6.4 Geology

Definition:

(INSPIRE, 2007) Geology characterised according to composition and structure. Includes bedrock, aquifers and geomorphology.

Description:

Geological information provides basic knowledge about the physical and chemical composition and the genesis of the underground, in particular on the properties of the rocks and sediments (age, petrography, genesis and tectonic elements, ...) and their structure.
NOTE: Experts from EuroGeosurveys will provide an improved version of the Description for the theme 'Geology' in 2008.

Scope, use examples:

Geological information, on-shore and off-shore, is the basis to locate distribution of natural resources such as ores, groundwater, oil, industrial minerals, aggregate materials and building stones. They may, albeit indirectly, warn about the danger of natural hazards, climatic change or supply information about suitable sites for land-fill, house-building or enhance aspects of tourism. They thus provide the basis for environmental planning and protection and support public-policy decision making. Thus, Geological data are the basis for understanding the earth and its processes.

Thus, geological Data are used in:

- Detecting geo-hazards,
- Locating natural mineral resources (oil, gas, gas hydrates, coal, ore, e.g. iron, copper or aluminium, sand, gravel, limestone etc.)
- Locating groundwater resources for drinking water supply
- Aid in depicting indicators for climatic change
- Aid in protecting ground water
- Ensuring the security of constructing buildings and infrastructures
- Ensuring the safe disposal of wastes
- Ensuring the safe construction of buildings and infrastructure
- Support for public decisions
- Providing crucial information for environmental planning
- Adding value to tourism information
- Providing crucial information for the interpretation of geophysical and geochemical data

Important feature types and attributes:

- Age (from ... to ... , as geological formations ages represent time spans rather than absolute times and name of periods)
- Rock type
    - Sedimentary Rocks
    - Igneous rocks
    - Metamorphic rocks
    - Anthropogenic deposits
    - Regolith (unconsolidated superficial formations, fractured/ weathered bedrock)
- Genetic aspects
- Tectonic aspects
- Regional names
- Metamorphism

Hydrogeological parameters of individual rock formations:

- aquifer type:
    - porous aquifers
    - fissured aquifers
    - karstic aquifers
- groundwater qualitative parameters
- groundwater quantitative parameters
- dynamic parameters (recharge/ discharge rates, groundwater flow rate and direction)
- aquifer vulnerability
- depth of the bedrock

- Geomorphological features (incl. sedimentation/erosion rates in coastal areas)

Overlaps and links with other themes:

The main relations with other themes:

- Soil
- Land use
- Hydrography
- Protected sites
- Area management/restriction/regulation zones & reporting units
- Natural risk zones
- Oceanographic geographical features
- Bio-geographical regions
- Habitats and biotopes
- Energy resources,
- Mineral resources,
- Environmental monitoring facilities,
- Sea regions

Groundwater held in aquifers is controlled by the physical properties and structure of the aquifer and its adjacent rocks. Groundwater is considered by geologists as a natural resource and it is thus an integral part of Geology.

Reference documents:

Asch, K. (2003): The 1: 5 Million International Geological Map of Europe and Adjacent Areas: Development and Implementation of a GIS-enabled Concept; Geologisches Jahrbuch; SA 3, BGR, Hannover (ed.); Schweitzerbart (Stuttgart), 190 p., 45 fig., 46 tab.

Asch, K. (2005): The 1: 5 Million International Geological Map of Europe and Adjacent Areas. Map. (BGR) Hannover.

BGR & UNESCO (1974 – ongoing): The 1 : 1.5 Million Internationale Hydrogeological Map of Europe (in 25 map sheets). BGR (Hannover)

Gilbrich, W.H. (2000): Internatioanle Hydrogeological Map of Europe. – Feature Article. Waterway No. 19 (Paris), 11 pp., 1 fig. 1 tab.;

Gillbrich, W.H., Krampe, K. & Winter, P. (2001): Internatioanle Hydrogeologischen Karte von Europa, 1 : 1 500 000. Bemerkungen zum Inhalt und Satnd der Bearbeitung.- Hydrologie und Wasserbewirtschaftung, 45, H.3, BFG (Koblenz) pp 122 – 125

Gradstein, F.M., Ogg, J.G., and Smith, A.G., Agterberg, F.P., Bleeker, W., Cooper, R.A., Davydov, V., Gibbard, P., Hinnov, L.A., House, M.R., Lourens, L., Luterbacher, H.P., McArthur, J., Melchin, M.J., Robb, L.J., Shergold, J., Villeneuve, M., Wardlaw, B.R., Ali, J., Brinkhuis, H., Hilgen, F.J., Hooker, J., Howarth, R.J., Knoll, A.H., Laskar, J., Monechi, S., Plumb, K.A., Powell, J., Raffi, I., Röhl, U., Sadler, P., Sanfilippo, A., Schmitz, B., Shackleton, N.J., Shields, G.A., Strauss, H., Van Dam, J., van Kolfschoten, T., Veizer, J., and Wilson, D., 2004. A Geologic Time Scale 2004. Cambridge University Press (Cambridge), p 589

International Commission on Stratigraphy (2006): International Stratigraphic Chart. http://www.stratigraphy.org/cheu.pdf

IUGS-SCMR ; 2004; Subcommission on the Systematics an Nomenclature of Metamorphic Rocks

Le Maitre, R W Streckeisen, A and 13 others. (2002) Igneous Rocks: A classification and glossary of terms. Recommendations of the International Subcommission on the systematics of igneous rocks. Cambridge University Press 2nd Edition 236 pp.

Streckeisen, A. L. (1976): To each plutonic rock its proper name.- Earth Sci. Rev., 12: 1-34.

Streckeisen, A. L. (1978): Classification and Nomenclature of Volcanic Rocks, Lamprophyres, Carbonitites and Melilitic Rocks.- IUGS Subcommission on the Systematics of Igneous Rocks. N. Jb. Miner. Abh., 141: 1-14.

Voges, A. et al. (1993): Geologische Karte der Bundesrepublik Deutschland. *(Map and GIS),* BGR (Hannover).

Suggested links:

The just started OneGeology project that will globally make available cross-boundary geological information at a 1 : 1 Million scale: www.\\onegeology.org

The Geological Survey of the Netherlands and Alterra, the Soil institute of the Netherlands, Integrated soil and geology information model:
http://dinolks04.nitg.tno.nl/dinoLks/lookAndFeelIMBOD/index.html
http://dinolks01.nitg.tno.nl/dinoLks/about/dataTypes/dataTypes.jsp

The Norwegian feature catalogue including a UML application schema for different types of geology, based upon Norwegian user requirements (as soon as links are available)
(links did not work as accessed 2007-11-19):
http://www.statkart.no/sosi/UMLfullmodell/GeologiGenerellDel.htm,
http://www.statkart.no/sosi/UMLfullmodell/Losmasse/Losmasse.htm,
http://www.statkart.no/sosi/UMLfullmodell/Rastoff/Rastoff.htm,
http://www.statkart.no/sosi/UMLfullmodell/Gfys/Gfys.htm,
http://www.statkart.no/sosi/UMLfullmodell/Gkjem/Gkjem.htm,
http://www.statkart.no/sosi/UMLfullmodell/Grotter/Grotter.htm
The models are in the process of being translated to English and will be available autumn 2007)

Shell Standard Legend
http://www.energistics.org/images/posc/esrc/Geology/esrc_geology_lithology_shell95.pdf

Shell GeophysicalML
http://www.energistics.org/posc/Geophysical__Reservoir_Standards.asp?SnID=1369808806

Projects executed by the European geological community that strive for cross-border access to and application of geological data
http://www.eEarth.eu
http://www.eWater.eu,
http://www.geomind.eu

http://www.posc.org/rescue/#FtPrnt

WITSML Version 1.3.1
WITSML (Geology) wellLog http://www.witsml.org/

From the reference material submitted by SDICs and LMOs, the following may be relevant to this theme:

Norwegian feature catalogue and standards

Geological knowledge and digital geologic mapping: hints derived from CARG activity (reference document submitted by MAGGIS)

Ministery of the Flemish Community - Natural Resources and Energy Devision, Water Devision, Geotechnics Devision: A view to subsoil of Flanders - http://dov.vlaanderen.be

UKHO/Ordnance Survey/ British Geological Survey: ICZMap - Data Research Project