) Title: GEIXS - A Geological Information System for Europe and its Hungarian Module (A GEIXS Europai Foldtudomanyi Informacios Rendszer es annak magyar modulja)

15-19/11/99 GEIXS presentation at the Krasnoyarks geological conference, Russia

15-18/11/99 ESRI European User Conference, Munich. Paper on GEIXS - Enabling Access to a Key Environmental Resource ....

The Future of GEIXS Beyond the Current EC Funded Project

1 Maintenance and upgrading of the meta-data system that GEIXS will deliver

The EuroGeoSurveys Directors have unanimously agreed to sustain the GEIXS facility. A maintenance plan has now been developed and it is attached as Appendix 5.

2 The further development and enhancement of GEIXS

A considerable amount of time was spent by a small number of the geological surveys involved in GEIXS developing two proposals building on the GEIXS system :-

GIVES: Geological Information Virtual European Shop

This project would have pursued the development of E-commerce for geoscience data.

GIFT : Geological Information for Tomorrow's Europe

This proposal was to develop web enabled geo-environmental thematic maps at low resolution for the whole of Europe with proof of concept links to high resolution systems in selected countries.

Both projects were submitted to the First Call of the EC Fifth Framework programme (Deadline 16 June 1999). We have since heard (as yet only informally) that both failed to gain approval.

It is possible that both projects may be modified and redirected at other funding targets. However, the current situation is that there is no EC-funded provision for the further development of GEIXS.

There have, however, been some initiatives to extend GEIXS to Africa, South-East Asia and the Mediterranean Rim (via EUMEDIS):

- BRGM is coordinating the production of a project proposal (A-GIS) aimed at creating a GEIXS-like system for the geoscience data of Africa. Several members of the GEIXS Steering Group are involved with this.
- GEIXS was demonstrated at the 1st SANGIS Technical Workshop in Bangkok. SANGIS (South-East Asian Network for a Geological Information System) is a UNESCO initiative originally envisaged as focussing on bibliographic data following on from the similar African PANGIS project. It was argued at the Workshop that a metadata system similar to GEIXS might be more appropriate and it is hoped to put forward a project proposal for this in conjunction with CCOP (Coordinating Committee for Coastal and Offshore Geoscience Programmes in East and South-East Asia).
- A presentation on GEIXS was made at PETRA '99 organised by DG IB, DG III and DG XIII. This meeting was held under the auspices of EUMEDIS with a view to extending cooperation in the field of Information Systems between the EU and the non-EU Mediterranean countries. The possibility of extending GEIXS in this region was discussed and was well received. It is intended to put together an extension proposal for this region.

Individual geological surveys will continue to use their own funding to develop and enhance their metadata systems and several are now actively initiating internet (and e-commerce) product delivery.

PROYECTO ESPRIT 23802

GEOLOGICAL ELECTRONIC INFORMATION EXCHANGE SYSTEM (GEIXS)

DATA LOADING (NON-EU PARTNERS)

ERIK STENESTAD

NOVIEMBRE 1999

Purpose: To incorporate meta-data from the nine non-EU partners into the database established by the main GEIXS project.

Tasks T039 – T040 *Coordination of data entry. Work flow records showing receipts, acknowledgements, security copies, actions, activities, reporting on progress. Support by e-mail, telephone and fax. Execution of validation routines on loaded data, production of test results, notification of errors, progress reports. Digital data on agreed media to the specifications set out with supporting documentation.*

Background

The Syd-Norden Group (SNP) proposed in 1997 a metadata base project: Baltic Region Information on Geology (BRIG), with the same aims as the ESPRIT 23802 GEIXS metadata base project. In 1998 BRIG was accepted as an eastern extension of GEIXS. Norway was included in the extension but could not be compensated by the EU. In addition three other non-EU countries were included in the extension. The contract was finally approved and signed by the Commission, dated 28th December 1998. The end of the project was later put back to 31st December 1999.

Work Package 7

Tasks T039 and T040 are described in GEIXS Technical Annexe, Part 2: Description of the project, 2.2.8: Work Package 7: Data loading by additional project partners (page 12).

Task T039 – To be performed by Denmark: Co-ordination of data entry. Work flow records. Support to partners. Validation routines on loaded data, production of test results, notification of errors, progress reports.

Task T040 – To be performed by the 9 non-EU National institutions: Digital data in agreed media to the specifications set out with supporting documentation.

The deliverables are listed in the Work Plan (Annexe 1) under the headings: Co-ordination of data entry; Documentation of data flow; Quality assurance; Progress of work.

Partners

The GEIXS Extension to the East now has the following nine partners:

- Armenia — Institute for Informatics and Automation Problems - Yerevan;
- Bulgaria — Technical University of Sofia - Programming and Computer Systems Applications (PIIS) Department - in co-operation with the Ministry of Environment and Water / GEOFUND (see below);
- Estonia — Geological Survey of Estonia -Tallinn;
- Hungary — Hungarian Geological Survey - Budapest;
- Latvia — State Geological Survey of Latvia - Riga;
- Lithuania — Geological Survey of Lithuania - Vilnius;
- Norway — Geological Survey of Norway - Trondheim;
- Poland — Polish Geological Institute - Warsaw;
- Russia — North-West Regional Geological Centre - St. Petersburg.

Organisation

The co-ordination of the extension (task T039) is provided by the Geological Survey of Denmark and Greenland (GEUS). The Geological Survey of Austria is 'assisting co-ordinator' for Armenia, Bulgaria, and Hungary. The EU Commission does not reimburse for the co-ordination.

Co-ordination activities

The co-ordination of the GEIXS extension project is based on the listing of deliverables related to task T039, and on decisions made at the meetings of the GEIXS Steering Committee and the Review Meetings.

7/7/98: Extension partners were informed about the status of the extension proposal.

7/8/98: Mail to extension partners: (1) *System GEIXS - User's guide*, (2) Draft status report for commenting.

25-26/98: Syd-Norden Programme Committee / Geological Survey Deputy Directors' meeting in Copenhagen. Directors were informed about the GEIXS extension project and urged to support the project work.

17/8/98: Nordic Geological Survey Directors' meeting in Espoo, Finland. Directors were informed about the GEIXS. They endorsed the setting up of the project. However, they were not prepared to support economically the co-ordination of the work provided by non-geological institutes outside the FOREGS circles.

2/9/98: Syd-Norden Programme Board meeting in Warsaw. Directors endorsed the work plan. Austria agreed to assist Denmark in the co-ordination of the Hungarian, Bulgarian and Armenian contributions.

29/9/98: 3rd Review meeting in Brussels.

7/10/98: Extension partners were informed about the outcome of the 3rd Review meeting. Armenian and Bulgarian partners were asked to confirm that they will co-operate with the data holders in their countries. The Armenian partner is a representative of the Academy of Sciences that is in charge of all relevant bodies. The Bulgarian extension partner reported back difficulties with the Bulgarian Geofund and promised to seek to have co-operation arranged.

18-22/11/98: Meeting in Vilnius of the Syd-Norden Group. The GEIXS project was explained and discussed.

3/12/98: Mail to Jan Jellema: Access to data input module requested by extension partners.

7/12/98: Manual for GEIXS Data-Entry, version 2 received from Jan Jellema.

4/12/98: Contract draft amendment received from the Commission. Signed and returned 7/12/98.

4/12/98: An informal meeting of the Armenian and Bulgarian GEIXS partners and the Austrian co-ordinator, Dr. Udo Strauss, was arranged in connection with the ITS'98 in Vienna. The Hungarian

member was invited but could not stay. Three other colleagues from the Hungarian Geological Survey and its institutes were attending the meeting.

18/12/98: The Data-Entry manual was distributed to all Extension partners together with an updated list of addresses.

25/1/99: Receipt of the Manual was confirmed by all partners. A few changes to the list of addresses was received. Some of the partners have got new bank accounts.

9/2/99: The Technical University of Sofia (TUS) informs Ulrich Boes and Erik Stenestad about the talks with the Bulgarian Geofund . Details of the new bank account in EURO were received.

12/2/99: First Status report on Data Loading (non-EU Countries) was sent to project management and all partners.

10/3/99: 7th GEIXS Steering Group meeting (Brussels)

11/3/99: 4th GEIXS Review Meeting (Brussels)

31/5/99: 1st milestone in data loading: Project partners to send test files to GEUS for validation. (Test files from seven out of nine partners were received at GEUS in the period 21/5 – 16/6/99).

10/6/99: Proposed 2nd milestone in data loading: All data sets should be with GEUS by end September.

23/7/99: Planning of the Budapest workshop was started.

15-18/9/99: Meeting of the Syd-Norden Group (Gdansk). Directors were urged to give priority to the GEIXS project.

21/9/99: All partners were informed about the 2nd and 3rd User workshops.

22/9/99: Bulgarian participation in GEIXS was ensured by an agreement of co-operation between the Technical University in Sofia (contractor) and the Ministry of Environment and Waters (sub-contractor).

12/10/99: 8th GEIXS Steering Group meeting (Brussels).

13-14/10/99: 2nd GEIXS User Workshop (Brussels).

15/10/99: All project partners were informed that the ultimate date for data loading (2nd milestone) was 31st October.

30/11/99: 9th GEIXS Steering Group meeting (Budapest).

1/12/99: 5th GEIXS Review meeting (Budapest).

2-3/12/99: 3rd GEIXS User Workshop (Budapest).

Activities and Status of the Extension data loading work

Most of the Extension partners started up activities in the autumn of 1998 before the contract was signed.

Armenia:

Activities: In autumn 1998 major issues were believed to include software for GIS and database management, standards of data entry forms, and hardware problems. These problems were eventually solved and on 16th June 1999 a test file was sent to Jan Jellema. It was reported back that some changes should be made, and more data should be added. 2nd September Levon Aslanyan informed Erik Stenestad that one data set had been entered, and that "some tens" were in preparation and would be sent later in September for testing. In October Levon Aslanyan sent a short statement on the project status to John Laxton. 3rd November a statement on the progress was sent to Erik Stenestad.

Status: By 19th October data sets were sent to Jan Jellema. They were sent in two groups together with seven other description. They are referred to as two big clusters of five and seven descriptions. Some mistakes in the input of the data sets were identified and corrected by Jan Jellema.

Problems: A major problem seems to be - or to have been - the transmission of large data files in the magnitude of up to 10 megabytes. Another problem has been the delayed transfer of the advance payment which should have been done by bank order and not by cheque. No other problems have been recorded.

Planned activities: It is understood that the remaining tasks will be accomplished as scheduled. No details are available.

Bulgaria:

Activities: The geodata holders (i.e. the "Department of National Geofund and Geology" / Ministry of Environment and Water) expressed the opinion that they should be the main partner from Bulgaria, and sign the contract with the European Commission. On 10th September the co-operation problems were solved. Rector Prof. Dimitar Dimitrov of the Technical University of Sofia and Deputy Minister Mr. Neno Dimov, the Ministry of Environment and Waters, signed an agreement of co-operation which implies that the Technical University of Sofia will in this case serve as the GEIXS contractor and the Ministry as a sub-contractor. The *de facto* technical contact person for GEIXS is now: Valeri Trendafilov (Chief Expert and Data Base Administrator), Department of National Geofund and Geology, Division of Geology and Protection of Subsurface, Ministry of Environment and Waters. 22, Princess Marie Louise Blvd, Sofia 1000, Bulgaria. (Tel: +359 2 981 9572; Fax: +359 2 980 5561).

Status: 17th October 1999 Dr. Trendafilov informed Jan Jellema, Raina Pavlova and Erik Stenestad that Geofund has now downloaded the data-entry application and all other documents from EuroGeoSurveys' Web site and started the work. 25th October the lexicon was updated by Jan Jellema to "gelex.15" in order to include the name of Geofund. 31st October Geofund sent a zip file to Jan Jellema containing a "geixsmeta.mdb" file with 14 data sets.

Problems: Dr. Trendafilov in his letter 17th October notes that the time up to the deadline for data entry is very restricted. Geofund do not have access to a FTP-server.

Planned activities: It is understood that all metadata from Bulgaria will be provided as soon as possible.

Estonia:

Activities: It was found difficult to start the data loading in 1998 because of other obligations and because of lack of money to employ the necessary extra staff. However, the GEIXS User's Guide was studied, the data entry program was downloaded, and preparation of databases for access to the data input module was started early in 1999. 6th July 1999 a sample of correct test files was received at GEUS.

Status: By 18th October, 30 data sets in the correct GEIXS format were received (by Jan Jellema).

Problems: None reported.

Planned activities: Possible remaining tasks will be accomplished as scheduled.

Hungary:

Acticities: A working group of experts of the Hungarian Geological Survey, and the two research institutes within the Survey (the Geological Institute of Hungary, the Eotvos Lorand Geophysical Institute) was established. A common survey of existing geological data sets/ resources was carried out, priorities were defined, and co-ordinated lists for metadata processing and loading were drawn up in order to guarantee the proper sharing of the Hungarian contribution to GEIXS.

Present status: 76 data sets (66 full inputs an 10 quick inputs) were produced and validated by the beginning of September, and were successfully loaded into the Delft server.

Problems: During data entry, a limit of the present system, namely, the fixed list of languages was noticed. That is why in the fields "Dataset language" and "Name of areal unit" HGS had to use "Finnish" and "Suomi", respectively. Therefore, HGS suggests adding "Hungarian" and "Hungary" to the Lexicon. HGS is ready to correspondingly upgrade their datasets.

Planned activities: A co-operation with METATER (Hungarian Geospatial Meta Data Service) has been started. At several meetings with Mr. Zsolt Sikolya, director at the Prime Minister's Office and responsible for Inter-Ministerial IT projects (maintaining and developing METATER), the possible contact points of the two systems (GEIXS and METATER) have been established. The suggested results will be a link between the two databases and data exchange between the two systems. Possible remaining tasks will be accomplished as scheduled.

Latvia:

Activities: Test files were provided 21st May 1999. They were in word text format and had to be changed into GEIXS format. The State Geological Survey (SGSL) was assisted by Jan Jellema in solving some technical problems.

Status: 22nd October, 10 data sets were received by Jan Jellema. Mainly geological maps were included. By end October, 28 data sets were transferred to Jan Jellema from SGSL, and a list of the 28 data set titles was received by GEUS.

Problems: Some technical problems were encountered. They were related to the formats of maps, and to metadata on existing data bases holding information on groundwater, soils and minerals. Remaining technical problems in the entering of data have recently been solved, and the data are being transferred to BRGM.

Planned activities: Possible remaining tasks will be accomplished as scheduled.

Lithuania:

Activities: A working group established at the Geological Survey of Lithuania collected, described and recorded meta information about 42 geological data sets. This described in map form the primary geological survey of Lithuania. As one example of the raw data, the borehole database was also described in GEIXS. Each data set was supplemented with spatial indexes. Spatial indexes of boreholes show the location of each borehole and contain the borehole number and its depth. All data were converted from the map format, loaded to the GEIXS application, and then transferred to the GEUS server. In June 1999 a number of test files in the correct format were received at GEUS.

Status: Mid-October, 42 data sets were received by Jan Jellema.

Problems: The application is based on an outdated version of MS Access. The process of updating the lexicon isn't quick.

Planned activities: Possible remaining tasks will be accomplished as scheduled.

Norway:

Activities: The Geological Survey of Norway (NGU) was invited to participate in the GEIXS extension to the East as a non- EU member. In the first place it was assumed that NGU data could be transferred directly from the Norwegian databases to the GEIXS databases. This proved difficult and NGU data had to be entered manually.

Status: 21st October files containing 21 data sets were transferred to Jan Jellema.

Problems: No problems have been recorded.

Planned activities: Possible remaining tasks will be accomplished as scheduled.

Poland:

Activities: The Polish Geological Institute (PGI) performed an analysis of current PGI geological meta data resources in order to establish their compatibility with GEIXS requirements. The existing meta data resources needed further completion to meet GEIXS' requirements. All sections and regional branches were involved in supplying additional data. A work plan was developed for organising and entering data from the Warsaw office and the regional branches. PGI also performed a translation of the GEIXS dictionaries into Polish for internal use, to make the metadata preparation more consistent and compliant with geological terminology. Some proposals for modifications and improvements to the GEIXS keyword dictionaries were prepared as a result of the translation – these were sent to Jan Jellema. The entering of data sets was for some time stalled as the PGI was not included in the organisation table. It was also a problem that "Polish" cannot be input as a "dataset language" using the GEIXS application. Regarding this, preparation of a

common enhancement requirement by the East-European countries was suggested by Jan Jellema. Methods of geographical indexing were also discussed. As was made clear from the start of the project detailed geographical maps of the non-EU countries would not be included. However, a list of Provinces and Municipalities may be included in the GEIXS database, and simple geographical descriptions like "the Polish coast", "East Poland" etc. may be satisfactory. The list of municipalities of Poland, as prepared in the PGI, has been finally sent and included in the GEIXS application. In this connection the exclusion of Polish letters may be mentioned as a minor problem. 20th September 1999 PGI was advised by Jan Jellema to send mdb files on metadata and map series. Spatial files should preferably be shape-files as used by ArcView. Data transfer was a little difficult because GEUS can only receive meta data files by normal e-mail. GEUS does not run an open ftp server (firewall limitations). However, on 22nd September test data sets were transferred to GEUS without problems, as well as spatial indexes of three main digital mapping projects. Bitmaps for 9 data sets (digital maps) were being prepared then. They were sent on 2nd November.

Status: 28th October, 40 correct data sets were received at GEUS. They were transferred to Jan Jellema 5th November.

Problems: No further problems have been recorded.

Planned activities: Possible remaining tasks will be accomplished as scheduled.

Russia:

Activities: The Institute had no questions on the Manual. For some time the Institute did not have access to the data input module, and the name of the Institute was not on the list of the data entry application. These problems were eventually solved and five correct test files were received in June. However, transfer of complete data sets proved to be difficult because of low storage capacity (MS Exchange megabyte limitations), but this problem was also solved.

Status: 28th October, a zip-file with 293 data sets was received without any problems.

Problems: Geographical indexing (co-ordinates) is a major problem. It would be preferable to use administrative units, but they are not included in the list. A list of spatial reference systems with the Russian National grid (cartographic projection) might be added. Such references can be used for the description of the data-set extent (description with polygons). Many spatial problems could be solved after the possible introduction of 1:500000 IGME maps. 4th November, Dr. Mishin was informed that Jan Jellema is prepared to include the names of the provinces/ departments/ municipalities in the lexicon. No other problems have been recorded.

Planned activities: Possible remaining tasks will be accomplished as scheduled.

Work Plan for the remaining activities

Time Plan and Milestones for the remaining activities are included in the overall time plan for WP7 attached as Annexe 2.

ANNEXE 1

WP 7 - Work plan

A. Co-ordination of data entry

A.1 Data flow, procedures and time plan to be agreed with all parties

- Data flow diagram
- Time plan

A.2 Contacts with data providers

- e-mail, fax, 'phone calls, letters
- meetings

A.3 Contacts with project officials

- Project leader (Ian Jackson, John Laxon)
- Data base administrator (Jan Jellema)
- Commission

B. Documentation of data flow

B.1 Log on data flow

- Data and background information received from data providers
- Data and background information sent to GEIXS data administrator

B.2 Journal

- Correspondence
- Progress reports

C. Quality assurance

C.1 Data

- Validation of data
- Test productions
- Errors and deviancies

C.2 Safety copies

- Production and storage

D. Progress of work

- Time plan
- Steering Committee meetings
- Review meetings with the Commission

GEIXS WP 7 - Time plan

ANNEXE 2

Time plan

Version 1.3

October 1999

WP 7 Activities	1998	1999											
	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Data entry by project partners - T040	x	xxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx	xxxxx		
Testing data entry at GEUS –T039						xx	xxxxx	xxxxx	xxxxx	xxxxx			
Validation of data sets by GEUS – T039										xx	xxxxx		
- remedy of errors										x	xxxxx		
Data from GEUS to NL T039											x	xxxxx	
NL to GEUS on problems – T039												xxxxx	
Remedy of errors												xxxxx	
- contact to data provider – T039												xxxxx	
- errors corrected by data provider – T040												xxxxx	
Revised data from GEUS to NL – T039												xxxxx	
Data load in BRGM completed												xx	x
2nd Users workshop: Brussels											x		
3rd Users workshop: Budapest													x
Project concluded													x

Appendix 1: GEIXS Web server statistics

Analysed requests from Tue-30-Jun-1998 16:36 to Mon-08-Nov-1999 12:56 (495.8 days).

General Summary

(Figures in parentheses refer to the last 7 days).

Successful requests: 247,302 (6,445)
Average successful requests per day: 498 (920)
Successful requests for pages: 31,359 (782)
Average successful requests for pages per day: 63 (111)
Failed requests: 3,768 (132)
Redirected requests: 36 (0)
Distinct files requested: 28,601 (995)
Distinct hosts served: 2,943 (130)
Corrupt logfile lines: 7
Data transferred: 1,555 Mbytes (30,961 kbytes)
Average data transferred per day: 3,212 kbytes (4,423 kbytes)

Monthly Report

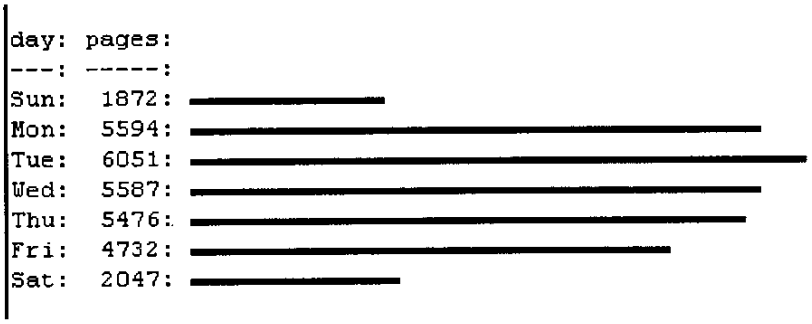
Each unit (-) represents 80 requests for pages, or part thereof.

month:	pages:	
Jun 1998:	4:	-
Jul 1998:	46:	-
Aug 1998:	52:	-
Sep 1998:	108:	--
Oct 1998:	13:	-
Nov 1998:	501:	------
Dec 1998:	804:	-------
Jan 1999:	2089:	----------
Feb 1999:	2945:	----------
Mar 1999:	3206:	----------
Apr 1999:	2801:	----------
May 1999:	2976:	----------
Jun 1999:	2903:	----------
Jul 1999:	3137:	----------
Aug 1999:	2436:	----------
Sep 1999:	2919:	----------
Oct 1999:	3566:	----------
Nov 1999:	853:	-------

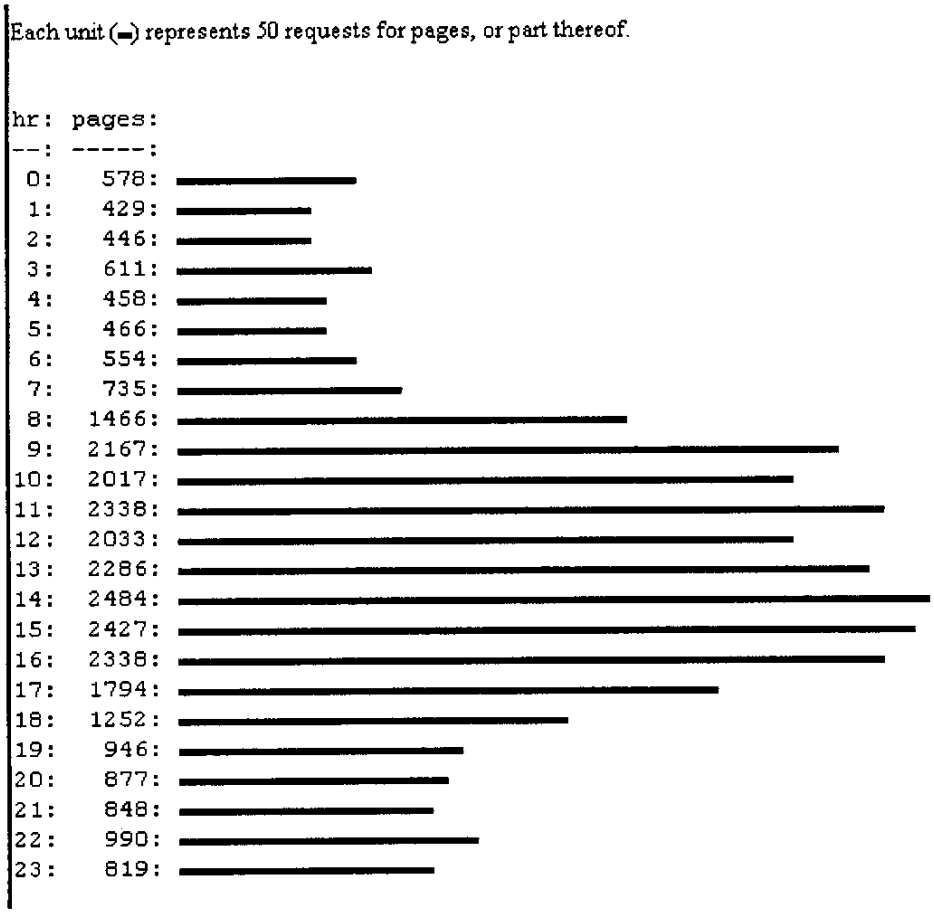
Busiest month: Oct 1999 (3,566 requests for pages).

Daily Summary

Each unit (-) represents 150 requests for pages, or part thereof.



Hourly Summary



Host Report

Listing hosts with at least 100 requests, sorted alphabetically.

Nr of request	% of use	IP adress
109	0.01%	12.10.159.27
134		24.112.99.126
275	0.02%	62.161.241.162
107	0.01%	63.22.64.155
174	0.02%	128.125.23.134
225	0.08%	128.178.50.58
163	0.02%	129.13.149.122
150		129.26.11.225
106	0.02%	129.31.9.88
101	0.01%	129.69.31.167
146	0.03%	129.82.216.78
192	0.02%	129.88.32.145
216	0.02%	129.88.41.70
107	0.01%	129.132.127.12
110	0.01%	129.139.72.207
123	0.01%	129.187.254.49
123	0.01%	129.247.249.92
185	0.01%	130.11.57.161
136	0.02%	130.37.66.156
211	0.02%	130.59.10.30
236	0.01%	130.59.211.10
322	0.02%	130.75.72.89
179	0.06%	130.79.10.247
146	0.02%	130.79.200.130
190	0.02%	130.149.4.44
104	0.01%	130.155.6.114
142	0.03%	130.188.21.119
114		130.206.1.138
173		130.206.111.221
130	0.01%	130.215.24.189
129	0.01%	130.227.133.11
1659	2.13%	130.227.241.133
118	0.01%	130.244.101.89
139	0.02%	130.251.55.20
150	0.02%	131.112.119.75
255	0.02%	131.114.200.7
153	0.01%	131.152.51.35
195	0.01%	131.173.86.143
140	0.07%	131.211.29.23
112	0.01%	132.149.107.65
107	0.01%	132.156.96.131
240	0.06%	132.169.31.53
988	3.53%	132.230.99.252
180	0.02%	134.1.13.76
109	0.01%	134.2.143.84
105	0.01%	134.32.118.180
183	0.02%	134.76.161.38
224	0.01%	134.76.176.218
118	0.01%	134.95.19.22
121	0.01%	134.102.49.19
111	0.01%	134.106.225.37
103	0.01%	134.176.172.176
107	0.01%	134.221.31.48
1755	2.26%	134.221.31.49
1461	0.66%	134.221.31.103
356	0.02%	134.221.31.110
179	0.01%	134.221.50.105
236	1.16%	134.221.107.160
241	0.02%	134.221.135.104
126	0.01%	134.221.161.174
101	0.01%	134.221.249.18
268	0.02%	134.226.66.27
175	0.02%	136.199.4.96
292	0.03%	137.224.12.159
331	0.02%	138.4.183.102
114	0.01%	139.17.164.101
121	0.09%	139.166.100.12
119	0.01%	139.191.21.67
179	0.16%	139.191.142.171
109	0.01%	140.105.123.29
102	0.01%	141.90.2.41
690	0.53%	141.90.2.42
582	0.61%	141.91.240.130
108	0.01%	141.201.111.173
137	0.02%	142.169.171.166
137	0.02%	143.179.151.145
137	0.03%	143.179.151.176
145	0.03%	143.179.151.250
134	0.01%	143.233.148.26
186	0.01%	143.237.73.222
167	0.01%	145.12.10.1
122	0.01%	147.96.194.218
188	0.01%	148.4.39.133
1678	6.20%	148.81.254.66
463	0.03%	150.29.45.2
311	0.03%	150.29.132.145
117	0.01%	150.128.82.57
105	0.01%	151.100.11.251
146	0.03%	151.189.0.131
400	0.03%	152.91.8.254

104	0.01%	153.19.99.125
360	0.04%	153.97.133.14
143	0.01%	153.97.133.18
106	0.01%	156.118.212.2
101	0.01%	157.100.24.106
100		157.193.56.123
199	0.01%	158.169.9.30
182	0.03%	158.169.131.30
179	0.02%	158.169.131.32
113	0.01%	159.84.47.44
184	0.02%	163.188.46.239
106	0.01%	164.15.13.67
652	0.06%	164.133.154.130
117	0.01%	164.138.23.107
233	0.03%	164.138.153.167
229	0.03%	170.76.253.8
114	0.01%	192.33.147.30
107	0.01%	192.35.246.9
3805	0.54%	192.71.158.2
157	0.01%	192.87.16.130
251	0.03%	192.87.173.2
245	0.04%	192.87.174.159
124	0.01%	192.87.174.208
1198	0.13%	192.89.135.197
277	0.02%	192.149.148.133
1243	2.99%	192.167.60.205
24441	13.02%	192.168.2.1
122	0.01%	192.171.144.25
359	0.02%	192.171.144.69
881	0.09%	192.171.144.90
170	0.01%	192.171.144.99
114	0.01%	192.171.148.186
293	0.03%	192.171.148.198
512	0.04%	192.171.148.199
305	0.02%	192.171.148.200
278	0.01%	192.171.150.76
210	0.02%	192.171.151.229
153	0.01%	192.171.197.18
105	0.02%	192.187.17.130
124	0.01%	192.244.210.1
838	0.08%	193.1.228.2
147	0.01%	193.2.1.88
167	0.03%	193.5.216.70
140	0.01%	193.49.98.102
244	0.03%	193.49.180.10
4522	1.09%	193.50.238.104
1041	0.10%	193.56.4.37
331	0.09%	193.56.4.131
2873	0.40%	193.56.4.132
173	0.03%	193.56.6.166
364	0.02%	193.74.211.131
108	0.02%	193.75.159.133
114	0.01%	193.75.247.95
129	0.02%	193.78.53.33
183	0.01%	193.85.184.10
152	0.02%	193.104.87.2
288	0.02%	193.120.7.43
114	0.01%	193.120.43.98
5239	1.77%	193.126.16.73
3505	1.08%	193.126.16.77
291	0.04%	193.126.233.25
138	0.02%	193.129.127.219
115	0.02%	193.131.74.43
118	0.01%	193.136.16.146
129		193.136.129.58
161	0.01%	193.136.173.80
473	0.04%	193.144.59.144
142	0.02%	193.144.179.116
106	0.01%	193.144.203.190
204	0.02%	193.145.73.34
188	0.01%	193.156.55.52
101		193.156.55.58
115	0.01%	193.156.55.71
107	0.01%	193.156.55.76
125		193.156.55.92
135		193.156.55.137
108	0.01%	193.156.55.140
102	0.01%	193.156.55.151
154	0.01%	193.156.55.162
134	0.01%	193.156.55.174
139	0.01%	193.156.55.181
824	0.06%	193.156.55.188
178	0.01%	193.156.55.191
129	0.01%	193.158.55.74
107	0.01%	193.158.150.136
146	0.01%	193.158.181.7
4081	1.42%	193.167.179.2
161	0.01%	193.170.104.71
2674	0.20%	193.170.253.65
111	0.01%	193.174.76.175
11870	2.12%	193.174.160.1
190	0.02%	193.174.160.4
387	0.06%	193.174.165.203
190	0.01%	193.174.169.4
1049	0.77%	193.190.182.11
163	0.01%	193.190.198.19

208	0.01%	193.190.223.44
210	0.05%	193.190.223.205
135	0.01%	193.212.109.20
1167	5.44%	193.219.89.136
206	0.31%	193.219.89.137
814	4.45%	193.219.89.199
214	0.04%	193.224.64.5
439	0.03%	193.224.64.154
123	0.06%	193.224.64.216
2697	8.33%	193.224.188.206
564	1.55%	193.225.12.47
123	0.01%	193.225.212.2
157	0.01%	193.225.212.132
402	0.05%	193.225.212.180
144	0.04%	193.232.229.5
162	0.02%	193.232.250.157
104	0.01%	193.252.125.1
130	0.01%	194.2.136.6
243	0.02%	194.7.15.89
110	0.01%	194.7.148.222
142	0.13%	194.7.203.24
186	0.02%	194.25.170.128
202	0.02%	194.30.0.130
310	0.02%	194.57.22.166
409	0.06%	194.57.178.190
168	0.01%	194.65.14.5
193	0.02%	194.65.131.2
106	0.01%	194.65.153.5
221	0.01%	194.65.154.132
141	0.01%	194.65.229.236
130	0.01%	194.65.248.161
1052	0.07%	194.76.232.130
168	0.01%	194.83.240.11
133	0.01%	194.83.240.18
131	0.01%	194.86.153.194
532	0.29%	194.95.176.27
3835	2.84%	194.95.208.2
141	0.01%	194.109.148.79
103	0.01%	194.109.157.68
227	0.04%	194.117.4.42
129	0.01%	194.117.208.227
236	0.01%	194.119.249.15
107	0.01%	194.125.134.183
135	0.01%	194.126.85.129
225	0.03%	194.134.0.98
211	0.02%	194.151.190.68
1238	1.48%	194.154.200.89
951	0.09%	194.167.44.1
103	0.01%	194.167.255.160
175	0.02%	194.176.206.131
134	0.02%	194.182.165.51
268	0.03%	194.191.169.75
127	0.01%	194.196.151.4
845	1.01%	194.196.212.66
171	0.01%	194.213.91.7
152	0.01%	194.219.70.70
135	0.01%	194.219.148.51
107	0.01%	194.228.41.67
210	0.03%	194.228.41.123
161	0.05%	194.233.223.180
102	0.01%	194.242.194.56
237	0.02%	194.250.53.20
113	0.01%	194.251.30.5
235	0.06%	195.0.17.84
388	0.04%	195.5.13.69
274	0.01%	195.6.33.66
114	0.01%	195.24.73.187
254	0.03%	195.25.31.5
151	0.03%	195.25.70.250
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288	0.02%	195.27.187.28
130	0.02%	195.36.229.30
538	0.05%	195.37.204.65
313	0.68%	195.50.198.102
172	0.02%	195.55.180.95
162	0.05%	195.58.67.129
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105	0.01%	195.132.19.9

108	0.06%	195.138.36.2
376	0.04%	195.145.245.225
183	0.02%	195.154.97.218
101	0.01%	195.207.35.10
355	0.15%	195.207.141.129
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108	0.01%	195.212.98.58
768	0.12%	195.212.213.60
427	0.05%	195.212.223.190
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110	0.08%	195.238.2.18
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185	0.01%	195.241.193.4
320	0.01%	195.242.46.55
115	0.01%	195.242.64.181
106	0.01%	195.242.64.182
354	0.03%	195.242.64.183
147	0.01%	195.242.79.76
1379	2.79%	195.244.148.205
1056	0.08%	195.244.148.212
423	0.69%	195.244.148.249
104	0.01%	195.249.234.79
107	0.01%	195.251.129.120
176	0.02%	196.34.250.6
102	0.01%	199.174.171.89
237	0.02%	200.21.205.42
623	0.07%	200.21.205.43
236	0.03%	200.21.205.44
111	0.01%	200.37.26.108
139	0.01%	200.223.197.76
182	0.04%	202.221.199.1
204	0.02%	203.40.56.16
272	0.02%	203.91.65.2
181	0.02%	203.154.196.51
808	1.70%	203.159.0.15
224	0.02%	204.19.106.198
166	0.03%	204.123.9.123
139	0.02%	204.162.98.94
138	0.01%	204.170.242.49
140	0.01%	204.222.216.35
423	0.04%	205.156.197.27
126	0.02%	206.49.176.243
101		206.71.126.39
125	0.02%	206.132.186.131
328	0.02%	206.168.216.115
123		206.206.163.47
234	0.04%	207.87.178.66
150	0.01%	207.193.101.129
222	0.02%	208.192.60.204
176	0.04%	208.215.47.115
190	0.02%	208.219.77.9
578	0.01%	208.219.77.19
210		208.219.77.29
106	0.01%	209.45.85.18
186	0.01%	209.88.233.168
120	0.01%	209.115.93.66
331	0.03%	209.156.83.71
199	0.03%	209.185.253.167
157	0.03%	209.185.253.168
198	0.03%	209.185.253.170
124	0.01%	212.7.42.95
146	0.01%	212.11.18.250
233	0.03%	212.25.141.216
148	0.02%	212.27.32.60
100	0.01%	212.49.140.141
187	0.01%	212.50.162.195
198	0.80%	212.56.6.33
171	0.01%	212.123.77.227
121	0.01%	212.123.89.44
116	0.01%	212.151.148.43
100	0.01%	212.184.0.53
150	0.01%	212.184.0.59
113	0.01%	212.206.12.152
148	0.01%	212.234.200.190
186	0.04%	216.23.148.127
106	0.02%	216.32.64.10
180	0.02%	216.66.143.162
143	0.04%	216.99.65.36

86929: 16.51%: [not listed: 2,583 hosts]

Appendix 2 – Workshop 2 programme and registrant list

OUTLINE PROGRAMME FOR THE SECOND GEIXS USER WORKSHOP: 13-14 OCTOBER 1999

13 October 1999: (Day 1) : CCAB, rue Froissart 36

Morning: Participants arrive.

Session 1 (13:30-17:30). Introduction to GEIXS: what the system does
Chair: *Richard Annells (Secretary General, EuroGeoSurveys)*

13:30 – 13:45	Why European industry needs geo-referenced information. *Mr Pedro Ortún, Industry Directorate, European Commission (Industrial affairs: Basic industries).*
13:45 – 14:00	Welcome and opening remarks by EuroGeoSurveys. *Richard Annells.*
14:00 – 14:25	An introduction to GEIXS. *Ian Jackson (GEIXS Project Manager, BGS).*
14:25 – 15:05	Demonstration of the GEIXS web site. *Jan Jellema (NITG-TNO) and Christian Braux (BRGM)*
15:05 – 15:20	Refreshment break
15:20 – 16:30	How GEIXS can deliver geoscience data and information to industry and research: some examples from users, including: • The European property insurance industry. *David Ovadia (UK Business Development, British Geological Survey)* • New construction and recycling techniques for Europe. *Valerie Shulman (Secretary General, European Tyre Recycling Association, Paris)* • The European mineral industry. *Jussi Aarnisalo (Outokumpu, Espoo)*
16:30 – 17:00	Open discussion: what do clients think of the GEIXS project and concepts?
17:30 – 19:30	Drinks reception for participants (hosted by EuroGeoSurveys at Lancashire House, 36 rue Breydel).

14 October 1999 (Day 2):

Session 2: 09:00 - 12:30. A vision for the future role of geo-referenced information in society.
Chair*: Ian Jackson (GEIXS Project Manager, BGS)*

09:00 - 09:10	Introduction. *Ian Jackson (GEIXS Project Manager, BGS)*
09:10 – 09:40	The development of electronic commerce through GEIXS. *Michael Rotert (XLink, Karlsruhe)*
09:40 – 10:00	Extending GEIXS through new projects in Central and Eastern Europe, the New Independent States and the Mediterranean. *Erik Stenestad (GEUS, Copenhagen)*
10:00 – 10:15	A Polish perspective of GEIXS. *Maciej Podemski (Deputy Director, PGI, Warsaw)*
10:15 – 10:35	Future applications of GEIXS: in other EU programmes, EU agencies and the wider international field. *Richard Annells (EuroGeoSurveys).*
10:35 – 10:50	The GEOMIST project. *Luis Delgado Martinez (Director, Planning and Management, ITGE Madrid)*
10:50 – 11:05	Refreshment break.
11:05 – 11:15	Demonstration of the Multi-lingual Thesaurus. *Jan Jellema (NITG-TNO)*
11:15 - 11:35	Our proposals for future development of GEIXS. *Ian Jackson (BGS).*
11:35 – 12:15	Open discussion: a future vision for geo-referenced information (Moderators*: Ian Jackson, Ulrich Boes*).
12:15 – 12:30	Summing up. *Ulrich Boes (Information Society Directorate, European Commission: (ISAC- Information Society Activities Centre/IS2).*
12:30	Close of meeting by chairman.

The list of registrants for the second GEIXS Workshop:

Last name	First name	Organisation	Address
Aarnisalo	Jussi	Senior Research Geologist, Outokumpu Mining Oy	Riihitontuntie 7A, Espoo, Finland, FIN-02207
Annells	Richard	Secretary General, EuroGeoSurveys	Rue Breydel 40, Brussels, B-1040, Belgium
Beer	Christoph	Head, Geological Mapping, Swiss National Hydrological and Geological Survey	Bern, Switzerland, CH-3003
Boes	Ulrich	Information Society DG, ISAC/IS2 European Commission	Rue de la Loi 200, B-1049, Brussels, Belgium
Bonnefoy	Denis	Head, Design/Architecture of GIS, BRGM	3 av C Guillemin, BP 6009, F-45060, Orleans, France
Braux	Christian	GIS Product Manager, BRGM	3 av C Guillemin, BP 6009, F-45060, Orleans, France
Carter	Mary	Head, IT Section, Geological Survey of Ireland	Beggars Bush, Haddingtion Rd, Dublin 4, Ireland
Classen	Willi	Geologist, Hessisches Landesamt fur Bodenforschung	Leberberg 9, D-65193 Wiesbaden, Germany
Cracknell	Arthur	University of Dundee	Department of A.P.E.M.E., University of Dundee DD1 4MN, UK
Crehan	Patrick	Consultant	107 rue Sans Souci, 1050 Brussels, Belgium
Delgado	Luis	Director, Planning & Management, ITGE	23, Rios Rosas, E-28003 Madrid, Spain
Decadt	Brigitte	Manager, Belgian National R&D Programme	TELSAT Programme, OSTC, rue de la Science 8, B-1000 Brussels, Belgium
Farrell	Bernard	Project Manager, MEGRIN GIE	6-8 ave Blaise Pascal, Cite Descartes, Champs sur Marne, F-77455 Marne Lavalle Cedex 2, France
Follestad	Bjorn	Deputy Director, Geological Survey of Norway	Leiv Erikssons vei 39, Trondheim, N-7491, Norway
Gronlund	Anders	National Land Survey of Sweden	Lantmaterigatan 2, S-801 82, Gavle, Sweden

Hebestreit	Corina	Director, EUROMINES	12 Avenue de Broqueville, B-1150, Brussels, Belgium
Jackson	Ian	Manager, Geospatial Information Systems Group, BGS	Keyworth, Nottingham, NG12 5GG, UK
Jellema	Jan	Senior IT Advisor, NITG-TNO	Schoemakerstraat 97, PO Box 6012, NL-2600 JA Delft, Netherlands
Laiginhas	Carlos	Geologist, Instituto Geologicao e Mineiro	Estrade da Portela – Zambujal, Apartado 7586, p-2720 Alfragide, Portugal
Laxton	John	GIS Specialist, BGS	Murchison House, West Mains Rd, Edinburgh EH9 3LA, UK
Millard	Keiran	Principal Engineer, HR Wallingford Ltd	Howberry Park, Wallingford, OX10 8BA, UK
Ortun	Pedro	Director, C: Industrial Affairs, Basic and ICT Industries, Enterprise DG, European Commission	Rue de la Loi 200, B-1049, Brussels, Belgium
Ovadia	David	Head, UK Business Development, BGS	Keyworth, Nottingham, NG12 5AA, UK
Podemski	Maciej	Deputy Director General, Polish Geological Institute	Rakowiecza 4, Warsaw, PL 00-975, Poland
Rotert	Michael	Director, NTG Netzwerk und Telematic	Vinzenz Priessnietz Str 3, D-76131 Karlsruhe, Germany
Shulman	Valerie	European Tyre Recycling Association	ETRA, Rue Leroux 7, F-75116 Paris, France
Stenestad	Erik	Director, International Affairs	GEUS – Geological Survey of Denmark and Greenland, Thoravej 8, DK-2400 Copenhagen NV, Denmark
Vanerseypen	Guido	C-3: Basic and ICT Industries, Enterprise DG, European Commission	Rue de la Loi 200, B-1049, Brussels Belgium

Appendix 3 – GEIXS marketing requirement report

GEIXS
COMMERCIAL AND MARKETING APPROACH

In the commercial and marketing aspect worked out around the GEIXS project, there are key questions we need to approach. If the project development seems to be meant for a scientific community, its extension to other professional or private uses is unavoidable.

This report synthesise the results of the studies carried out on the marketing theme. We detail according to two parts:
- Products
- The use of GEIXS

Products

Hence a first question should be : **"What do we want to market?"**.

We can define 4 main types of products which could be marketed.
- service and system for "cataloguing" data sources.
- Raw data (from Geological Surveys)
- Existing products with added value
- Services / solutions to produce decision-making documents

Compared to these products and the markets, a series of questions arise ?
- which market?
- are the products well adapted?
- how to enter the market?
- which developments are necessary

These questions are mainly touched on in the second part which relates to the use of GEIXS and which will make it possible to define a marketing plan and evolutions of GEIXS

1 . Service and system for "cataloguing" data sources.

The current product GEIXS is mainly dedicated to geosciences and adapted to a network of Geological Surveys comparable with the network EUROGEOSURVEYS. In this direction some targets zones can be defined:
- Asia
- Latin America
- Middle-East
- Africa

We can also define targets in local organisations (regional agencies....)

The approach to such market requires that local peculiarities are taken into account. The political aspects and the conditions relating to the property of the data are the major elements to consider in order to demonstrate the interest of such a system.
We can propose services in term of architecture of data, software, computer, training.

2. Raw data (from Geological Surveys)

This type of product is of interests mainly to European users. The first users are primarily at national level (national or regional public organisations, research centre.). The first question to addressed relates to the exhaustiveness of the data and whether they are adapted perfectly to the user's needs.

Data must:

- be more numerous so that GEIXS is really regarded as the European server of the "earth sciences" data ".
- to interest the decision makers directly
- not to be too "scientific "

3. Existing products with Added value

Right now it is necessary to plan to be able to make available in GEIXS decision-making documents which meet perfectly the needs of the decision makers.
These documents can be several types:
- derived maps starting from the source data
- predictive maps (vulnerability, sensitivity)

4. Services / solution to produce decision-making documents

Decision makers wish to be able to display documents which make it possible to take decisions quickly and with a high degree of reliability.
Data, currently presented in GEIXS must be integrated, combined to support the decisions.
In this direction GEIXS can be an element of promotion of the various Geological Surveys in order to draw up documents suitable for decision-making.

The USE of GEIXS

1. Vertical Approach of the Market

Generally, to answer the question « What is Target Marketing ? », it is necessary to define a few points :

- Set up a specific campaign targeted to a specific market where we have clearly identified market opportunities.
  - ⇒ targeting the geoscience market (research, oil and petrol industries
  - ⇒ targeting market from geoscience such as insurance or banking .

- Define a glossary of terms :

⇒ criteria Qualification and common terminology.

- Scale the activity
  - ⇒ According to the resources
  - ⇒ According to company strategy and priorities
  - ⇒ « always aim at the lowest "fruit on the tree"... »
  - ⇒ allocate sufficient time to methodically explore that market.

- Market definition
  - ⇒ do the necessary groundwork to fully understand the market, its potential and how it fits from a technological perspective
  - ⇒ test Market potentials
  - ⇒ identify networking opportunities (Sub-contractors, partners, etc.)

- Product Process
  - ⇒ understand the entire process of manufacturing, and links with other markets
  - ⇒ Clarify total product fit relative to process of manufacturing in vertical market.

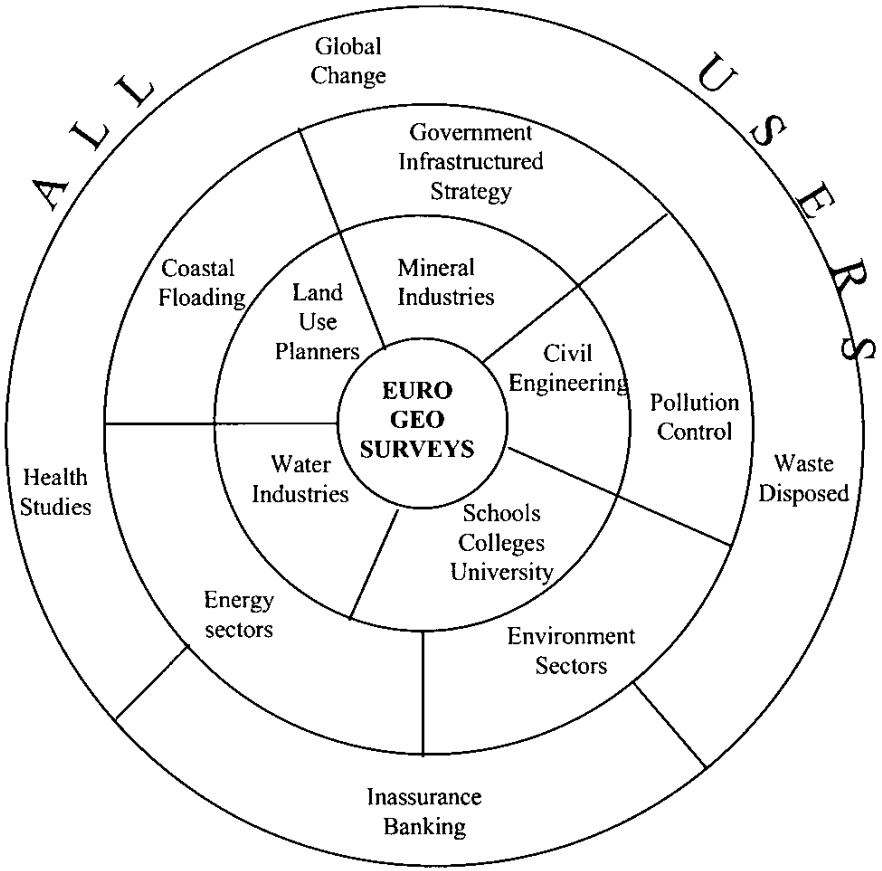
2. What is target marketing?

Sharing geological data and its visualisation tools seem to be a good channel of information that can interest a large number of people. Besides, when targeting some markets which deal more or less with the geology, it is worth not neglecting other sectors that can be interested in the availability of a WEB server like GEIX. The diagram in the next page shows an "onion" organisation of interested sectors. This non-exhaustive scheme gives some indications of a few targets in the market. It seems that for each target a more precise study must be conducted in order to define and to quantify the potential of this market coming directly or not from GEIXS.

The EUROGEOSURVEYS, which is the focal point of the structure, shows that being the first suppliers of geo-data, they should be their first customers. In the absence of this, the market around GEIXS cannot be established.

More specifically, participating in some trade shows and conferences gives the opportunity to demonstrate the use and advantages of the system.

In a nutshell, the marketing approach goes through specific demonstrations targeting as precisely as possible how a customer can use it. Naturally those actions can not be undertaken without a complete marketing project and a real follow-up of prospects with customers.



potential targets for GEIXS

To get any commercial action the most effective, It is necessary to provide to GEIXS some important assets. Besides the wide data base given by the GEIXS server, GEIXS must become a label in terms of « geodata » and so, being the reflect of a real know-how through geological applications.
Hence, the problem is no more the access to the geodata but their uses and the around utilities. "Customers pull, not producer push". Focusing on user friendliness and on the access easiness to meta data are two trivial aspects which seems to be clear. Nevertheless, a problem that may rise, can be sum up in the phrase: "too much or too less of informations kills the metadata or weakens them."
GEIXS has to be focused on the next three major points:

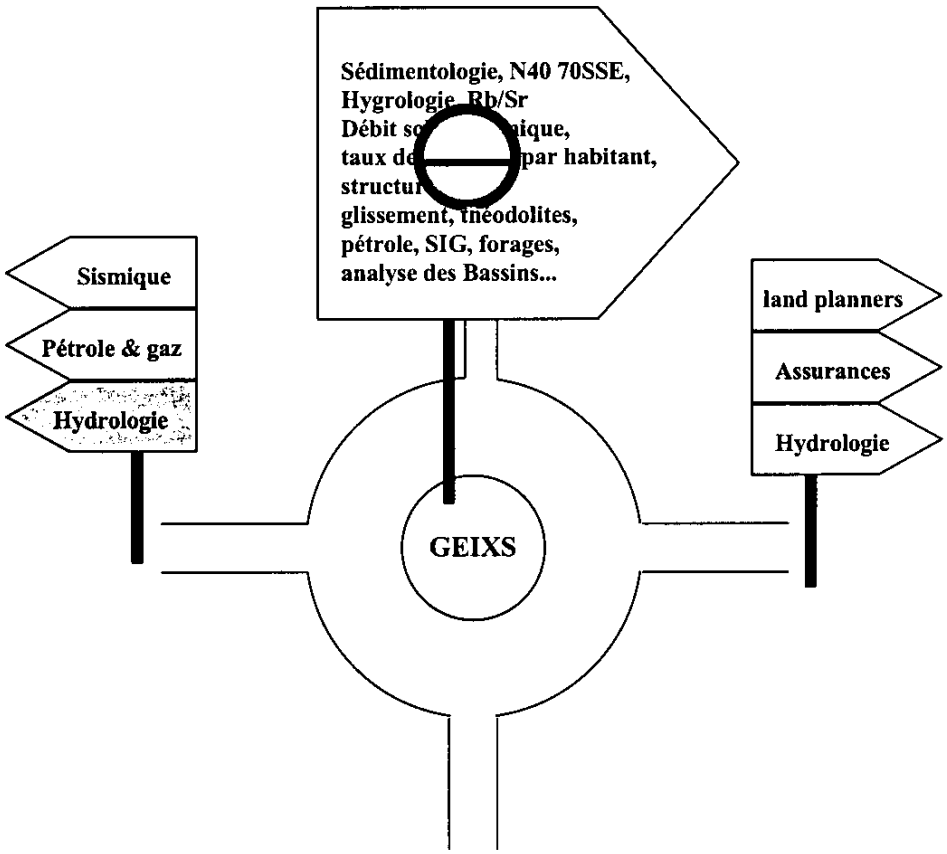
- Information: helpline, dictionnary...
- Access: data, meta data...
- Utilities : applications, geoscience tools, analysis, decision assistance...

Then a new question rises: if a large market can be defined around GEIX, by what way each customer can identify itself to the product? That is, we have to define some assets i.e. how can we get the data being reached by anyone. In other terms, it is necessary to define attribute combination or in what way could the data be enriched to be accessible by all users ?
If we identify GEIXS as a central point of a circle(scheme on the next page), it seems necessary that anyone who gets in can get out easily. For example, if a insurance company wants to use the geological data to assess a risk of a site, GEIXS must drive it with their own semantics (building risks for a particular site or area, pollution assessment in a defined district ...). In the same way, environmental administrative services would be more sensitive to pollution rate based on a pollution than specialised borehole data. The partial approach of GEIXS must be enriched with a professional approach. To one section must get a range of elements that cope with researched needs.

A commercial extension rises: What about giving one user some elements of the answer he seeks. According to the tools that GEIXS gets, it seems important to help users with some decisions parts or some elements of geological expertise. Indeed, the analysis tools must get GEIXS an unavoidable part in global decision on geological problems. Without giving strict answers, GEIXS could be a reference as an encyclopaedia of geological data and as an analytic approach. In that way and with the EuroGeoSurveys, GEIXS have to show its best practises in advantage in terms of geological expertise.

In that perspective of GEIXS project, it should be important to develop specific product dedicated to each targeted professional sector. Furthermore, a turn-key development would enable a better custumer follow-up. Then, GEIXS's label could be resumed in tree interconnected parts :

Meta-data catalogue,
Visualization tools and georeferential representations,
Utilities .



Specification of GEIXS's site

The following matrix synthesise the correlation product / market and the different phases of evolution.

PRODUCT / MARKET MATRIX

		ACTUAL	SIMILAR	NEW
ACTUAL	**International network** Asia Latine America Middle East Africa	System 1	derived maps Predictives maps 2	models applications tools 7
SIMILAR	National Organisation	data System 3	derived maps Predictives maps 4	8
NEW		5	6	9

Appendix 4 – Workshop 3 programme and registrant list

OUTLINE PROGRAMME FOR THE THIRD GEIXS USER WORKSHOP: 2-3 DECEMBER 1999

2 December 1999: (Day 1) :

Morning: Participants arrive.

Session 1 (13:30-17:30). Introduction to GEIXS: what the system does
Chair: *Ian Jackson (GEIXS Project Manager: British Geological Survey, Keyworth).*

13:30 – 13:45	Welcome and opening remarks *Istvan Farkas (Director-General of the Hungarian Geological Survey)*
13:45 – 13:55	Introduction to EuroGeoSurveys *Dick Annells (Secretary-General, EuroGeoSurveys)*
13:55 – 14:25	An introduction to GEIXS. *Ian Jackson (BGS).*
14:25 – 14:50	A technical overview of GEIXS, including the link to emerging international metadata standards. *John Laxton (BGS).*
14:50 – 15:10	The International Geological Map of Europe (IGME) *Kristine Asch (BGR)*
15:10 – 15:25	The GEIXS data entry system and procedures. *Jan Jellema (TNO)*
15:25 – 15:45	Refreshment break
15:45 – 16:00	The Multi-Lingual Thesaurus and its application to GEIXS. *Jan Jellema (TNO)*
16:00 – 16:30	The GEIXS web-based retrieval application *Denis Bonnefoy (BRGM)*
16:30 – 17:00	Open discussion: what do the participants think of the GEIXS project and concepts?
17:30 -	Workshop dinner

3 December 1999 (Day 2):

Session 2: 09:00 - 12:30. The eastward extension of GEIXS.

Chair: *Ulrich Boes (European Commission, DG XIII).*

09:00 - 09:30	GEIXS in Eastern Europe – an overview. *Erik Stenestad (GEUS)*
09:30 – 09:50	GEIXS in Eastern Europe – an individual perspective. *Tomasz Mardal (PGI)*
09:50 – 10:20	Future applications of GEIXS: in other EU programmes, EU agencies and the wider international field. *Richard Annells (Secretary General, EuroGeoSurveys, Brussels)*
10:20 - 11:00	Our proposals for future development of GEIXS. *Ian Jackson (BGS)*
11:00 – 11:20	Refreshment break.
11:20 – 11:40	The European Commission view of the future of GEIXS, with special reference to Eastern Europe and NIS countries. *Ulrich Boes (European Commission, DG XIII)*
11:40 – 12:10	Open discussion: future directions for geo-referenced information in Eastern Europe and NIS countries.
12:10 – 12:30	Summing up. *Ian Jackson (BGS)*
12:30	Close of meeting.

The list of registrants for the third GEIXS Workshop (as of 10/11/99):

First name	Surname	Organization	City	Country	E-mail
Richard	Annels	EuroGeoSurveys	Brussels	Belgium	RN.Annels@pophost.eunet.be
Kristine	Asch	BGR	Hannover	Germany	Kristine.Asch@bgr.de
Ranko	Biondic	Institute of Geology	Zagreb	Croatia	rbiondic@usa.net
Mary	Carter	Geological Survey of Ireland	Dublin	Ireland	carterma@tec.irlgov.ie
Dana	Capova	Geofond of the Czech Republic	Praha 7	Czech Republic	dcapova@geofond.cy
Ludovit	Caudt	Geological Survey of Slovak Republic	Bratislava	Slovakia	cau@gssr.sk
Dimitris	Drymonitis	I.G.M.E. Institute of Geology and Mineral Exploration	Athens	Greece	ddry@netgate.gr
Elizabeth	Erdélyi	Hungarian Geological Survey	Budapest	Hungary	erdelyi@mgsz.hu
Nabi	Eshnazarov	State agency on geology and mineral resources under of Government of Kyrgyz Republic	Bishkek	Kyrgyz Republic	kmeger@it.kg
Max	Fernandez*	Royal Museum for Central Africa Department of Geology Information Management Unit	Tervuren	Belgium	mfernandez@africamuseum.be
Milan	Gargulak	Geological Survey of Slovak Republic	Bratislava	Slovakia	gargulak@gssr.sk
Jan	Hultstroem	SGU Swedish Geological Survey	Uppsala	Sweden	jan.hultstrom@sgu.se
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Appendix 5 – GEIXS maintenance plan

Maintenance of GEIXS

Purpose :
- to keep the existing configuration of GEIXS on line and in good condition
- continuously update the content of the database

1. Tasks for each GSO

co-ordinator for each GSO

- responsibility for data acquisition
- focal point for communication between European level and national level
- co-ordinating the work of data managers
- translation of new terms

Estimated time : 3 hours / month for each GSO

Data managers

- checking and updating data sets every 3 years

Estimated time 20 hours a year

- entering new data sets

Estimated time 20 hours a year (5 data sets per year)

2. Data harmonization

The thematic administration of the GEIXS metadata base consists of ensuring the coherence of the metadata and making upgrades of the lexical terms. It is carried out by the geological survey of the Netherlands (NITG-TNO) and is estimated as follows:

Validating 100 datasets a year
Harmonise data sets (existing and new) (200 per year)
Test environment
Updating Keywords / lexicons
Communication and instruction to GSO focal point
Reporting to EGS

Estimated time : 5 weeks a year
TOTAL = 19 000 Euros

3. Configuration management

The technical administration consists of :

- ensuring the regular backup of the GEIXS system
- ensuring physical loading of data and spatial indexes
- producing statistical reports on the utilisation of the GEIXS server
- providing an Internet access point

It is carried out by the Geological Survey of France (BRGM) and is estimated as follows:

Loading data to the system
Application software maintenance
System management and back up
Provision for new developments
- **update tools for the internet**
- **new software or new version of software**

Estimated time : 5 weeks a year
+ 10 Keuros
TOTAL = 20 500 Euros

Maintenance of the software, hardware

EuroGeoSurveys is now the owner of hardware and software. Thus the license fees have to be paid by EGS. The **GEIXS web server** is hosted in BRGM.

Software/hardware	**EUROS**	**Comments**
Matra Cas-cad	500	Not necessary
SABE GIS licences, annual fees (*)	9146 Euros + 2286 E/Year	Mandatory
Oracle, annual fees	2000	Mandatory
Spatial Data Engine, annual fees	4200 (*)	Not necessary
Sun server, annual fees	500	Mandatory

(*) SABE: Seamless Administrative Boundaries of Europe. Topographical data used in GEIXS to locate the spatial extension of geological data.