CROSS-BORDER MAPPING – EXPERIENCES WITH GEODATA AND GEONAMES

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ABSTRACT

Due to the current EU development, the need of geospatial analyses in border and cross-border regions is growing. Availability and usability of the heterogeneous geodata have a substantial impact on success and efficiency of cross-border mapping. Moreover, language barriers can occur and cause multilingual maps. Decisions about the usage of toponyms are inevitable. Communication about experiences and knowledge related to cross-border mapping can help to meet the future challenges. This paper is an attempt to structure the field and open the communication between cartographers which are engaged in cross-border mapping.

1. INTRODUCTION

Scientists of the Leibniz Institute of Ecological and Regional Development Dresden (IOER) have researched on a number of cross-border projects during the past twelve years. The projects referred mostly to the German-Polish and German-Czech border and focused on transboundary urban or regional development, planning of infrastructure and nature protection [1, 2, 3]. The involved IOER cartographers primarily intended to support the research by supplying appropriate maps. Soon they had to discover their own field of cross-border issues: heterogeneous geodata, multilingual maps and endonymic geographical names often demanded more than the respective individual professional skills.
Advancing cooperation within an expanding European Union will increase the number of cross-border projects and cross-border mapping (Fig. 1). To meet the upcoming challenges for transboundary mapping properly, it seems useful to outline the issues, obstacles and advantages, and also to point out which developments have to be watched closely.

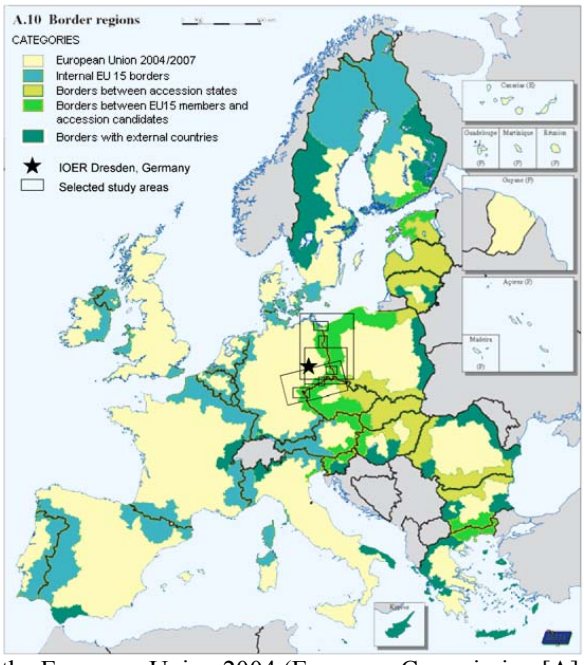

Figure 1: Border regions in the European Union 2004 (European Commission [A], adapted by Witschas 2005)

ISBN: 0-958-46093-0 Produced by Global Congresos

Exploiting the experiences of IOER projects and studying reports on similar projects [e. g. 4, 5], the following chapters will sketch problems and developments concerning geodata availability and usability (see 2), requirements related to endonymic geographical names (see 3) and multilingual maps generally (see 4). Resulting from this, some specifics of cross-border maps are tried to be characterised (see 5). Finally, tasks for present and future are specified (see 6).

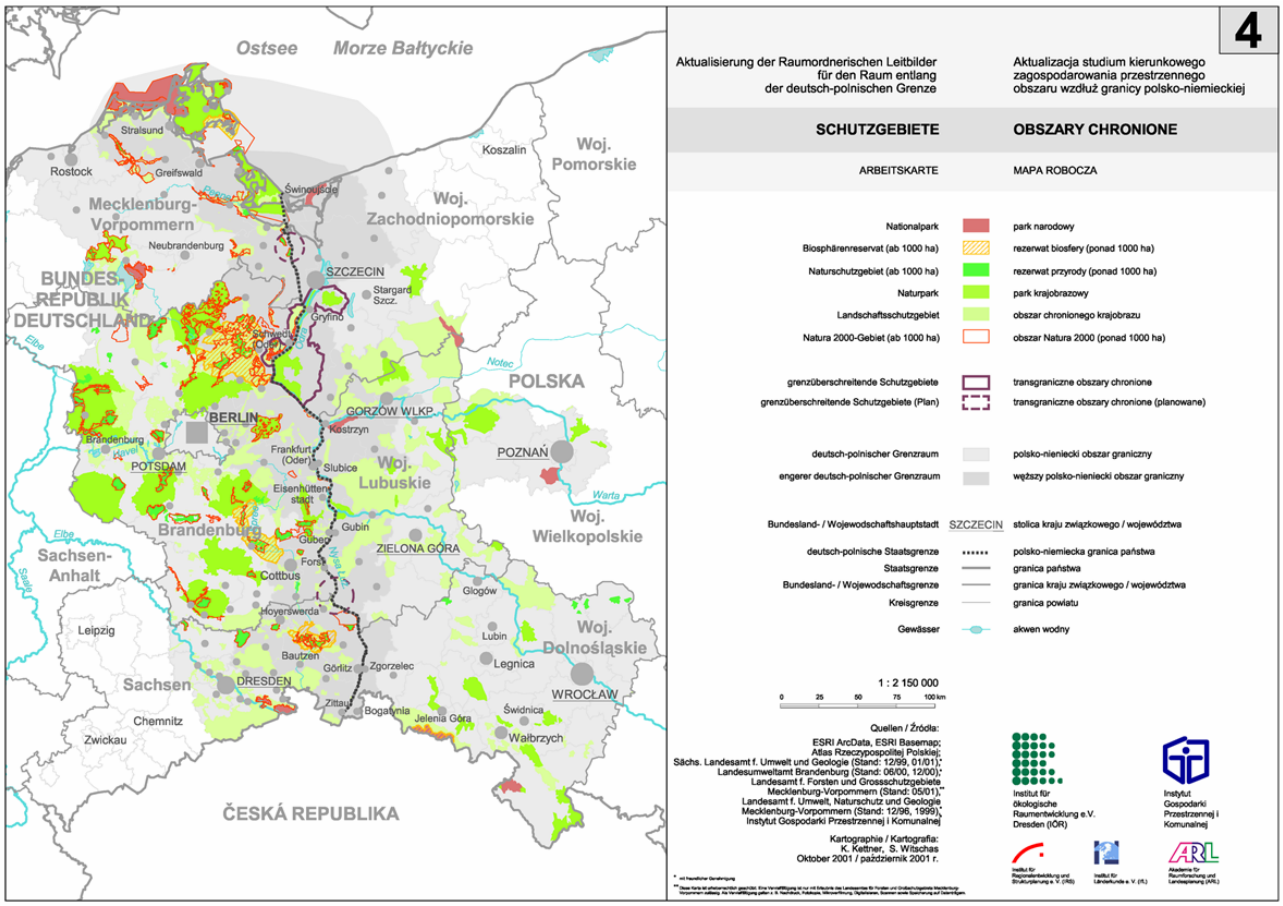

Figure 2: Sample of a cross-border map of the German-Polish border area (IOER 2002 [B])

2. GEODATA

Geodata build the base of any geospatial analysis. First task is obligatorily to find the proper sources. The scale and the scope of the respective cross-border project may demand the combination of national and regional geodata. The topics of the investigation may require not only basic spatial data, but also further statistical data or special thematic information. All this information is raised by different institutions and varying techniques according to diverse criteria. Thus, the usual geodata pattern of a cross-border map resembles a patchwork (Fig. 3). The application of supranational datasets supplied by European or even global data providers e. g. ESRI or EuroGeographics opens an alternative. Their products contain homogeneous data sets. Users have to consider the drawbacks related to cost, up-to-dateness or lacking medium/large scale accuracy.

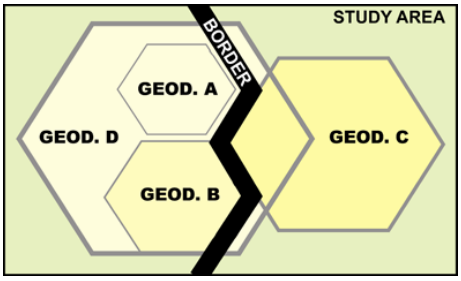

Figure 3: Potential geodata pattern in a cross-border study area (Witschas 2004)

Nowadays the search for relevant spatial information is usually web-based. More and more geo-portals wait for inquiries (but at the moment synchronously for substantial information to be filled with). Standard search engines can also help to locate geo-information or its supplier. For data search beyond the border, knowledge of languages is indispensable in order to enter the correctly translated search terms (e. g. polish "mieszkancy" in place of English "inhabitants") and subsequently to understand the delivered information and possible copyright notices. The development of search engines with spatial awareness [6] which understand and even translate spatial terms will ease the geodata search in the near future substantially (SPIRIT – Spatially Aware Information Retrieval on the Internet [7], Semantic Web[8]).

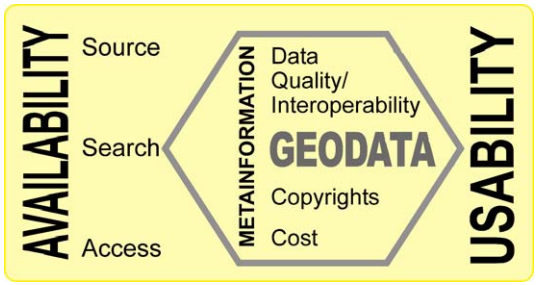

Figure 3: The value of geodata depends on the availability and the usability (Witschas 2004)

Geodata availability also depends on the opportunities to obtain them. Map makers which frequently work to deadline certainly prefer quick access. The time-consuming procedure to distribute geodata on CD-ROM is going to be replaced by online offers to immediate geodata download. The endeavours of the Open Geospatial Consortium (OGC) will enhance these opportunities. The Open Geodata Interoperability Specification (OGIS) will then allow users to browse distributed spatial data sets and to identify, evaluate and utilize them [9].
The need for accessible spatial data sets in Europe raised various initiatives on European and national level (e. g. INSPIRE, GDI-DE). However, the establishment of National Spatial Data Infrastructures (NSDI) perspectively building a European Spatial Data Infrastructure (ESDI) has to overcome numerous organisational, technical and judicial obstacles [10].
Especially in cross-border analyses, geodata usability depends on the comparability as one part of geodata interoperability [11]. The scrutiny of data quality is essential. There are global efforts to define and standardise geodata quality parameters such as spatial, temporal and thematic accuracy, resolution, consistency and completeness. The intentions still fail to consider the specific aim to use the data [12].
The practise of cross-border mapping in the present is confronted with the actual situation of inhomogeneous distributed geodata. Facing this problem, cross-border mapping has to include the necessary harmonisation measures affecting technical, geodetic and semantic aspects of geodata. Geoinformation systems provide appropriate tools. Interfaces allow the transfer of varying file formats. Specific GIS tools support the geo-rectification, transformation and re-projection of both raster and vector data for a synoptical visualisation [13]. Attribute data can be harmonised to some degree by means of various logical and mathematical operations.
Crucial to all these data harmonisation procedures is knowledge of the metainformation about the specific geodata. Without this information describing the data specifics, it is difficult or indeed impossible to evaluate the data quality, to assess the suitability for the intended purpose and to accomplish the required harmonisation measures. Standards for metainformation are in preparation. The INSPIRE initiative "Infrastructure for Spatial Information in Europe" is going to develop a legal norm for European and national data infrastructures.
Geodata usability can be constrained by cost and copyright restrictions. Although recent studies have proven the feasibility of low-cost or even no-cost geodata supply, e. g. [14], free geodata is the exception rather than the rule. Unfortunately, some providers attach copyright restrictions to their geodata, forcing geodata users to invest time and effort to gain and pay for "licenses for use" and "licenses to publish". Accounting the potential number of data layers integrated in one cross-border analysis, this practise is greatly hampering cartographic works.

3. GEOGRAPHICAL NAMES

Spatial entities can have different names in different language areas. The local name within the lingual area is termed endonym, names in other languages are exonyms.
International boards of experts deal with the problems of geonames' standardisation. The United Nations Group of Experts on Geographical Names (UNGEGN) is run by specialists from the fields of linguistics, cartography and history. The UNGEGN requests national gazetteers (alphabetical lists of names, with coordinates and other data) to promote the use of nationally standardised names on maps and in written documents [15]. They are also engaged in other measures,

such as providing training courses. The "Ständiger Ausschuss für geographische Namen" (StAGN - Permanent Committee on Geographical Names) works in the German linguistic area and offers, among other things, toponymic guidelines via the internet. The printed and electronically distributed publications of these bodies recommend the preferred use of endonyms (widely used exonyms can be provided additionally).

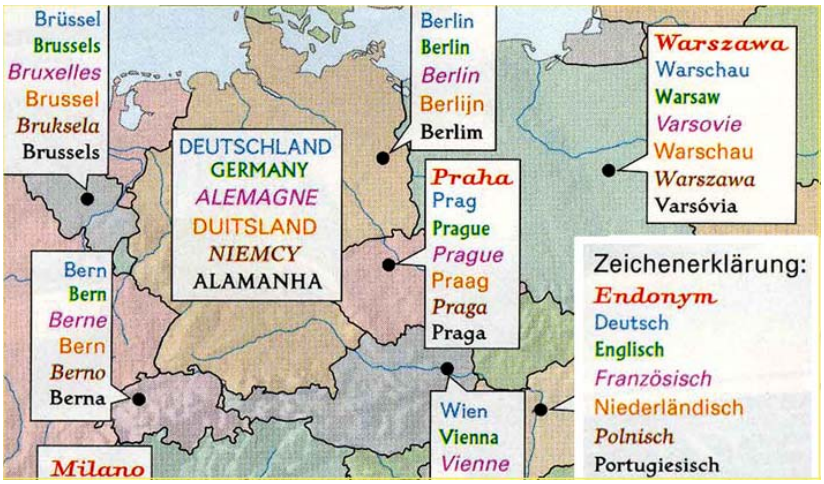

Figure 4: Central Europe Babylon (National Geographic [C] 2002)

IOER cross-border maps regularly follow these recommendations. As an exception, the maps occasionally present English geographical names. This corresponds with the conventions of international cooperation projects communicating in English, producing reports and maps in English. Anglonyms for important geoobjects (countries, capitals) are widely known, for less important objects (rivers, mountains, smaller cities) the supplement of endonyms is necessary and may burden the map content. Advantageously for the map makers, English geonames do not contain diacritics (see below).

The correct usage of endonyms requires authoritative sources such as the official topographic maps and as their basic, the national gazetteers. Access via internet and spatially determined inquiries to the name bases can improve the usability of these collections. Reasonably, name bases become a part of the National Spatial Data Infrastructures. The project "EuroGeoNames" prepares access to the NSDI's by means of a multilingual web service for the near future. By now there are web sites providing valuable multilingual geonames' collections, e. g. [16].

Writing endonymic geonames leads to problems of diacritics and characters which are not contained in the Latin alphabet. Appropriate and complete type fonts are necessary to display all letters correctly. UNICODE, symbol tables or specific keyboard settings offer technical solutions. Unfortunately, most procedures are neither very convenient nor well-engineered. Instructions or tutorials explaining the interdependencies between system software, application software and printer typesets etc., are sorely needed to guarantee successful integration of diacritics and special characters in maps and other documents.

Aid for the correct pronunciation of endonyms and their diacritics provide audio files as a part of online name gazetteers. The usage of endonyms, including correct spelling and pronunciation is a general problem affecting not just cartographers. In fact, it presents a linguistic challenge to all of society.

5. MULTILINGUAL MAPS

Borders often separate lingual areas. Languages influence the mapping workflow: they determine the textual information within or about geodata sets and can hamper the search, preparation and analysis of the spatial data. Languages raise different forms of geographical names calling for adequate handling in maps. Moreover, multilinguality reflects in the map texts such as title, legend and imprint. Most cross-border maps are multilingual maps and offer information translated into the relevant languages (see fig. 2). Alternatively to the use of numerous languages, one common known language can serve as a "lingua franca" (today usually English). In any case, all map texts have to be translated correctly by means of qualified dictionaries (printed or online versions) as well as experts or professional translators. Cartographers have to consider time and possible cost for this procedure. Moreover, they have to compose suitable layouts for the double or multiple text entries. The implementation of diacritics and non-Latin characters into the map and the publishing process remains a demanding task.

6. CROSS-BORDER MAPS

Cross-border maps show abutting territories. According to the dimensions of the particular cross-border relations, they present smaller border regions or greater interregional or transnational spaces. The borderlines separate different structures, systems and competencies [17]. Most of the information that has to be included in a geospatial cross-border analysis sustains these differences. Diverse harmonisation measures are necessary to produce maps of consistent content.
Cross-border maps have a particular communicative function. The non verbal, graphic map language can transmit information about spatial patterns mainly without the semantic problems of spoken languages. Representing the values of both sides of the border, cross-border maps can strengthen the regional identity of the population. Analysing and visualising the present and potential future states of the landscape and relevant spatial topics can provide substantial impacts to cross-border research and planning.
Cross-border maps can act as indicators for successful transboundary coordination, too. The visualisation of the cross-border issues reveals the grade of professional cooperation and data harmonisation. Contrary, the lack of appropriate cross-border maps and geodata respectively may be one prime reason for missing or low level transboundary cooperation [18].

7. CONCLUSIONS AND FUTURE TASKS

The core of cross-border mapping is set up by geodata and geonames; both fundamentally determined by heterogeneity what includes language barriers or lingual specifics. All steps of the mapping workflow (data search and access, data preparation, analysis and visualisation, publishing and storage) might be influenced by the specifics of a cross-border situation. Cartographers involved in cross-border mapping have to be aware of the consequential problems and need to find appropriate solutions to

- detect proper sources for both geodata and geonames despite of administrative, disciplinary and lingual borders
- manage access and integrate the information into one map view
- assess the quality and indicate inhomogeneity (best by requesting and studying the relevant metainformation)
- apply measures for harmonisation of geodetic and semantic geodata characteristics
- promote the usage of endonymic geographical names
- ensure the correct presentation of diacritics and non-Latin characters
- compose map layout and legend design according to the bi- or multilingual text entries
- assure the translations of the map texts.

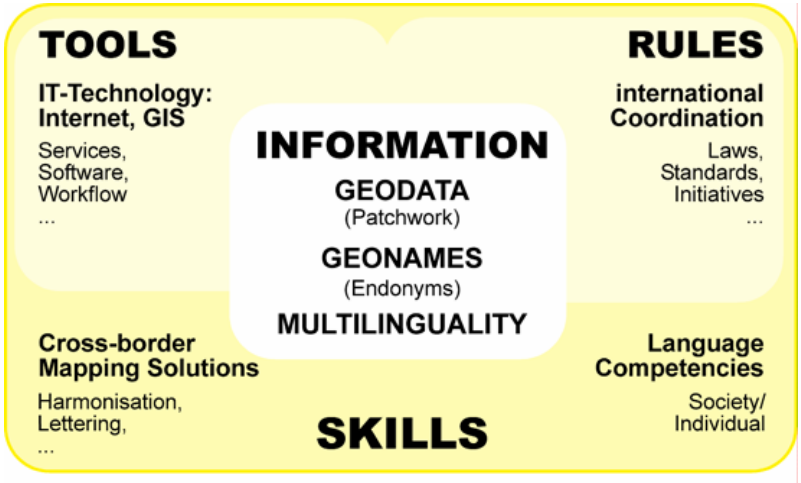

Figure 5: Aspects determining success and efficiency of cross-border mapping (Witschas 2005)

This requires more than the basic professional skills of a cartographer (fig 5). Cross-border mapping demand knowledge about the specifics of the included information (geodata, geographical names), the validity of relevant supranational and national rules (standards, laws) and the application of the appropriate tools (IT technology, GIS features) [19].
The recent heterogeneity of spatial information provokes a number of harmonisation measures on project level. On the other hand, the general awareness of the problem led to diverse endeavours to enhance geodata interoperability on international or national level. Standards and recommendations, rules and laws resulting of such coordination determine the availability and usability of geodata (e. g. OGC, ISO, CEN, Freedom of Information laws), but also the usage of geonames (e. g. UNGEGN, StAGN). IT technologies and geoinformation software facilitate cross-border mapping, both

in speed of production and quality. Especially the developments with regard to GIS standards and interoperability (such as OGIS) demand attention.

To meet the upcoming challenges for transboundary mapping properly (see fig. 1), the involved cartographers have to solve different tasks.
Facing the complex reality of one running cross-border project, they have to find a practical solution corresponding to the particular external situation (state of information and technology) and internal conditions (personnel, time, cost…). This framework of settings influences feasibility and efficiency of the mapping process. However, the approved workflow of one cross-border project is not necessarily to be repeated in another project. The diversity and dynamics of geodata offers, software updates and the common technology development may require a number of new procedures. Advances of transboundary coordination such as the new state of initiatives, standards and laws have to be considered, too. Thus, cartographers have to watch the developments of all relevant fields. Since cross-border mapping can be seen as pioneer work relating to multilingual geoinformation interoperability, the involved cartographers ought to contribute actively in the respective transnational coordination processes.

The operating with information originating from different lingual areas and the creating of multilingual maps presupposes language skills. Moreover, language is a fundamental issue for cross-border coordination in general. The importance of language skills and the correct usage, spelling and pronunciation of endonymic geonames becomes ever more acute in an increasingly interdependent European and world community. Cartographers can support this process. Technical solutions have to be considered.

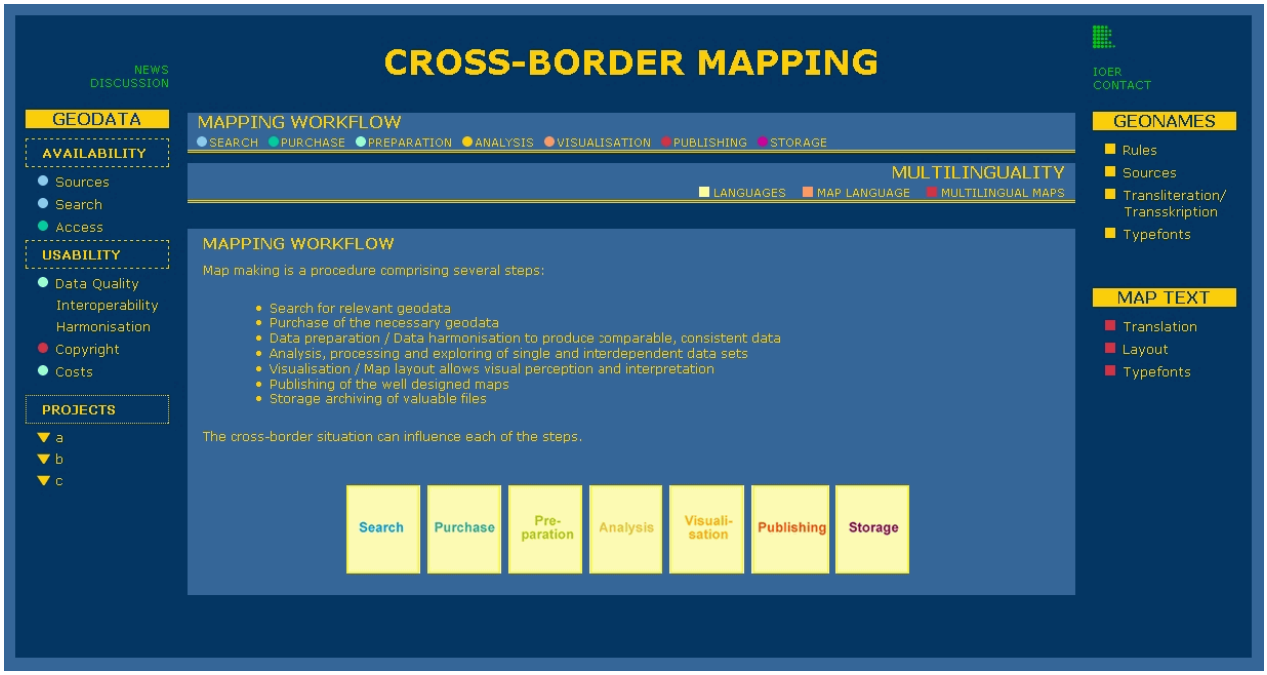

Figure 6: Cross-border Mapping website – basics, hints and useful links (Witschas, Kochan [D] 2005)

Taking advantage of the respective IOER experiences a website “Cross-border Mapping” is conceived. The intention is to structure the field, to offer basic knowledge relating to the single topics and to give helpful instructions and hints. Links to websites of relevant providers, organisations and initiatives aim to grant access to state-of-the-art information. With regard to the complexity the field and the dynamic developments, experts and involved professionals are welcome to contribute or to discuss. The consolidation of different perspectives, approaches and solutions could be one opportunity to improve the efficiency of practical cross-border mapping and strengthen a field of cartography with a promising future.

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Abbreviations/Organisations:

CEN: Comité Européen de Normalisation www.cenorm.be/cenorm/index.htm
ESRI: Environmental Systems Research Institute http://www.esri.com/about_esri.html
EuroGeographics (EuroGlobalMaps, EuroGeoNames): www.eurogeographics.org
OGC: Open Geospatial Consortium, Inc.: www.opengeospatial.org
GDI-DE: Geospatial Data Infrastructure Germany, IMAGI (GDI-DE, GeoMIS.Bund, GeoPortal.Bund) www.imagi.de
INSPIRE: Infrastructure for Spatial Information in Europe: www.ec-gis.org/inspire/
ISO: International Organization for Standardization, ISO 19113 Geographic information - Quality principles (2002), ISO 19115 Geographic information - Metadata (2003) www.iso.org/iso/en/CatalogueListPage.CatalogueList
UNGEGN: United Nations Group of Experts on Geographical Names: Links to Web Sites Relevant to Geographical Names Standardization unstats.un.org/unsd/geoinfo/Websites-links.htm
StAGN: Ständiger Ausschuss für geographische Namen: www.ifag.de/kartographie/Stagn/stagn.htm, www.bkg.bund.de/ un-conference2002/stagn_e.htm

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Biography

Sabine Witschas is cartographer at the Institute of Ecological and Regional Development (IOER) in Dresden. She is a graduate engineer of cartography (Technical University Dresden 1986), gathered vocational experiences in Leipzig (Germany) and Amsterdam (Netherlands), and is now working on thematic and cross-border mapping.