

## Marine Geospatial Information and Hydrographic Services

Keynote Address at the CARIS 2004 Conference  
'Where Waterways Meet'

By Prof. Dr Peter Ehlers, President and Professor of the Federal Maritime and Hydrographic Agency (BSH), Hamburg/Rostock, Germany

### Entering the Information Age

Do you remember Y2K? The year 2000? The change from the second to the third millennium?

When there was great fear that all our computer systems would break down? They did not. But were we only lucky? Or was that nothing but a fantastic promotion activity of the computer industry? Whatsoever. This event made evident that we have entered the information age. That our total life is more and more dominated by the information technology.

Could you imagine to live without a mobile phone? It is only some years ago that we posted letters or sent a fax in case of urgency. We accepted that it took a week or longer before we got an answer. Now we are sending e-mails and are getting nervous if after 30 minutes we still have to wait for a response. When we need specific information we no longer consult encyclopaedias, we do not visit libraries, but we are surfing the Internet. And it seems unacceptable if we do not find an answer for all our questions.

We are collecting inconceivable amounts of data, we process them automatically, we assess them and

develop new information products. Sophisticated simulation models are more and more used as a basis for far reaching decisions. It even becomes more and more difficult to differ between virtual and real life. Information technology has transformed the world to a global village.

### ... and the Maritime Age

Well, one or the other in this audience might be thinking: Why is he dwelling on this fuss about the information age? In one way or other this might be related to geomatics which is the topic of this conference. However a keynote speaker should expressly refer to the conference motto. O.K., but what does the motto 'Where waterways meet' really mean? Is it a reverence to Hamburg, a place where the inland river is approaching the sea, both of them important waterways? Or shall this motto emphasise that geomatic technology is more and more used not only for landborne, but for marine purposes? In any case this motto is associated with the marine element.

If that describes your feeling, let me start again. I am rather sure that coming generations will refer to our times

as the beginning of the maritime age. The seas, the oceans play an increasing role for our life, and maybe for the survival of mankind. Since time immemorial the seas have been used by man. Certainly fishing is one of the oldest professions. But likewise since old times the seas have served for transportation. We know, the oceans do not separate the people, but are bridging the countries and continents. Maritime shipping is the major factor for international commerce. More than 95% of the intercontinental transport of goods is done by ships. Globalisation without efficient merchant fleets would have been impossible.

Today other uses of the sea and the seabed also come to the fore. That is true for non-living resources such as oil and gas as well as sand and gravel. We all know about the far reaching offshore activities. Oil and gas from the North Sea alone cover one third of Europe's energy demand. But we are also looking for renewable energy from the sea. This is actually demonstrated by offshore wind energy parks. Some of them are already in operation, e.g. in Denmark and Sweden. In other countries the planning of such parks is advancing. For thirty projects in the German Exclusive Economic Zone of the North Sea and the Baltic Sea applications for permits have been submitted to my agency, the BSH, which is responsible for granting permits. Wind energy, however, is only a beginning. Various research and development projects are in progress concerning the use of tides, waves and currents for the production of energy.

Aquaculture, that is the cultivation of the natural produce of water such as fish, shellfish and aquatic plants, is another emerging activity. More than that, marine biotechnology which is described as "the sustainable commercial exploitation of marine organisms for the benefit of mankind" gains in importance. "The oceans are the future pharmacy of mankind" was recently proclaimed as a newspaper's headline.

In view of the increasing uses of the marine sphere we must not forget that the seas are the greatest and quite vulnerable ecosystems. So we have to undertake all endeavours to protect and preserve the oceans and to ascertain that we only use them in environmentally friendly and sustainable manners. Especially the coastal areas are under heavy stress. This is reflected by demands for an inte-

grated coastal zone management, covering both the land and the sea side. With regard to this spatial planning and management tools, as they are applied e.g. in Germany and neighbouring countries, are of particular significance. Not without purpose the German Parliament, the Bundestag, has just recently extended the national Regional Planning Act to the German EEZ.

### **The Need for Geospatial Information**

However, an indispensable prerequisite for using and for protecting the seas, for planning and for management is that all necessary and relevant data and information are available. How to accomplish that? Now I have a chance to tie up to the beginning of my remarks when I spoke about the information age. What we need is comprehensive geospatial information accurately describing the marine sphere and that requires well advanced information and geomatic technology.

There is one marine Geospatial Information System (GIS), even though it is only an analogue one, which has already been in existence for a long time, at least for many centuries, that is the system of nautical charts, internationally co-ordinated by the IHO, covering all marine areas which are important for shipping.

The traditional paper charts, however, are more and more supplemented or replaced by the electronic chart. Since some years the so called ECDIS, that is the Electronic Chart Display and Information System, based on standards established by IHO, is recognised as an equivalent of the official paper chart. Anyhow the introduction of ECDIS, which is a navigational GIS is much more difficult and time consuming than we thought in the beginning some ten or twenty years ago. It depends on the production and availability of ENC's, the electronic navigational charts, as the data bases for ECDIS. Building such data bases is much more laborious and complicated than even digitising an ordinary cartographic vector chart. We are still far from a world wide coverage with ENC's. However, we are well on our way. Using the IHO Transfer Standard for Digital Hydrographic Data, named for short 'S-57' after the respective publication the Hydrographic Services are applying various tools for digitising their data and producing

ENCs. This illustrates, however, a current dilemma: The more products and services we have to provide, the more complex the production chains in the Hydrographic Offices grow.

In addition, we also have learned that simply digitising paper chart information is not sufficient at all. The quality ultimately depends on the completeness, accuracy and updateness of the basic data, and that means on hydrographic survey activities. As long as due to the lack of new surveys data are to be used which are outdated, the ENC would pretend a safety which does not exist. The more uses of the marine areas are envisaged, planned and finally realised, the higher the demand for hydrographic information grows so that we have to also step-up our endeavours to collect data, and to keep them up-to-date.

The further condition for an effective ECDIS service concerns the distribution of ENCs. Here the concept is that the hydrographic services, each of them responsible for their waters under national jurisdiction, co-operate by establishing a joint or several networks of data centres.

### **The Development of a Marine GIS**

In the meantime we know that ECDIS is much more than the digitised version of a paper chart. It is a data based real-time navigational information and data management system which is controlled by GPS and supplemented by information from Radar and the new Automatic Identification System AIS. Surely further information about water level, currents, ice coverage and others will be added in the future. However, we are not only speaking about systems to further improve safety of navigation. Electronic charts establish the nucleus from which a comprehensive marine geo-database may develop and we need such databases for spatial planning and management. The IHO standard S-57 - one of the most advanced and most powerful spatial data standards today - provides a consistent, efficient concept to integrate all possible application profiles. Its potential reaches far beyond ECDIS, and its object catalogue can readily be extended to accommodate virtually all imaginable geo-spatial objects. This is also shown by the fact that the International Standards Organisation (ISO) has used S-57 as the basis for developing an all-

encompassing, even multi-dimensional standard for spatial information.

Developing a marine geo-database is a complex, time consuming and therefore expensive matter. Basically it means charting one's waters completely anew, using all high-resolution base data from all sources and covering much more than only data which are of interest for shipping. Technology today allows the networking of various related, but so far not physically connected data sources into an integrated, distributed system. This comes at a significant trade-off: reduced efforts for maintaining the integrated resources, with considerably enhanced updateness, integrity and functionality.

Surely, the development of a marine GIS will begin on national and regional level. However, in the long run the marine space must be considered as a unity as all kinds of spatial utilisation are interrelated. This means that marine geodata must eventually grow together from many sources and purposes.

### **The Future Role of Hydrographic Services**

The question now is: Who is to be tasked with developing and establishing a marine GIS? As I see it the hydrographic services could and have to play a leading role in this field. Hydrography traditionally has been a service for navies and merchant fleets. Hydrographic services, however, are not only important to shipping. Beyond that they also provide a marine data basis, which is needed for the scientific exploration, use and protection of the hydrosphere. Time has come for a much wider definition of the term hydrography, which should not be limited to shipping, but should rather be defined as a description of the seas for all maritime purposes. Taking that into account it makes sense that the hydrographic services embark on the task of developing a marine GIS. If they are not prepared to this new development other institutions will fill the gap. In the longer run this would mean that the need for specific hydrographic services had to be questioned.

I will even go a step further as concerns future tasks of hydrographic services: Developing a marine GIS is not an end in itself. The question coming up is: Who will apply the system, who will be responsible to make the necessary decisions related to marine

spatial planning and management? Again my view is that the hydrographic services should address this new task. What else would be more appropriate? However, I am fully aware of the fact that for many hydrographic services this would mean a fundamental change of their responsibilities and also of their self-conception. Especially those services which are part of their national navies may have great problems with such a development. Whatsoever, I believe that there is no real alternative if hydrographic services do not wish to end in insignificance.

### **The German Approach**

In Germany we are following this line. The German Government has expressed its intention that the establishment of the marine part of a nation-wide GIS should be promoted under the responsibility of the BSH. A first step in this direction was the introduction of CONTIS, the Continental Shelf Information System, which gives an overview about all uses and protection measures in the German EEZ and is available to everybody on the BSH website. For the time being we are working at developing a comprehensive BSH geodata infrastructure encompassing hydrography, marine geology, marine chemistry and oceanography. Networked with other specialised data bases this will be the fuel needed to drive marine spatial planning which is another new responsibility for the German EEZ that has been given to the BSH.

In other States similar considerations are on their way. At the 26th meeting of the North Sea Hydrographic Commission, just a few weeks ago, we came to the conclusion that it is high time to discuss the future role of the hydrographic services with regard to marine geo spatial planning and management infrastructure. The result was that the BSH will invite services which are interested in this issue to a seminar to be held in autumn next year in Rostock, the centre of our hydrographic work.

### **A Hydrographic Revolution**

But there is also another component. The task we have to face will not be restricted to national coastal areas, but has sooner or later to be dealt

with on a global level. International co-operation will be required to exchange information and experience, to care for a global coverage and to share the workload, including capacity building activities where needed. This could best be achieved within the framework of the IHO. But before that we have to make IHO fit for this new and challenging development. This is the aim of an Extraordinary International Hydrographic Conference of the IHO in April next year when we will decide about the modification and extension of the tasks of IHO and about the modernisation of the organisational structure and working procedures. Much will depend on whether or not the proposed measures will be accepted by the IHO Member States.

However, whatever high-flying strategic conceptions we may produce and pursue an indispensable precondition is that we are able to comply with the respective tasks. It is totally clear that we can only do so with the support of further advancing information technology which brings me back to the beginning of my speech. What we need, and what we already can see appearing on the horizon, is something that revolutionises hydrography as much as the Internet or the mobile phone did to all mankind: a universal, highly versatile information system allowing us to provide the whole range of services and products with one integrated system, just as the mobile phone that today combines the functions of a telephone, a GPS receiver, a navigation system, a camera, a movie player, a note pad and other things. I highly appreciate this conference which gives a chance to discuss the relevant requirements for hydrography and related issues. As it is the purpose of a keynote speech I hope very much that I have offered you some keys for opening the doors to the specific issues you have to consider now.

(This paper has been reproduced with the kind permission of the Conference organisers).

E-mail: peter.ehlers@bsh.de