How to promote cross-border mapping

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Abstract

Networking environmental information implies the sharing of the relevant spatial information. The border-crossing nature of most environmental phenomena necessitates research into transboundary topics, while also the processes of European integration demand efficient geodata analyses and high-quality cross-border mapping. Wider awareness is therefore required in this field. Recommendations are to outline structure, issues and obstacles, to extract criteria for success, and finally, to provide more aid for active cross-border mappers, probably by means of a web portal.

1. Cross-border Mapping Relevance

Spatial environmental phenomena continue to ignore political boundaries at the same time as economic and social interdependencies between countries are increasing. Investigations of such events require information from all affected countries.

The mere intention to analyse geodata usually initiates a sequence of work steps. The search for appropriate information, its acquirement and preparation are preconditions for geodata processing. Visualisation, designing and publishing of maps complete the workflow. The archiving of the relevant files and documents should also be considered.

The workflow of spatial analyses in transboundary areas is even more complicated. Administrative borders divide (and connect) territories of different systems, structures and laws (AGEG 2004). Thus, the information which has to be used and explored is heterogeneous. This relates to inhomogeneous geodata qualities, to different forms of geographical names (geonames) and to language barriers in general.

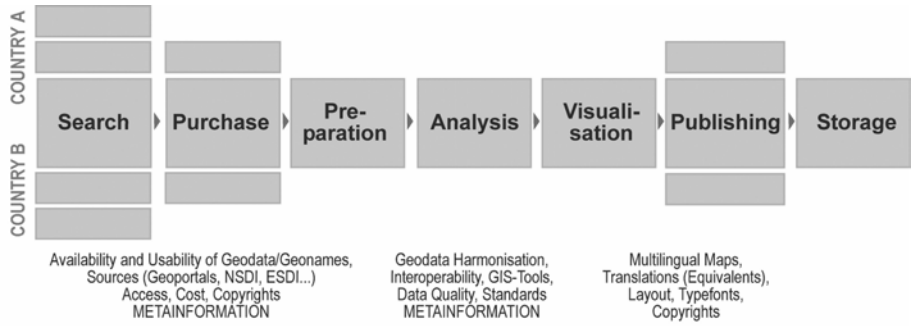

Figure 1
Possible Cross-border Mapping Workflow
Source: Witschas 2005

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These specifics of the cross-border situation can influence every step of the map-making process. Thus, "cross-border mapping" can be conceived as the field of cartography which comprises all workflow steps with regard to the transboundary and multilingual situation (Fig 1).

Supported by recent EU policy to encourage transboundary cooperation and to strengthen previously deprived border regions, cross-border projects are advancing both in number and range. The demand for high-quality and efficient cross-border mapping is expected to rise similarly.

In fact, the recent developments in processing tools and the improved supply of geoinformation have eased the entry to the field of geodata analysis for professionals of almost all disciplines. Cartographers as experts in this discipline have to continue to apply their specific skills and knowledge. At this time they can help to define the preconditions for successful cross-border mapping.

1.1 IOER contribution

Scientists at the Leibniz Institute of Ecological and Regional Development, Dresden Germany (IOER), conduct interdisciplinary research on requirements, concepts and strategies for environmental-oriented spatial development. Over the past 13 years, a significant number of IOER spatial research projects have examined border areas of Central and Eastern European states (Leibenath 2005, Leibenath/Deppisch 2005). While the IOER cartographers primarily intended to support research by supplying appropriate maps, they soon discovered their own field of cross-border issues, comprising heterogeneous geodata, multilingual maps and endonymic geographical names (Fig 2). The knowledge of IOER stuff concerning these topics were deepened by studying relevant literature (Afflerbach 2004, Großer/Droth 1996), and condensed into some fundamental principles of cross-border mapping (Witschas 2004, 2005). The following chapters can only sketch the basic problems and advantages.

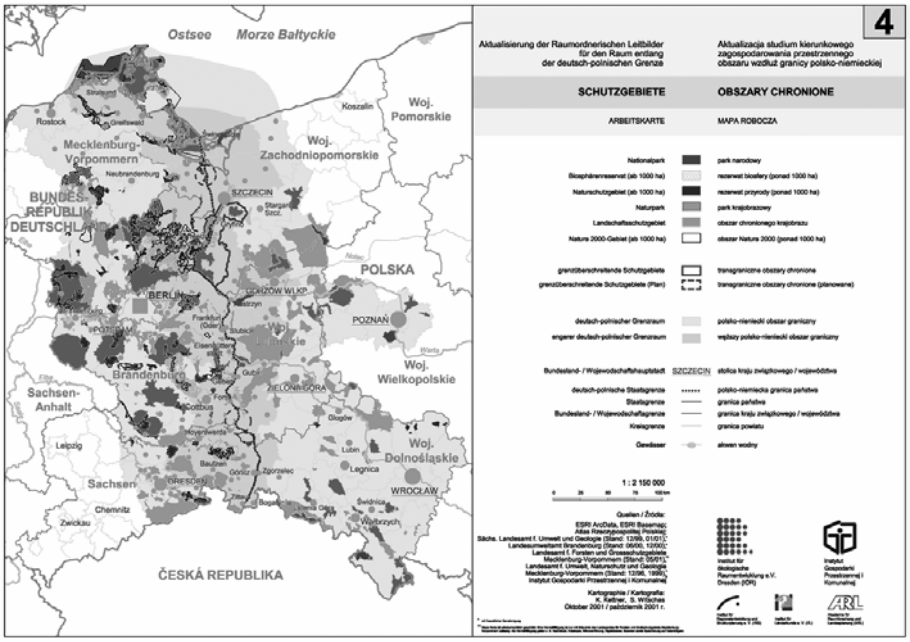

Figure 2
Cross-border Mapping concerns Geodata, Geonames and Multilingual Map Texts
Source: IOER Kettner, Witschas 2002

2. Cross-border Mapping Issues

2.1 Geodata

Geodata forms the base of geospatial analyses. Contrary to an apparent surfeit of spatially-related data, analyses in a specific area often face problems in the availability and the usability of the necessary geodata (Fig 3). The scale and scope of a cross-border project may demand a combination of national and regional geodata. The topics under 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 using various techniques and according to diverse criteria. Thus, the usual geodata pattern of a cross-border map resembles a patchwork of heterogeneous spatial information (Fig 4).

The application of supranational datasets supplied by European or global data providers, e. g. ESRI or EuroGeographics offers one alternative. Their products contain homogeneous datasets. Users have to consider the drawback of cost, grade of up-to-dateness or lacking medium/large scale accuracy. The need for accessible spatial geodata has led to further initiatives on European and national level such as INSPIRE. However, the establishment of National Spatial Data Infrastructures (NSDI) with the perspective of building a European Spatial Data Infrastructure (ESDI) has first to overcome a number of organisational, technical and legal obstacles (Luzet 2003).

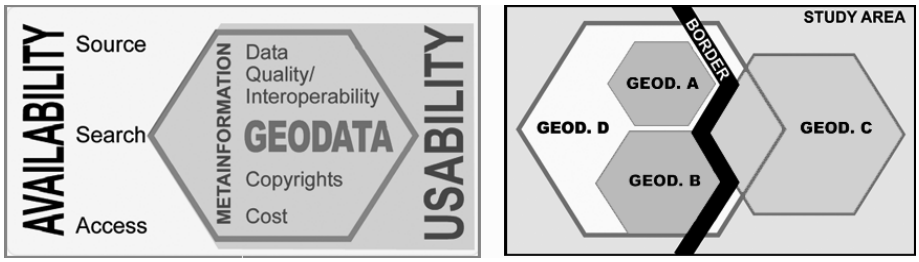

Figure 3 and 4
Availability and Usability of Geodata / Cross-border Geodata Patchwork
Source: Witschas 2004

The internet is of course the most useful contemporary medium when searching for specific geodata or its provider, with tools ranging from standard search engines to geoportals. At present it is crucial to find and translate a semantically accurate search key (e.g. “population” or “inhabitants”? with the Czech translation “obyvatelé”). The elaboration of geographical ontologies, semantic web (W3C 2001) and search engines with a spatial awareness (Sester/Heinzle 2004) which understand and translate spatial terms (aim of the European funded Project SPIRIT) will ease the search for the success in the near future.

Geodata availability also depends on the opportunities to obtain them. Map makers which frequently work to deadline certainly appreciate quick access. The time-consuming procedure of distributing geodata on CD-ROM is going to be replaced by immediate geodata downloads from online providers. The endeavours of the Open Geospatial Consortium (OGC) will enhance these opportunities. The Open Geodata Interoperability Specification (OGIS) will allow users to not only browse distributed spatial data sets, but also to identify, evaluate and utilize them (Gardels 1996)].

Geodata usability primarily depends on the data quality, with important criteria being spatial, temporal and thematic accuracy, resolution, consistency and completeness. The quality of geodata is actually difficult to describe owing to the dependency on the specific purpose (Caprioli, Tarantino 2003). Geodata usability, particularly in cross-border analyses, presupposes comparability as one factor of geodata interop-

erability (Woodsford 2003). Distributed competencies of data capture, different techniques and wide variations in criteria cause data to be heterogeneous. Cross-border mappers have to scrutinise the data quality and apply suitable harmonisation methods to the technical, geodetic and semantic aspects of geodata. Geoinformation systems offer appropriate tools to handle different file formats, to transform projections (Flacke/Kraus 2004) and even to help tune attribute data. Knowledge of the data characteristics offered by the specific metainformation is indispensable. Standards for metainformation are in preparation (e.g. ISO 19115) which will be integrated into the INSPIRE initiative. This initiative is going to develop a legal norm for European and national data infrastructures. Practical experience has shown the variety in metadata forms and furthermore the need for language skills to understand foreign metainformation.

Geodata usability can be constrained by both cost and copyright restrictions, the latter forcing geodata users to invest time and effort in acquiring and paying for "licenses for use" and "licenses to publish". In view of the potential number of data layers integrated in one cross-border analysis, this practise is greatly hampering cartographic work. Freedom of information laws and other initiatives (e.g. Fornefeld et al 2003) are required to ease or remove these restrictions.

2.2 Geonames

While geodata certainly stands at the heart of the information workflow, the issue of geonames should not be ignored. In fact they are of the utmost importance for both orientation and communication with maps.

As a result of lingual heterogeneity, many geographical objects have different names. The local name for an object inside the language area is called endonym. Outside this language area the same object may have other names according to the spoken language there. These other names are called exonyms (Fig 5).

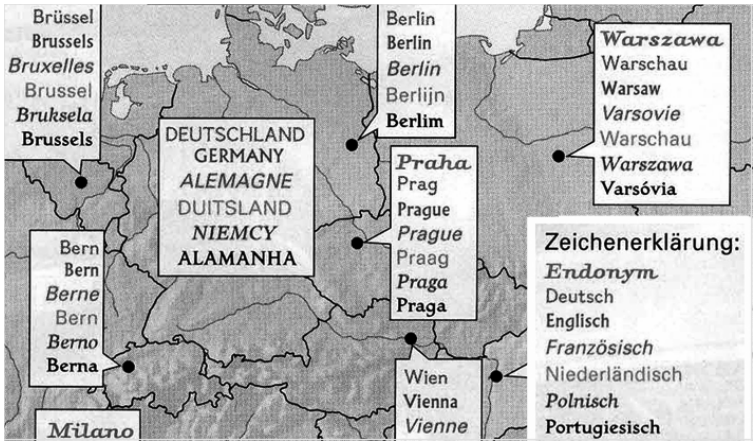

Figure 5
Babylon in Europe
Source: National Geographic 2002, adapted by Witschas

International boards dealing with the problems of geonames' standardisation, such as UNGEGN, generally recommend the use of the endonymic form. This approach causes some problems for both publishers and users. Different languages use different scripts and pronunciation rules, may require transliteration or transcription procedures (Kadmon 2001). Map makers have to find sources for the exact endonymic geonames and ensure the correct appearance of the special characters in both printed and electronically displayed maps.

The use of endonyms is an issue facing society at large. Appropriate cross-border maps can contribute to this.

2.3 Multilinguality

Language barriers are most obvious when crossing borders and can hamper cross-border cooperation in general. Languages determine the textual information "within or about" geodata what includes metainformation and different forms of geographical names. Multilinguality as the existence of a plurality of languages in a defined area, influences the geodata workflow and the mapmaking process as previously described. The main issues are human language skills of comprehension, correct spelling (including transliteration/ transcription included) and pronunciation as well as technical opportunities concerning the integration of special characters into the electronic document workflow.

For the sake of communication most cross-border maps are multilingual maps. They contain translated map texts such as title, legend and imprint. English, as today's "lingua franca", occasionally replaces these polyglot texts. That basically avoids the trouble with the special characters, but it doesn't prevent from translation effort as a part of map making and the map using process. Qualified online or printed dictionaries, experts or professional translators can give assistance. The EU project CEGIS-MDB established an online "Data Elements Dictionary" intended to help spatial planners. Technical terms as used in the legends often require equivalents in place of translations and this calls for a degree of expertise.

The legend usually models the assumed structure of the mapped topic by means of (typo-)graphics. Moreover, bi- or multilingual legends have to reveal the consistency and comparability of the explored geodata for all countries. The map design has to correspond to the multiple text entries. Several types of legend layouts are possible.

Map language in a cartographic sense is the non-verbal, graphic language to transmit information about spatial patterns. It essentially overcomes the semantic difficulties of spoken languages. It is important to distinguish this term from the map language as the spoken language(s) used in the map (e.g. Czech, English). However, the communicative function of maps finally depends on the sophisticated utilisation of all applied languages.

3. Cross-border Mapping Requirements

Reviewing the IOER experiences and examination of similar project reports and related literature it is possible to point out some decisive factors for success for cross-border mapping can be derived (Fig 6).

Geodata and geonames form the core of cross-border mapping. Both are fundamentally determined by heterogeneity what includes language barriers. The handling of this input information requires particular geo-professional skills, knowledge of relevant laws and conventions, and competencies when applying the appropriate tools and techniques.

Communication technologies and geoinformation software provide the technical basis ("tools") of cross-border mapping. They maintain each step of the workflow: online search for geodata, purchasing, data preparation and harmonisation, analysis, map layout and distribution. Technical developments and up-dates must be continually adopted and training measures implemented.

Improvements in data availability and accessibility depend on technical opportunities such as the internet provides, but also on organisational conditions such as horizontal and vertical co-ordination of Europe's geodata providers and initiatives such as OGC, INSPIRE, CEGIS etc ("rules"). Various standardisation efforts aim to improve interoperability of geodata. Legal regulations related to the Freedom of Information can ease the existing copyright restrictions and enhance geodata usability.

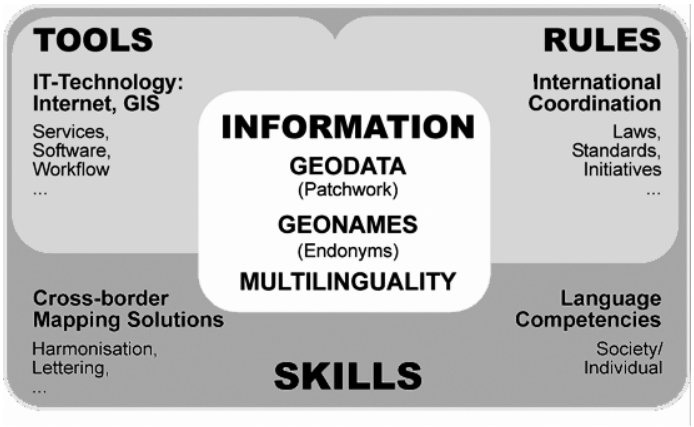

Figure 6
Impacts on Success and Efficiency of Cross-border Mapping
Source: Witschas 2005

Language is an important issue for cross-border coordination in general and cross-border mapping in particular. The necessity of better language skills and the correct usage, spelling and pronunciation of endonymic geonames become ever more acute in an increasingly interdependent European and world community. Appropriate multilingual maps can support this process. The corresponding technical questions, e.g. the integration of suitable type fonts, must be solved as a precondition for success.

Cross-border mappers create mapping workflows and visualisation solutions according to the intended purpose. The general concepts and the detailed solutions of cross-border mapping should be shared to a wider public even beyond the "borders" of their professional community.

The primary focus of cross-border mappers is always on their current project. They have to find a practical, feasible and efficient solution within the particular framework settings of project deadline, cost and available staff. However, the approved workflow of one cross-border project is not necessarily the same for the next. The diversity and dynamics of geodata supply, software updates and common technological developments may require a number of new procedures. Advances in transboundary coordination such as new initiatives, standards and laws have also to be considered. Cartographers must therefore monitor developments in all relevant fields. Since cross-border mapping can be seen as pioneer work relating to multilingual geoinformation interoperability, cartographers involved in this area ought to contribute actively in the respective transnational coordination processes.

4. Cross-border Mapping Promotion

In view of the current and future challenges to quick and high-quality cross-border mapping, it seems wise to disseminate skills and knowledge, to share experiences and support advances in this field. A web portal is perhaps the most efficient medium to connect the people involved and provide a platform to publish insights.

Taking advantage of the IOER`s experience, a website titled "Cross-border Mapping" has been conceived. The intention is to structure the field, to offer both basic and detailed knowledge in individual topics and to give helpful instructions and hints. Links to websites of relevant providers, organisations and initiatives

will facilitate access to state-of-the-art information. Moreover the site has the potential to serve as a forum for all professionals interested in this topic.

Experts and professionals are welcome to contribute or to discuss this complex field and comment on dynamic developments. The consolidation of different perspectives, approaches and solutions should provide an opportunity to improve the efficiency of practical cross-border mapping and strengthen this complex area in cartography.

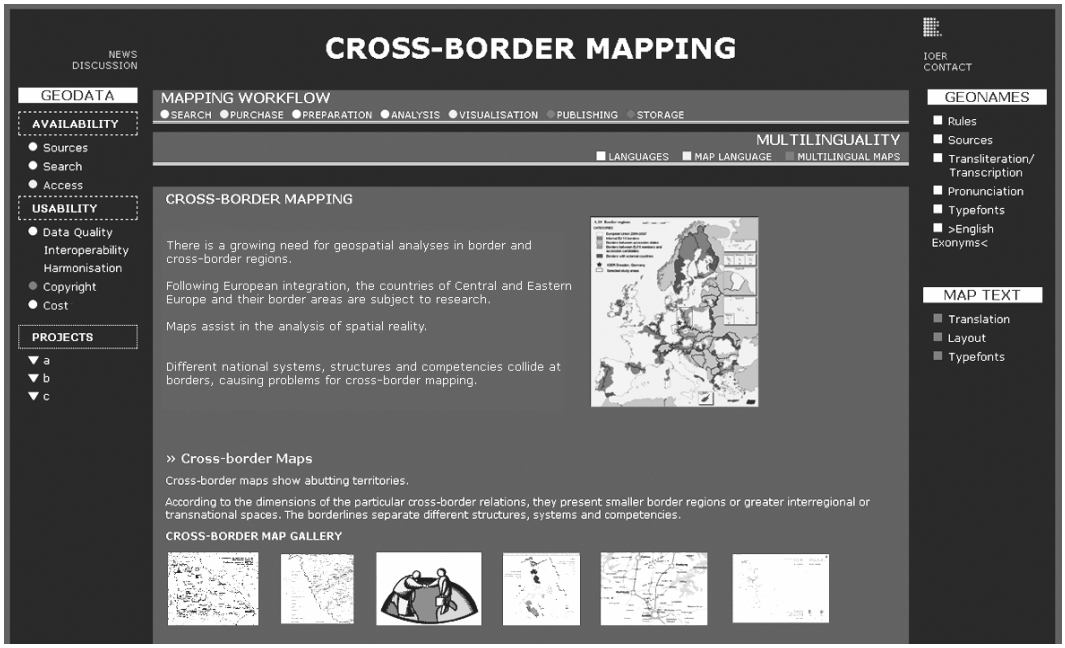

Figure 7
Preview of the IOER Web Portal CROSS-BORDER MAPPING
Source: Witschas, Kochan, 2005

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Abbreviations/Organisations:

CEGIS-MDB: Central European Geographical Information System – MetaDataBase Project http://gis.cvut.cz/

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

OGIS: Open Geodata Interoperability Specification

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

SPIRIT: Spatially-Aware Information Retrieval on the Internet www.geo-spirit.org (2005)

UNGEGN: United Nations Group of Experts on Geographical Names: Links to Web Sites Relevant to Geographical Names Standardization http://unstats.un.org/unsd/geoinfo/Websites-links.htm

W3C: Semantic Web 2001. http://www.w3.org/2001/sw/ (2001)