

ICA Statement on SDI and Cartography

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1. Introduction

The reason of this paper is to give ICA points of view about cartography, and SDI. Cartography similarly as other sciences dealing with GI is influenced and at the same time is trying to influence broader processes occurring on our globe.

Our former president, contemporary vice-president of the International Cartographic Association (ICA) Michael Wood in his Opening Speech of the ICC in Ottawa 1999 mentioned that it has been said that humankind has invented three great forms of communication: *language, music and mapping*, but by far **the oldest is mapping**. Technology has been the driving force behind many changes in Cartography. After possibly thousands of years of mapping during which technological influence was low, we reached the middle of the current millennium. Then printing offered a stimulus for change, although the type of map to thrive during the next five centuries was essentially a flat paper copy. But maps were not always so. Many may have been drawn on rocks, in caves, on the sand as well as on cloth-like material. Nevertheless examples of the iconic flat, so-called conventional map were created in their millions and the definition of 'map' became codified. Only in the latter stages of this century, with *the arrival of computers*, have serious **changes** begun to appear in **map products**. They no longer need to be static and on paper. *They are dynamic, virtual, enriched with multimedia and much more interactive than ever before*. However, although modern maps can be described as graphic expressions of essentially digital spatial data, it is the **visualised product** which is, and always has been, the essence of the 'invention' of mapping I mentioned before. And '*Cartography*' describes the field in which these visible products, whether two-dimensional paper graphics, or virtual four-dimensional animated interactive holograms, accessed via the internet, are produced. So do not abandon the term. It works and it can never be replaced by general or more comprehensive terms such as GIS or even Geomatics. Accept that 'cartography', although a relatively new word, can be sufficiently flexible in definition to include all these new dimensions. And thus our subject can continue to advance, instead of being lost in a sea of terminological chaos.

The Ottawa ICC congress was a demonstration of many positive and excellent results created by cartographers from over the World. But also sharp discussions took place. Especially the paper by one of the keynote speaker, Michael Goodchild provoked attendees to discuss many aspects of contemporary cartography. In the center of gravity was a discussion about the role of GIS and Cartography, their links, support and as well as independancy.

Michael Wood in his Closing speech responded: „Mike (Goodchild) highlighted the contemporary challenges to conventional cartography, especially with reference to

the huge expansion of spatial data on the Web, from sites such as Terraserver and MapQuest. In a world where everyone can make maps, who needs cartography?

A common conventional view is that cartography is becoming less relevant. Wood would like to think that ICA 1999 suggests the contrary. Geospatial data issues are vital and ICA should be both aware of and involved in such concerns. He also accepted the concept of structured digital spatial data as providing what is, essentially, the fundamental virtual map which may be used in a variety of ways, from support of navigation systems, to provision of statistical analysis, etc. However we must not forget the fundamentals of cartography, especially its visual character and, as an abstraction, designed to help readers understand the truth (even a DTM model virtual reality fly-through is such an abstraction). Some of our friends more deeply embedded in the world of GIS may not agree but my (Wood) belief is that every visible facility (externalised from such data manipulating systems) which is clearly derived from or linked to the spatial framework (and this includes maps, 3D flythros, 3D interactive, dynamic, virtual reality creations, enhanced with multimedia, etc.,) are essentially cartographic products.

Wood agreed completely with Mike Goodchild that 'maps' are only one form of expression of geographical information. But he believed that maps and the wider range of modern cartographic products in general are by far the most universally appreciated and effective forms of communication.

2. The World we are living in

There are many activities and several very important one to recognize and define processes going on over the globe. Very famous is U.N. Human Development Report (1999), others are connected with information society and global information society (Konecny 1999). The topics as *Sustainable Development* and *Digital Divide*, which are evident also in cartography and GI fields are discussed on the highest political levels (for instance G-8 group, OECD and others).

The ICA as an organisation is looking for these activities especially those connected with sustainable development (SD) which is one of the most important topics of this conference. ICA has not one general ideology and strategy how to solve all problems of humankind but contemporary is very sensitive for all signals, requests and possibilities to be helpful in solving the present-day problems.

The world is coloured and different at every continent and in fact every region or country. I personally believe that initiatives starting in different continents, generalizing knowledge of one region and -not dictating- but offering the best experiences to other regions have chance to be successful and sometimes harmonize development in global scale. In the last years cartography is driven by two main forces . One is very visible-there are technologies. Second is not so fast developing but as important – geographical thinking (Morrison 1995). In connection to SD cartography also has a wider overview for global and regional problems and accept not only technological or ecological aspects, but all aspects of creating SD.

I would like to mention at least one of the activities going on for the last 7 months. It is the so called global society dialogue. This dialogue was approved at the time of

Expo 2000 in Hannover. The participants of the conference “Information Society, Globalisation and Sustainable Development: The promise of a ‘European Way’” accepted a proposal of 16 organisations from different countries and continents. This activity is developed in the Information Society Forum of the European Union (btw this Forum is preparing some of the European statements towards Rio+10 conference).

The central objective of the GSD is **to work on a framework** which can orient a *globalised economy towards sustainable development for the benefit of all.*

The **GSD** deals with **sustainability** in all its **dimensions** in a global perspective, ***environmental, technological, economic, social, cultural and ethical.***

The **GSD** is an important civil society forum with an ongoing commitment to reach for consensus on core values that could eventually be translated into a coherent framework for international governance and trade. Naturally, there is a deep concern with the further development of the WTO and the **post-Kyoto process.**

The **GSD** will also monitor the **Global Business Dialogue (GBDe)** and put it in a context beyond the e-commerce world.

The basic thinking of the Global Society Dialogue is that :

Ethics is the Basis of Frameworks that steer Markets towards ethical / societal concerns.

These Frameworks should address

- Legal / constitutional issues (including the jurisdictional systems, ownership rights, law enforcement, security, etc.)
- regulation for markets and the financial system (including taxes, anti-trust laws, intellectual property rights, ...)
- co-finance mechanisms
- social issues and financing aspects
- cultural issues and financing aspects
- environmental concerns and financing aspects

In times of Global Markets we need Global Frameworks based upon Global Ethics

A solid understanding is emerging on the content what a global ethics is all about from the standpoint of humanism as well as from the standpoint of the world religions.

Basic documents, among others, are:

- UN Earth Charter
- Declarations towards a Global Ethics of the Parliament of the World Religions

Overarching ethical concerns for sustainability are:

- long-term ecological stability
- dignity for **all** humans

Global frameworks today unfortunately do not reflect such a World Ethics. This is one of the reasons, that globalisation today *is not on a sustainable track*.

- The core topics are the agreements needed between North and South, rich and poor, young and old etc. within *global contracts*.
- The approach is *civil society-oriented*, and the background is the information society and its overriding impact on the future – for good or for bad. Major issues here are topics such as the potential for dematerialization and higher resource efficiency, the factor 10 debate and the so-called rebound effect and the problems arising.
- Major issues in *compromise finding* deal with the tension between shareholder value and social solidarity, diversity of cultures and common global values, consumption and care for the environment, short-term orientation and the need for long-term strategies, innovation and tradition, security and freedom.

Basic Views of the Global Society Dialogue are:

- " *Sustainable development* is the crucial challenge for this century. Nature could survive without humans, but humans cannot survive without nature. Therefore we need to care more for the ecosystem.
- " The mega-trends today are *globalisation* and rise of the *knowledge-age*. In that framework the world-wide network-based information society is developing.
- " This leads to opportunities and risks for sustainable development. Information and communication technologies offer many opportunities for more social inclusion, cultural diversity, protection of nature (e. g. by means of *dematerialization*) and economic growth.
- " However, via *rebound effects*, the information technologies might also create new environmental stress, reduce cultural diversity and exclude more people than ever. It is a matter of building political frameworks to prevent that.
- " The decisive factor for the future will be to set *adequate frameworks of global governance*. In this context questions of *co-financing* of world-wide development have to be addressed.
- " These frameworks cannot be set on a national level for reasons of competition, they have to be dealt with *on the global scale*.

" The *Global Society Dialogue* intends to discuss framework issues that make sustainable development possible and ensure adequate living conditions for all humans on Earth.

Amongst others the GSD sees relationships between her work and the Kyoto contract and in particular the CDM mechanism and broader scopes of emission-rights trading per capita, equal share of such rights for all humans.

Also the UN initiatives for a global compact and upcoming global conferences, such as Rio+10 are hot topics just on the table.

The Global Society Dialogue will address co-financing issues on the global scale, regulatory questions for the world financial system, trading of pollution rights for all critical environmental resources, based on equal per capita share of such rights for all people on Earth, issues such as a vision for world citizenship and global interior policy, the topic of a better understanding of the crucial role of equity for sustainability and the European unification process as a benchmark for how to proceed, in a fair information process, towards a sustainable global framework. More information:

<http://www.global-society-dialogue.org>

Plenty of the tasks mentioned above are not cartographical or GI origin. But the potential newly established frameworks could also be supported by spatial data, information and knowledges. Also amongst ICA members we have big differences in the skills to use new technologies, also in the use of GI we have digital divide problems. Cartographers, GI and GIS specialists are starting to talk about ethics of the use of their data and information (Rhind 2000). We as a part of GI community would like to have convenient frameworks, spatial data one which will support also activities in the political, environmental and cultural fields.

What is the position of cartography regarding these complicated processes?

3. Cartography as a science

The latest definition of cartography describes it as a process to compile, organise, visualise and use geographically related information. Rystedt (2000), president of ICA, is giving this overview of some of the trends in cartography:

- Cartographic information and services will be available in systems for planning, decision support and surveillance of environmental changes and management of natural resources.
- Cartographic products will be common in Internet and multimedia products. Especially mobile Internet in combination with the *blue tooth technique* will create an increasingly demand on cartographic products.
- Cartographic functions will be integrated in office information systems for wide use by non-professional cartographers.
- It will be common to use a map as interface in many kinds of systems.

- Cartography will be a tool to create virtual realities in order to simulate different aspects such a traffic behaviour and future environments in planned settlements.
- Cartographic technique will be used in operational systems for navigation and guidance of all kind of vehicles.
- Cartographic technique will be used in automatic control of robots, mainly in construction.
- New sensors will collect high resolution data, that have to be proceed by using cartographic techniques. An example is land mobile laser scanning for mobile mapping.
- Maps in archives will be scanned for public access, which will create a demand for rectification and other kind of processing.

What are the challenges that we are confronted with in cartography in this new Millennium? I believe (see also Ormeling 2001) that the most important is the **paradigm shift**. Though it has been with us for some 30 years, it is only now that every cartographer is confronted with it, because of the impact of the computer. Now cartography is the discipline that aims at allowing people to take the right decisions on the basis of visualised spatial data (decisions how to navigate, how to plan a new extension of a town, etc.). In order to take the optimal decision cartographer not only have *to provide the relevant spatial information* but also *visualise it correctly and provide supporting imagery that informs about the quality of the visualised data for the task at hand*. So from production of maps cartography became communication of spatial information and then changed again into provision of the proper conditions for spatial decision making.

It was a long time dream of cartographers to legitimate that cartographic methods are general scientific methods useful in many disciplines handling, analysing and interpreting GI similarly as mathematical, statistical and other methods. It happened. We have seen a **democratisation** of mapping. Everyone now can produce the maps needed with the help of mapping packages, that combine statistics and boundary files into socio-economic maps. Until the 1990s cartographers were needed to produce these maps. Now, everyone can buy topographic files, and adapt them to their need. Everyone seems to be able to work with geographical information systems and analyse the various data files and their combinations. Are cartographers not necessary anymore? The answer is yes they are, because when it really comes to assessing the accuracy or quality of the data in these files and of the results of the data processing in these GISs, then cartographers are needed again. *Their expertise in collating data from different sources, in map design adapted to the specific map use and analysis tasks* has not yet been incorporated in these computer mapping packages and GIS programmes. Their work has been freed from tedious routine tasks by the computer, and this has allowed them to concentrate more on the data provision and design tasks.

In some way, **cartographers become a kind of spatial information brokers** (Rystedt 2000, Ormeling 2001): they would be able to indicate to would-be users of spatial data what kind of data, with what level of quality would be needed for specific tasks. They would be able to show the way in a spatial data jungle characterised by conflicting trends: decreased **spatial data access** because of digitalisation and price considerations and increased spatial data access because of the information super highway.

The academic cartographers in the past will step into the professional world as *spatial information brokers*. According to Rystedt (2000) brokering of spatial information involves the following activities:

- Setting up and monitoring the process of spatial information creation aimed at communication of the information.
- Identifying and monitoring the user requirements for specific applications.
- Specifying data quality requirement for specific applications and end products.
- Setting the specifications of visualising spatial data/information along the paths of cartographic and semiotics theory.
- Developing new products and services that facilitate access to spatial information both for experts and the general public.
- Mediating between suppliers/producers of spatial data and the user community.
- Bringing technical knowledge of data base, geometry and visualisation tools to the application field.
- Supporting standardisation initiatives at all levels of government and industry.

This is one side of the coin . The other side is, that more and more information is accessible on the information superhighway. We can download satellite images, weather forecasts, or information about traffic jams on line. GIS functionality is offered in many Internet sites, which allows us to analyse spatial data on line. The National Atlas of Canada site is a good example. It is difficult to find one's way through this jungle of conflicting trends, and cartographers in their role of spatial data brokers will have to learn to act as guides.

4. Cartography and SDI

Let me start with a wider overview of the SDI approaches, aspects and realisation. Similarly as mapping sciences and cartography played a key role in the creation of GIS, I am certain they will play a very important role in the implemantation of SDI on the local, regional and global levels.

I have to agree with David Rhind that mapping is important. Irrespective of the form in which it is held, paper or digital-IT underpins many activities of the state and private industry; it facilitates certain types of leisure activities world-wide; and it is central to geographical education and supports the inculcation of good citizenship (Rhind 2000)

As a consequence of increasing demand, the last 10 years there have seen numerous attempts to forge national and multi-national policies in regard to Geographic Information. This is manifested typically in the creation of National Spatial Data Infrastructures which are now claimed to exist in at least 28 countries. The criteria for success are multiple but, at best, the bulk of these have only been partially successful to date. The reasons for this are conjectured to be (Rhind 2001):

- A too overtly technology-driven approach summarised by the phrase 'this technology will change the world'
- A lack of explication of how this fits in with national government priorities and other policies
- Lack of force behind pan-national policies as opposed to focus on national issues
- The amorphous and ubiquitous nature of GI
- The perception that GIS is simply a small sub-set of the Information and Communications Technology industry, rather than 'spatial being special' and requiring special attention
- An undue focus on the public sector drivers, to the relative disregard for the private sector ones
- Global fragmentation in GI policies at a time when GIS technology and education is ever more homogeneous (though education should not be)

Yet, on the other hand, GIS education and training has come to be remarkably similar in many countries. This is astonishing since about 2000 universities run courses on GIS and hundreds of other courses are run by non-academic organisations, such as software vendors. Those taking the courses come from a huge variety of backgrounds – environmentalists, people working in local and central government, utility companies, the military and not-for-profit bodies. There seem to be about 100 different GIS textbooks.

The core of all mapping is that of the topography of the Earth, sometimes called the geographical framework. Until now, almost all all topographic or „framework“ mapping has been conceived, created and maintained up-to-date within a national context.

On the basis of the British approach of updating the national topographic data base continuously, with major features like a new road being guaranteed to be in it within sixth months of construction(!!!) Rhind (2000) is setting up contemporary characteristics of national mapping:

1. perception of national need;
2. the legacy of the history of the mapping in that country;
3. available sources;
4. the technology and skills available; and
5. a few non-national considerations.

Thus, national mapping is highly national and hugely varied in its characteristics. Global mapping is currently little more (and sometimes less) than the sum of the national parts and is not readily available.

One of the first inspirations for global co-operation in cartography came from the Economic and Social Council resolution 131 (VI) of 19 February 1948, entitled "Coordination of cartographic services of specialized agencies and international organizations" published by United Nations on 24 February 1948 (Cartography and Geographic Information Science, 2000). Unfortunately many of good intentions were not realized till today.

The need for globally available mapping to facilitate sustainable development is requested by *Agenda 21* (agreed in Rio de Janeiro 1992 and supported by 175 governments of the world). The eight chapters of the Agenda21 plan dealt with the need to provide geographic information (GI). In particular, Chapter 40 aimed at decreasing the gap in availability, quality, standardization and accessibility of data between nations. This was again confirmed by the Special Session of the United Nations general Assembly of the Implementation of Agenda 21 held in June 1997. The report of this session includes specific mention of the need for global mapping, stressing the importance of public access to information and international cooperation in making it available.

Rhind (2000) is assuming forces fostering globalization in mapping as follows:

- Political and visionary influences (for instance Al Gore Digital Earth vision)
- Trans-national events which do not respect national boundaries yet require real-time monitoring (e.g. Chernobyl crisis of humanitarian Aid which must be ferried across multiple countries with minimum delay)
- Military requirements for offensive or peacekeeping actions anywhere across the world. International harmonisation of content, detail accuracy and even style of mapping seems to be a vital objective of military planners wherever it can be achieved at sensible costs; (NATO Vmap programme and former Soviet equivalent).
- The needs of international Aid organizations for consistent data to access (at the macro level) relative needs of different countries of large areas and, at the meso-scale, of smaller areas within any one country or region). Data consistency helps to minimize costs and to maximize the quality of the analytical procedures.
- Business opportunities ranging from those needing wide area connectivity information (such as car guidance) to wide area „micro-geography“ queries (e.g. location of Automatic Teller Machines (ATMs) and Web enabled services provided by citizens themselves (like sites of private events). Strictly, those in the micro-geography category do not need seamless international mapping but consistency of content and form greatly facilitates the work of the multinational service provider, and

- Competitive advantage gained by commercial organizations and NMOs operating in the international marketplace who reduce costs by being able to work to consistent specifications.

Rhind is also mentioning many obstacles, especially from the point of view of the National Mapping Organisations.

The obstacles to globalization in mapping are these: The priority to work within national context attached by Ministers and taxpayers (where much remains to be done in most countries, even setting aside the need for more frequent up-date). The legacy effects of national mapping. Inter-departmental differences in priorities so far as the government departments controlling NMOs are concerned. Variations in government funding rules and *pro bono publico* approaches so far as NMOs are concerned. The impossibility of any one NMO (or even military organization) creating a global map without collaboration with other NMOs and with other parties. The conflicts between the different military and civilian interests. And last but not least, the lack of resources for facilitate harmonization work in organizations charged with international remits, notably the UN agencies.

What is the ICA position in this so important field? First, ICA is fully supporting all global spatially oriented activities such as GSDI, Global Mapping, Digital Earth and U.N. Geographic Data Base. On the Executive level of it is commenting on ongoing activities and creating its own strategy for cartography how to participate. Secondly, within the ICA several commissions have an interest to develop an ICA strategy for SDI. The Executive Committee designed a Working Group on SDI and also commissions, such as the Commission on Standardization, are co-operating in this field. In the coming ICC in Beijing at the start of August this year one of the two plenary sessions will be devoted to the Global Issues and the possible role of cartography in it. The fundamental thoughts about a possible role of the ICA in SDI will be discussed in Beijing. Presently agreed-upon conditions for future developments are based on the facts that the SDI effort of ICA will not overlap similar activities of other organisations. The ICA will define its contribution to the SDI activities. The ICA will co-operate with sister organisations with the target to establish a visible GI community in global information society environment and last but not least the ICA and its commissions will create adequate cartographical methods, approaches and tools to deal with possibilities offered by existence of SDI.

The Above mentioned ideas will certainly be developed further. Nowadays cartography has a lot to offer for using SDI data. Ferjan Ormeling (Ormeling 2001) is highlighting these present-day or near future roles of maps and cartography. It is the distribution of the GI through **Internet**, which leads us to a whole new range of users. Young people that never would have looked in an atlas are most interested when the spatial information is presented on this new medium. And of course it will not end with the Internet. We have the new WAP technology coming up that will allow people to access information on their hand held mobile telephones, included spatial information. For instance in my country, the Czech Republic, we have applications of mobile information in forestry management or precision farming.

The fact that spatial information is now available in digital form allows us to turn it into so-called **smart maps**, that is maps that seem to think: depending on the scale at which they are queried, they will display more or less data, be more or less

generalised. They will have a larger or smaller number of names added. And when the scale passes below a specified threshold, certain land use categories will not be displayed any more, and the appropriate legend boxes will disappear as well.

Another important aspect of the digital revolution is that finally we are able to produce **animated maps and model dynamic reality** with our maps more accurately than ever. But this also provides requirements. We cannot present our children with atlases full of static maps, when, in the evening, they will see the weather forecast on the television with moving cloud patterns and tropical cyclones. Our atlases will have to compete with the computer games children are playing with, so the cartographic animation has to play several functions.

Finally it is **virtual maps** that we are now producing, when planning for the future we can create three-dimensional scenes in a realistic way that show what the proposed changes would look like in reality, on the basis of our databases.

In the Internet as well as in other electronic means of data presentation, **the role of maps is changing**. Before the electronic age, maps served two functions: both storage and display. And our traditional topographic maps are so crowded because they had to play both functions. Nowadays, these two functions can be separated. The *storage function* rests in the data files or data base; the *display function* is determined by the users on the basis of what they need for a specific spatial data – based task. Only those data layers are activated that we need for the task at hand, and even can be selected per layer data. But the development goes even further. The map on the computer monitor or on the mobile phone is changing into an **interface** to access the spatial data behind it. If you click on a map symbol, its name will be shown, or its number of inhabitants, or a photograph or whatever. If you click on an area the area characteristics will be shown, such as the average population density or height above sea level. But the map interface will also refer to other data files (Ormeling 2000).

Increasingly, maps are used as interfaces to the clearing houses for geo-information that are emerging all over the world.

I am certain that spectrum of the possible cartographic activities connected with SDI will grow.

A big challenge for cartographers is of course to be able to continue the control of these trends. When computers took over in cartography, for some time computer experts decided on the issues instead of cartographers, with the result that maps were barely legible in the early days of computer cartography. It took cartographers some time to adjust to the new technology. With the advent of Internet and WAP similar dangers are threatening, that Information Technology experts will take over from cartographers again and we have to be ready to meet this challenge.

6. ICA as an organization

The ICA executive committee and the commissions otherwise participate in global projects, such as the Global Spatial Data Infrastructure project, projects for the

standardisation of terminology, there is co-operation with the UN in a project on the production of a digital map of the world, and there is close co-operation between the various other professional societies in the surveying and mapping field, such as the ISPRS, FIG, IHO and IAG, as indeed we produce geo-information in teams together.

All these activities are described in the ICA publications, such as ICA News, that is sent in small quantities to all member states and is also available on the web, even in a Spanish form, thanks to the staff and students of Madrid technical university (<http://mercator.org/>). There are proceedings of all our conferences, and also of most of the commission meetings that are held.

Our major ICA events are the international cartographic conferences that are held every two years, and in which 600-1200 cartographers participate. The next one will be held in August 2001 in Beijing in China; after that Durban in South Africa will be the next venue in 2003; for 2005 it has not been decided yet.

It is in this way that we help cartographic colleagues all over the world, by providing them with incentives, material and education, and contribute to world wide standardisation in order to boost the spatial information exchange. All these activities can be seen in the directories that we publish and in the ICA web site: www.icaci.org

6. Conclusions

Cartography reflects society. In the past cartographers not only rendered the current spatial knowledge, they also reflected in their work the views and attitudes of the societies they lived in as well as their own views and peculiarities. So the information contained in old maps reflects the knowledge of the world at that time, the views of society at that time and the views of the cartographers. There is no reason to believe that it will be otherwise nowadays, as future generations of cartographers will testify. Although some changes are bound to occur, what will not change is that there will still be future generations of specialists dealing with spatial information. They might not be as subject to changes in concepts and techniques as our generation, and they might not be termed cartographers. After all, the term 'cartographer' has not been in use for more than a century, while geographical information has been produced for decision making purposes for at least four millennia. ICA believes that the profession will survive the change and even the change in name.

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