

NAUTICAL CHARTING IN SMALLER COUNTRIES WITH SHORT COASTLINE - TROUBLES AND ADVANTAGES

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ABSTRACT

Slovenia is a young and small maritime country with around 45 km of coastline in the north Adriatic. Hydrographic activities in Slovenia started after its independence, a little more than a decade ago. All the old charts, data and fair sheets remained in the former Yugoslavian hydrographic office. However, these data were old and needed to be re-surveyed according to new standards. During these years of sovereignty Slovenia established own hydrographic office, became a member of IHO in 2002, completed 5 modern hydrographic surveys for complete coastal aquatory, a GPS survey of complete coastline, compiled two nautical charts at the scale 1:12.000 covering entire coast, produced one ENC and printed some fundamental hydrographic documents.

Considering that a young and small country has to start its own hydrographic activities literally from the beginning, the article presents how this brings out some troubles, some advantages and, what is more important, many effective solutions.

INTRODUCTION

There are three major ports in the north Adriatic Sea, Monfalcone, Trieste and Koper. Statistical analysis shows, that there the overall traffic in the north Adriatic reaches over 6000 ships per year in all three ports. Some of this cargo represents dangerous substances, such as chemicals and oil (port of Trieste only has a turnover of more that 30 million tons of crude oil per year). To safely transport all this cargo, a maritime state needs to supply to the mariners a lot of information about the sailing routes, aids to navigation and many others. Among the countries in the north Adriatic whose hydrographic offices are responsible for nautical charting is also Slovenia.

Slovenia is a small and young maritime country, with a short, only about 45 km long coastline. Hydrographic activities in Slovenia started after its independence, a little more than a decade ago. At that time Slovenia did not have any of its own nautical charts. All the old charts, data and fair sheets remained in the former Yugoslavian hydrographic office, which was responsible also for charting of the Slovenian sea. However, these data were old and needed to be re-surveyed according to new standards. Demands of increasing maritime traffic in the Port of Koper and its importance for Slovenia obliged us to produce new and accurate nautical charts.

ESTABLISHMENT OF HYDROGRAPHIC OFFICE - HISTORY

Charting of aquatory of the north Adriatic Sea is now in the responsibility of three neighbouring countries, Italy, Croatia and Slovenia. Italian Hydrographic Office (HO) has already a long and rich history. Croatian HO is a successor of former Yugoslavian HO, and has also long history. In the past, they have charted the Yugoslavian sea between the borders with Italy and Albania, including a large number of Dalmatian islands. On the other hand, the third country, Slovenia, had neither HO, nor charts after gaining independence. However, there was a persistent need to cover its national waters and approaches to the Slovenian major and very important Port of Koper.

Soon after proclamation of independence larger ships shown reluctance to come to the Port of Koper, since they were not sure about water clearance under their keel. They usually had very old charts on board and the status of water depth was not known. The fact was at that time, that the charts were compiled decades ago according to the surveys, which were done, of course, some years prior to the compilation of the charts. The other fact was, that the accuracy of the survey was so low that it could not meet contemporary standards for modern hydrographic surveys.

Such were the disadvantageous circumstances, which Slovenia has faced as a young maritime country, with no HO to provide hydrographic surveys and nautical charts of national territorial waters. In the beginning of nineties, the Hydrographic department of the Maritime office at the Ministry of Transport of the Republic of Slovenia was established which acts since then as Slovenian HO. One of the first tasks of the HO was the application for the membership in the International Hydrographic Organisation (IHO), which resulted in a full membership in April 2002.

In the beginning of 1998, national HO provided the training of a certified hydrographer, who would be able to conduct hydrographic surveys adhering to contemporary IHO standards and to compile internationally recognized nautical charts. The training of the first Category B hydrographer at the International Maritime Academy (IMA) in Trieste, Italy has finished after six months. A year later, one hydrographer for coastal hydrography was trained and another one for the production of Electronic Navigation Charts (ENCs).

At the end of the year 1998, the first hydrographic survey was accomplished, which covered about 70% of our sea (the north-east part on figure 1). The survey was done in two parts, by Naval Oceanographic Office (Navoceano) from the USA. The first part was the establishment of GPS reference points for the survey along the coast. Few weeks after that, the hydrographic survey team arrived with a survey ship Littlehales with two Hydrographic Survey Launches (HSL), all equipped with modern survey equipment. With the results of this survey Geodetic Institute of Slovenia compiled the first Slovenian nautical chart, the Bay of Koper, at the scale 1 : 12 000, published in June 1999. The chart in Mercator projection is referred to the WGS 84 ellipsoid.

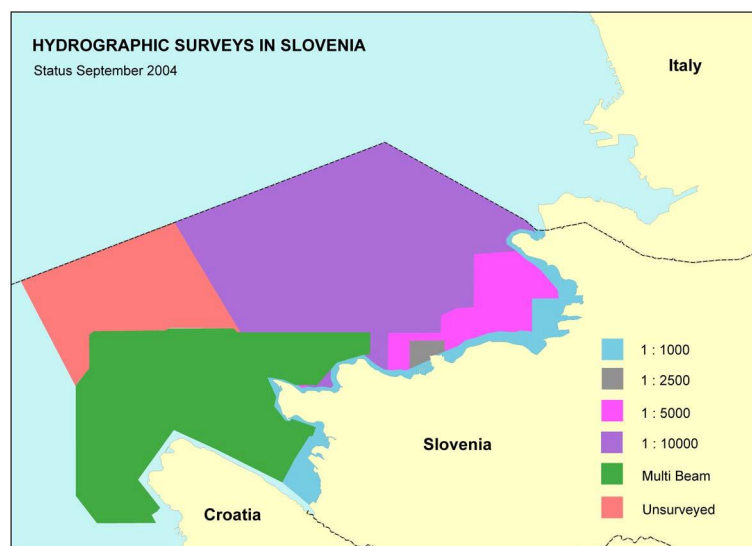


Figure 1: Hydrographic surveys in Slovenia

After the first survey, several more have been accomplished in the years 1999, 2000, 2002 and 2003. The surveys in 1999, 2000 and 2003 have covered the entire coastal area up to 200 m from shore. The next larger survey was accomplished in 2002 with multibeam sonar in joint co-operation of IMA, Slovenian HO and Croatian HO and covered the area of the Bay of Piran (the south-west part in figure 1). The result of all these surveys was the second chart published in November 2004. The chart is also at the scale 1 : 12 000 and is referring to the WGS 84 ellipsoid. With this one we have finished the charting of the entire Slovenian coastal waters in large scale (figure 2).

In the past years of hydrographic activities of our HO, we published also two nautical publications. The Slovenian version of publication *IALA - Maritime Buoyage System* was first published in October 2000, followed by a booklet *Symbols and abbreviations used on Slovenian nautical Charts* in January 2001 (figure 3).

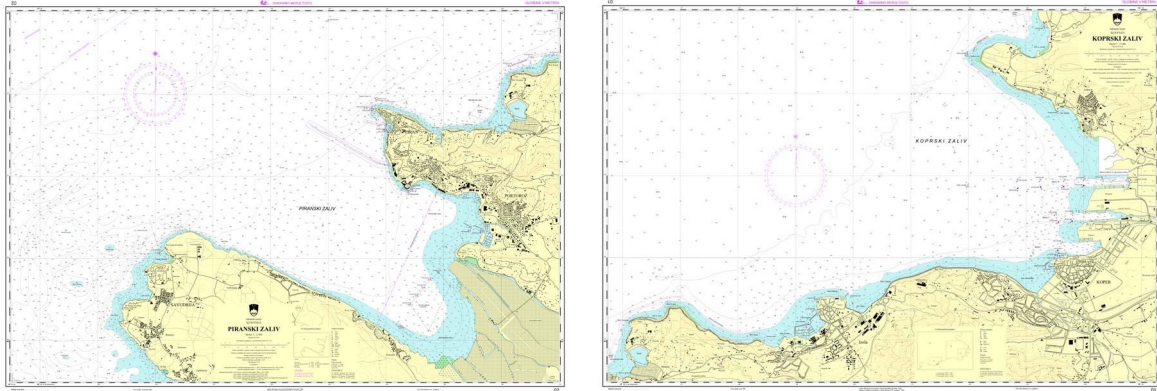


Figure 2: Slovenian charts at the scale 1 : 12 000

In the year 2003, the first Slovenian ENC (Port of Koper) was produced at Geodetic Institute of Slovenia and the GPS survey of the complete coastline was finished. In January 2005 we also published the INT chart of the Bay of Koper with an INT number 3469 (figure 4), as well at the scale 1 : 12 000 on WGS 84 ellipsoid. Before the end of this year, we plan to publish the third publication *Sailing directions* for the Slovenian waters, which will include description of larger and smaller harbours and marinas together with a number of small, detailed charts for these harbours.

SMALL HYDROGRAPHIC OFFICE - TROUBLES

The tasks of HO, regardless if it is big or small, are basically the same. HO must supply the updated nautical charts, carry out the hydrographic surveys, publish series of nautical publications, etc. Older HOs have established well working systems to carry out these tasks, which is a consequence of a long history of nautical charts production.

Young and small countries have to start establishment of these operative systems from the beginning. In this process, of course, they can face several difficulties. Usually there is no history and tradition in the nautical charting in younger countries, as the case is in older HOs, especially, if this work was previously done by other HO. The lack of tradition brings more important drawbacks. One of them is, to determine who will be responsible for nautical charts. In some countries HO is under Army or rather Navy responsibility. This is reasonable since the information about water depths and seabed can be of great importance for the national security (it is well known, how the information about the coast and water depth is treated by the navy). The problems can rise if these responsibilities can't be delegated easily. For instance, nautical charting can be the responsibility of Ministry of Transport (since maritime transport is one of their departments), or it can be under the auspices of the Ministry of Maritime affairs (since we are talking about sea), or even it can be organized under the Ministry of Defence (for the already mentioned security reasons). If the government does not perceive appropriately the importance of hydrographic works for maritime transport and safety of navigation, then the tasks of HO have to be well defined and promoted, before any accident occurs. For instance, the disaster of large proportion, such as the accident of the tanker *Prestige*, would mean catastrophe for the affected area.



Figure 3: Front pages of publications IALA and Symbols and abbreviations

When a small state determines to execute the hydrographic survey and charting, this is strongly connected with the question of providing the budget for running the entire HO as (relatively) independent body. Funds needed to execute hydrographic surveys are usually very high. In connection with this we arrive to the fact, what kind of a HO individual country would require. To establish a big, complex HO for a small country may not be reasonable and would be too costly. On the other hand, small HO may not cover all functions needed for providing a proper hydrographic service. Purchasing the hydrographic survey boat with all the equipment, software, crew and experts to carry out the surveys, post processing and charting, needs input into education and maintenance for which small HO may have difficulties to provide. A rational solution can be outsourcing at least for hydrographic surveys.

In younger countries, public awareness regarding maritime affairs may not be as high as in countries with a long maritime tradition. Although on a short coastline are meeting various interests (eg. as in Slovenia for marinas and harbours, holiday resorts, swimming areas, diving activities, fishery, natural reserves, ship industry and real estate), national users of hydrographic data and information are scarce. It seems, that the users are not yet aware, what sort of information HO is collecting and what can be the potential use of this information. Even when there are requests for hydrographic data, users are not sure what they might need from the amount of data available, or even what area they are interested in. Important about this requests for data and information is also, that regardless of the interests of the users, the coastline is vulnerable for pollution and degradation. This effect is even more perceivable if the coastline is short and every metre is valuable for the people who live in the coastal area, and depend on the sea (as eg. in fishery and tourism). Even more, the whole country and economy can be affected and this fact cannot be ignored.

SMALL HYDROGRAPHIC OFFICE - ADVANTAGES

Although we have discovered some difficulties for young and small HOs, there are also advantages in all this. Namely, the geographic area of responsibility for hydrographic service is small. That means less time to complete the surveys and process the data. The amount of data is smaller and easier to manage. Less survey and charting means considerable decrease of budget for running the HO. Also the work can be done in shorter time. In Slovenia, we accomplished quite a number of hydrographic tasks in less than a decade. This was made possible with outsourcing of all technical hydrographic and cartographic operations to Geodetic Institute of Slovenia (which is also a public institution), and to some other national companies and foreign co-operators (especially hydrographic surveys with larger ships). The main task of HO in that case is therefore organization, funding, control and legislation, while the burden of technical execution is dispersed and transferred outside the core of HO.

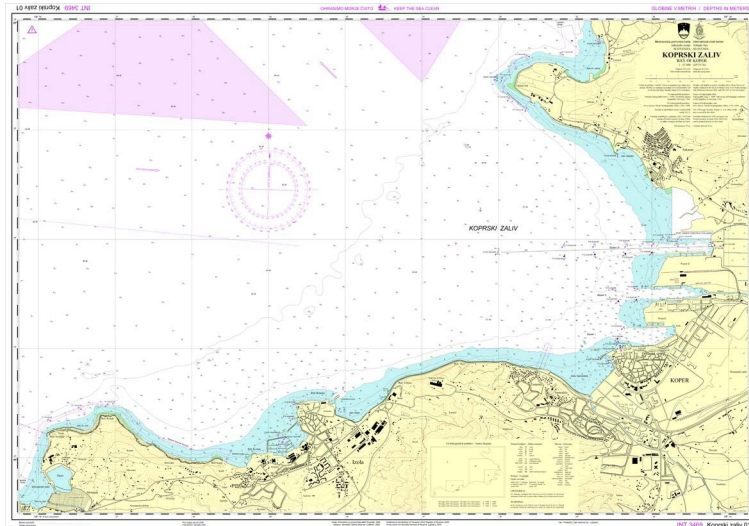


Figure 4: INT chart the Bay of Koper

Monitoring smaller area with hydrographic surveys has another advantage. All dangers for navigation can be easier to supervise and detect. From the fact, that all survey can be done in rather short time, more time can be spent for detailed investigation of all dangers to navigation. Wrecks and shoals can be reported in details and charted with a great precision.

Since every action in a newly established HO is starting from the beginning, all the equipment used adheres to new hydrographic standards for accuracy and precision. And since there is no burden from the national history of hydrographic activities (eg. traditional methods of surveying, analogue charting, old coordinate systems), transition to a new technology is faster and almost instantaneous. Consequently, we could have immediately started using computer-aided cartography for charting and all charts were compiled according to international standard for INT charts. All charts also refer to WGS 84 ellipsoid so GPS positions can be plotted directly on the chart. Creation of ENC of the Bay of Koper was easier because no additional transformations between different systems were needed. All data are stored in digital form and are processed, organized and updated as a GIS.

Small HO which is supported with outsourcing to a national public institution has altogether a small number of experts and support staff and is much more flexible than big HO. In a small office, one or two experts of hydrography and cartography can manage all the work needed and are familiar with all phases from planning of survey to charting and updating of charts. Additionally, they can cover also administration procedures, what results in shortened procedures. The response to the need of a mariner, or other users can be faster and effective. This is most welcome in the need for outsourcing of hydrographic surveys, but also in cooperation with other users and suppliers of hydrographic data and information.

SOLUTIONS

Organizing own HO for a young country can be a hard task, as we already have seen and discussed in previous sections. The fact remains, that every country needs its own HO to carry out the duty to take care for the safety of navigation in national territory. The main problem is, how this will be done. Smaller HOs can rely on help of the IHO and its member states. Larger and older HOs are usually prepared to offer help and advice based on their experience.

In the case of Slovenia, the first survey was carried out by Naval Oceanographic Office from USA (Navoceano). Help from large, experienced and well-equipped HO was most welcome, since it was capable to conduct a large survey. It is rational for small HO to co-operate with strong maritime nations. On the other hand, for small countries it is most welcome to co-operate also with other small countries and their HOs. They may have used the same solutions as we were facing.

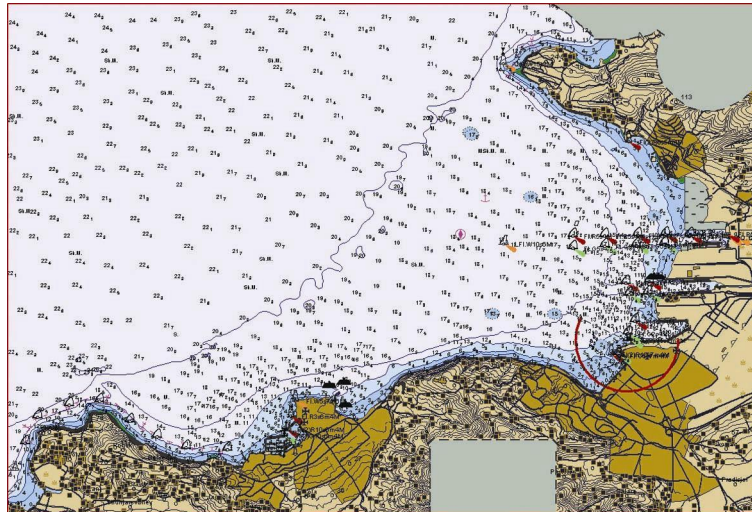


Figure 5: ENC Bay of Koper

Providing hydrographic service can be driven by the national transport sectors, especially strong co-operation should be made with the sector responsible for maritime affairs. One of their concerns is (or at least should be) the safety of maritime transport in national waters, which is of a great interest for the economy of any nation. They have experience in maritime transport and the HO should act as a support.

For countries with a limited number of experts, it is most welcome to couple experts from different fields. For instance, educate cartographers, which are already familiar with a production of maps into a hydrography and production of nautical charts. Or, use geodesists and educate them in conducting hydrographic surveys. The same hold for the experts for data management and post processing of hydrographic data. If there are GIS experts available, let them widen their areas of data processing "into the water".

Now, how will we conduct the surveys, some might ask? Well, one possibility is to rent the equipment. This is a lot more in accordance with the limited budget, and equipment is constantly new or maintained. Same solutions we can find for chart production - use the software for production of topographic maps. Do not burden the budget with new equipment and software for production of nautical charts, if the cartographer, who is now educated also as a nautical cartographer, is already familiar with his "topographic" software. The only thing is, that a new library of nautical symbols is being required. Additional symbols and abbreviations must be created for the software, which was used for production of topographic maps and the result is fast chart production.

In Slovenia something else was also considered as a good solution for nautical charting. As already mentioned briefly, the Maritime office of the Ministry of Transport, which is acting as Slovenian HO, contracted Geodetic Institute of Slovenia for the production of nautical charts. The institute had already many decades of experience with the production of topographic maps. In this way, same equipment was used for land and sea charting. No extra equipment or software was purchased. This proved as very good combination. The institute had quite large topographic database, which was simply used for the land part of the nautical charts. In this way, the compilation of nautical charts is much easier and faster.

This is not the only benefit from this sort of co-operation. Since all the data, topographic and nautical are stored and maintained in the same place, we can organise "one stop shop" for various users of hydrographic data. In Slovenia's case, the HO, which is in fact part of the Ministry of Transport, is only administrative part of the hydrographic service. The technical part is taken over by Geodetic Institute of Slovenia, which is in this way a technical support for the Slovenian HO.

CONCLUSION

Hydrographic activities and nautical charting should be provided by any state, regardless of its size and amount of maritime traffic going through its national waters. It can easily happen, that the ships will reluctant coming into ports of the country, which will fail to provide reliable nautical information. Small country, which relies on the economical aspects of their ports, cannot afford this. Shipping companies will not hesitate to transfer their ships to other ports and than, if not before, a maritime state will be faced with organising hydrographic activities to support shipping industry.

For smaller countries it is reasonable to establish small hydrographic office, preferably with engaging experts from various fields (eg. from cartography and geodesy) and train them in hydrography. Upgrade the equipment for compilation of topographic maps with applications for nautical charting. If the area of responsibility for small HO is small, it is not reasonable of equipping own survey boat, since the maintenance would burden the budget. Use the possibility to rent the equipment, if we summarize only few of the solutions for small HO. Co-operate with other, larger HOs about the outsourcing for conducting the surveys and post processing.

Young European countries may find welcome also another possibility, participating in international projects. In this way, a country can apply for regional funds to support the establishment of HO and help it running. The safety of navigation is not (and it should never be) a concern of only one country. It must be the concern of all maritime countries, big or small. Large accidents at sea (especially with dangerous cargo) affect everybody in the wider area. The hydrography can help to prevent from such troubles.

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Born on 05. July 1970 in Ljubljana, Slovenia. In 1997 I graduated at University of Ljubljana, Department of Geodesy. In 1998 I finished Course for Hydrography (level B) at International Maritime Academy (IMA) in Trieste, Italy. My work was mostly related in hydrography, among that production of first Slovenian nautical chart (published in June 1999), production of Slovenian version of IALA publication (published October 2000), production of Symbols and abbreviations used on Slovenian Nautical Charts (published January 2001). Now I am doing Masters degree at Faculty for Maritime Studies and Transport.