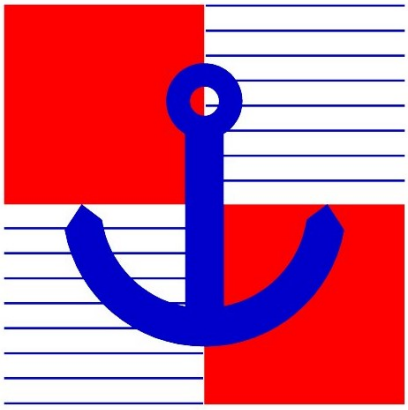
MEDITERRANEAN AND BLACK SEAS HYDROGRAPHIC COMMISSION

24th CONFERENCE

REPORT BY CROATIA

HRVATSKI HIDROGRAFSKI



INSTITUT

2 – 4 July 2024

HYDROGRAPHIC INSTITUTE
OF THE REPUBLIC OF CROATIA

MEDITERRANEAN AND BLACK SEAS HYDROGRAPHIC COMMISSION

24th CONFERENCE

REPORT BY CROATIA

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1. CROATIAN HYDROGRAPHIC SERVICE

Legal framework

In accordance with the provisions of SOLAS Chapter V (Hydrographic Service), that are implemented in the Croatian national legislation (Hydrographic Activity Act, 1998, 2003, 2014), the Hydrographic Institute of the Republic of Croatia (CHI) carries out scientific and research work, as well as development and professional tasks relating to the safety of navigation, hydrographic-geodetic survey in the area of the national responsibility, marine geodesy, construction and production of charts and nautical publications, oceanographic research, submarine geology research, and finally publishing and printing activities. The CHI has been appointed National Coordinator for Navigational Warnings. Position of the CHI in the structure of Croatian (maritime) administration is shown in Annex 1. The CHI is registered as a public institution of the Republic of Croatia under the Law on Public Institutions. For details see www.hhi.hr.

CHI structure and main tasks of departments

Organisational structure of the CHI is arranged into several departments. Hydrographic activities and data flow starts with the survey of the sea, in the internal sea waters, the territorial sea and the Exclusive Economic Zone (EEZ) of the Republic of Croatia, covering a total surface area of about 55,349 km² or 97.9 % of the Croatian land area (Fig. 1).

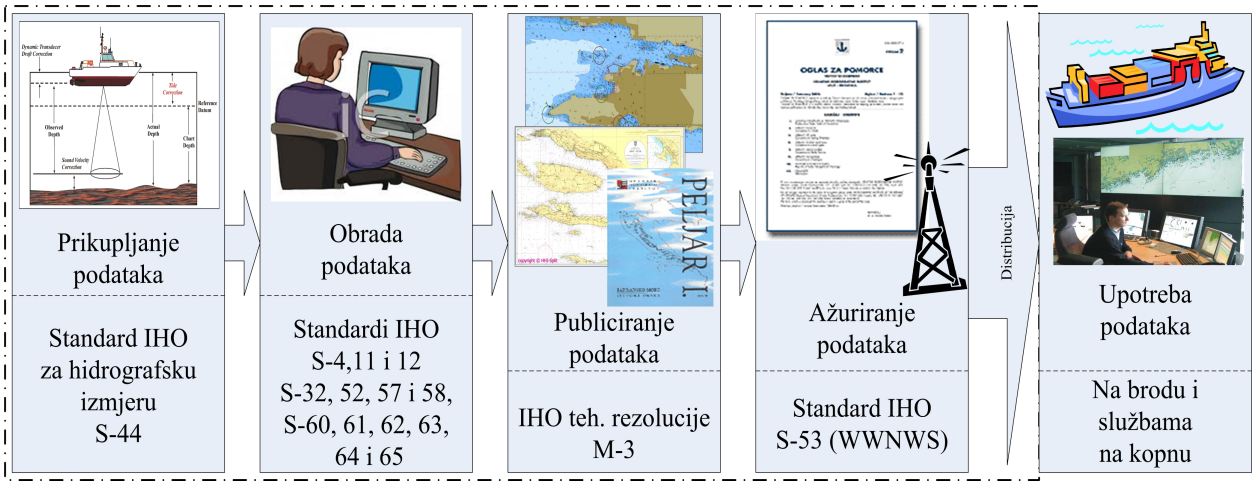


Figure 1. Data flow and working processes

Survey operations are carried out mostly by Hydrographic Department and Oceanographic Department, with the support of S/V Hidra and S/V Palagruža. All measured data are stored into databases with the support of Information System Department. Cartographic Department (Fig. 2) and Nautical Department are responsible for the production and maintenance of official nautical charts (paper and electronic ones), and other publications. The Notice to Mariners is issued on monthly basis for the paper edition and weekly for ENCs. Nautical Department is National Coordinator for Navigational Warnings.

Figure 2. Structure in Cartographic Department through various work process

Detailed information to update IHO Publication P-5 (Yearbook) has been submitted using the online system.

2. HYDROGRAPHIC SURVEY

Hydrographic Survey Vessels

The CHI has two survey vessels designed for the conduct of hydrographic survey, oceanographic measurements, marine geology research, magnetometric detection, and cartographic revision of the coastal and insular sea areas in the Adriatic Sea. The CHI also has one small hydrographic survey boat. (Fig. 5)

Survey vessel HIDRA (Fig. 3) is used for survey operations in the coastal and inshore areas of the Croatian part of the Adriatic. Survey vessel PALAGRUŽA (Fig. 4), for its size and equipment capable of operation in severe weather conditions, is used for the survey in the open sea. With an endurance of 25 days at sea, it is also capable of operating in the Mediterranean Sea.

Figure 3. S/V Hidra

Figure 4. S/V Palagruža

Figure 5. Hydrographic survey boat

The CHI is in the process of conducting a study on the renewal of the CHI fleet.

Status of hydrographic survey

Hydrographic surveys conducted along the Croatian coast since the 23rd MBSHC Conference were focused to selective parts of the coastal areas and to principal ports and passages according to the defined priorities. Total surveyed area measured by the CHI is 3,018 km^2. (Fig. 6).

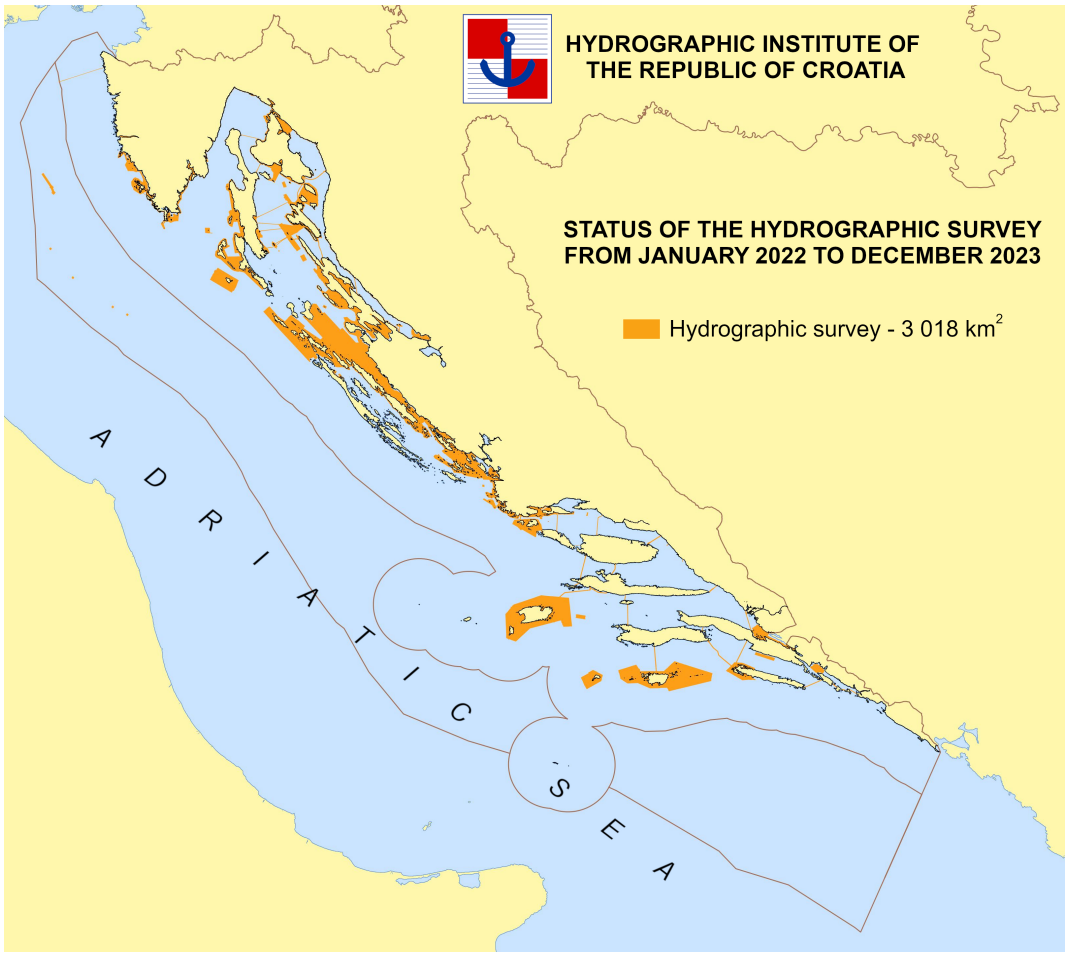


Figure 6. Status of the hydrographic survey from January 2022 to December 2023

By the end of 2023, eight legal entities with authorizations to perform hydrographic surveying activities were registered in Croatia under the new Ordinance (January 2019).
Annex 2 summarizes the status of the hydrographic survey according to the criteria in the IHO C-55 publication. Annex 3 shows the status of the hydrographic survey up to December 2023, indicating the types of survey. Annex 4 (a-c) summarizes the hydrographic survey three-year priority plan (2024 – 2026).

CROWDSOURCED AND SATELLITE-DERIVED BATHYMETRY – NATIONAL POLICY

Crowdsourced Bathymetry (CSB) activities are restricted in all waters under Croatian maritime jurisdiction. This includes internal waters, the territorial sea and the Exclusive Economic Zone (EEZ). Bathymetric measurements, including measurements and collecting of other sea data and parameters, are regulated by national laws and regulations in accordance with the United Nations Convention on the Law of the Sea.
Lawfully collected bathymetric data are available for use by signing a licence agreement. Bathymetric and some other hydrographic data collected by the CHI and other authorized entities are available for public use in accordance with the CHI licensing policy and regime which is in line with the public service information principles.

3. CHARTS

The CHI produces official paper charts and electronic navigational charts (ENCs) covering the waters within the national responsibility (https://www.hhi.hr/en/products-and-services/official-navigational-publications/detail/pubid/2675).

ENCs

In the period from May 2021 to December 2023, the CHI produced 45 ENC cells based on the new hydrographic survey.
Status of the CHI ENC production is shown in the following table:

		1 July 2008		**1 July 2013**		**1 May 2017**		**31 December 2019**		**31 December 2020**		**31 December 2021**		**31 December 2023**	
Usage band	Navigational purpose	No of Cells	Area coverage (%)	No of Cells	Area coverage (%)	No of Cells	Area coverage (%)	No of Cells	Area coverage (%)	No of Cells	Area coverage (%)	No of Cells	Area coverage (%)	No of Cells	Area coverage (%)
1	Overview	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%	1	100%
2	General	5	100%	5	100%	5	100%	5	100%	5	100%	5	100%	5	100%
3	Coastal	15	90%	15	90%	15	90%	18	100%	18	100%	18	100%	18	100%
4	Approach	9	72%	13	85%	14	88%	21	92%	21	92%	22	93%	25	93%
5	Harbour	31	77%	37	84%	40	88%	44	91%	44	91%	45	92%	49	92%
6	Berthing	20	74%	24	85%	50	87%	144	95%	183	96%	210	97%	218	98%
TOTAL		**80**	**87%**	**94**	**92%**	**124**	**93%**	**232**	**95%**	**271**	**96%**	**300**	**97%**	**315**	**98%**

Annex 6 shows current ENC release status with special emphasis on ENCs of marinas, small ports, shoals and coastal passages.

ENC distribution method

The CHI distributes its ENCs through the PRIMAR RENC. In the period from May 2021 to December 2023, the CHI produced 45 new ENCs, 134 ENC new editions, and 704 updates (ERs).

WMS for ENCs

The CHI as a member of PRIMAR RENC actively participates in the project WMS for ENCs together with other PRIMAR member states. Currently, the CHI and a few Croatian maritime governmental organizations (MRCC, Maritime Directorate, HM Offices) and the Croatian Navy use WMS for ENCs for administrative purposes (Fig. 7).

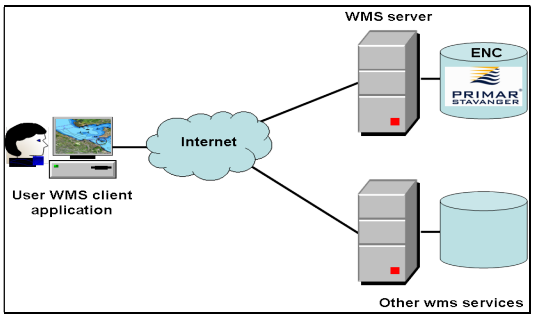


Figure 7. PRIMAR WMS for ENCs

INT ENC scheme

Most of the overlaps have been resolved. There are some remaining minor overlaps in UB3 with the LOW status regarding overall risk severity. Also, there is one overlap with MEDIUM risk status in UB3, which is currently being reviewed and resolved. Potential new overlaps are continuously monitored and the process of resolving them through negotiations with the respective countries is immediately initiated.
Status of the overlap with ENC cells of neighbouring countries is shown in the following table.

Overlap Report: Croatia Date: 24.03.2024

Nation	RENC	ENC	UB	Edtn	Updt	Scale	Overlap(km²)	Comments
Croatia	PRIMAR	HR100101	1	3	30	800000	6,214.895	
	IC-ENC	GR1OVER1		2	8	1500000		
Croatia	PRIMAR	HR100101	1	3	30	800000	336,732.916	
	IC-ENC	IT100340		5	18	1500000		
Croatia	PRIMAR	HR100101	1	3	30	800000	1,257.028	
	IC-ENC	IT100350		4	1	1500000		
Croatia	PRIMAR	HR200351	2	1	24	350000	44,910.659	
	IC-ENC	IT200435		5	26	700000		
Croatia	PRIMAR	HR200352	2	1	3	350000	4,683.644	
	IC-ENC	IT200434		7	2	700000		
Croatia	PRIMAR	HR200352	2	1	3	350000	26,680.652	
	IC-ENC	IT200435		5	26	700000		
Croatia	PRIMAR	HR200353	2	1	12	350000	34,671.212	
	IC-ENC	IT200435		5	26	700000		
Croatia	PRIMAR	HR200354	2	1	8	350000	50,661.122	
	IC-ENC	IT200435		5	26	700000		
Croatia	PRIMAR	HR3C0015	3	4	2	100000	2.514	
	IC-ENC	IT300039		5	21	90000		
Croatia	PRIMAR	HR3C0028	3	3	20	100000	1,583.817	
	IC-ENC	ME3CMNE1		2	0	90000		
Croatia	PRIMAR	HR3C3414	3	1	2	100000	0.029	
	IC-ENC	ME3CMNE2		1	0	90000		

RNCs

RNCs covering the Croatian area of responsibility are available from UK HO ARCS under a bilateral agreement.

INT paper charts

HR status of INT paper charts is shown in the table in Annex 6 and in the figure in Annex 7. The CHI made input of current INT Charts status (May 2024) using the IHO INToGIS manager (figure in Annex 8).

National paper charts

In the period between the two MBSHC Conferences, the CHI published the following charts:

New charts: Figures 8, 9

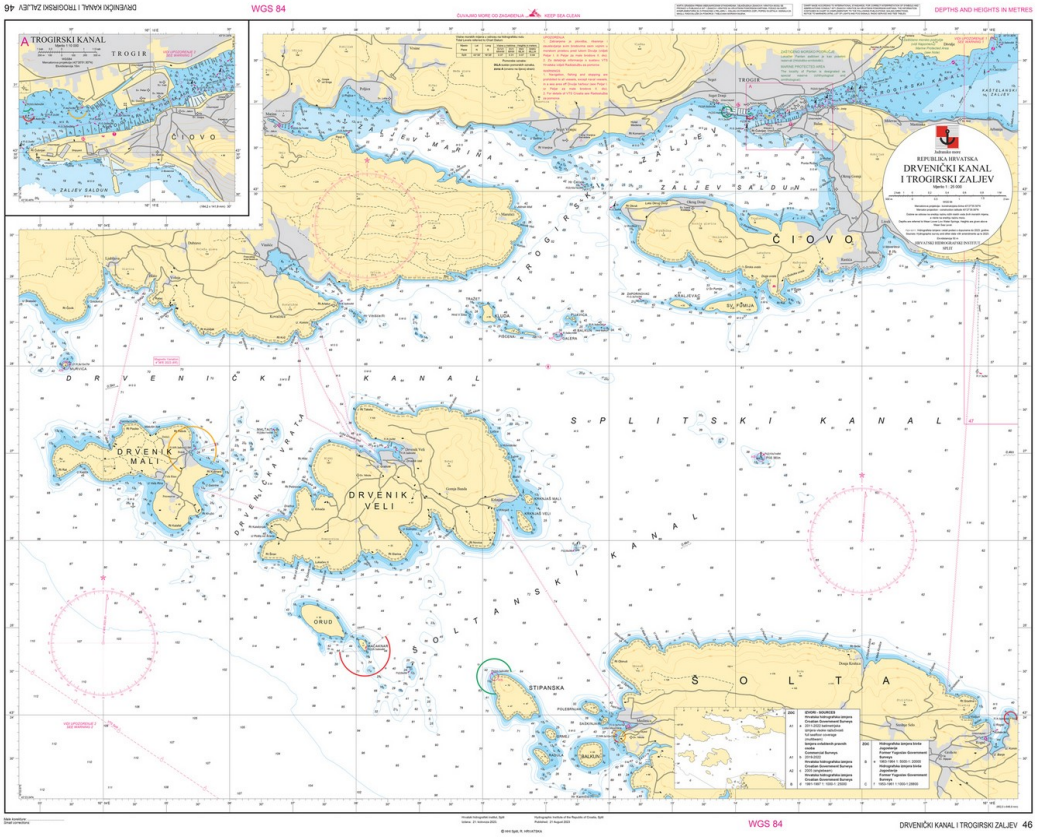


Figure 8. 46 Drvenički kanal i Trogirski zaljev 1:25 000
Trogirski kanal 1:10 000

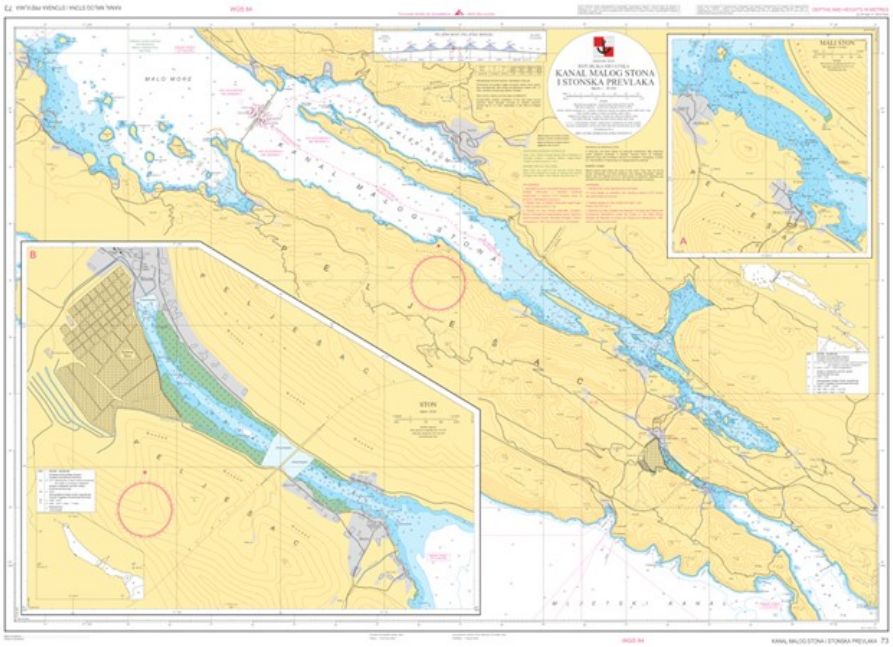


Figure 9. 73 Kanal Malog Stona i Stonska prevlaka 1:30 000
Mali Ston 1:10 000, Ston 1:6000

New edition: Figures 10, 11, 12, 13, 14, 15

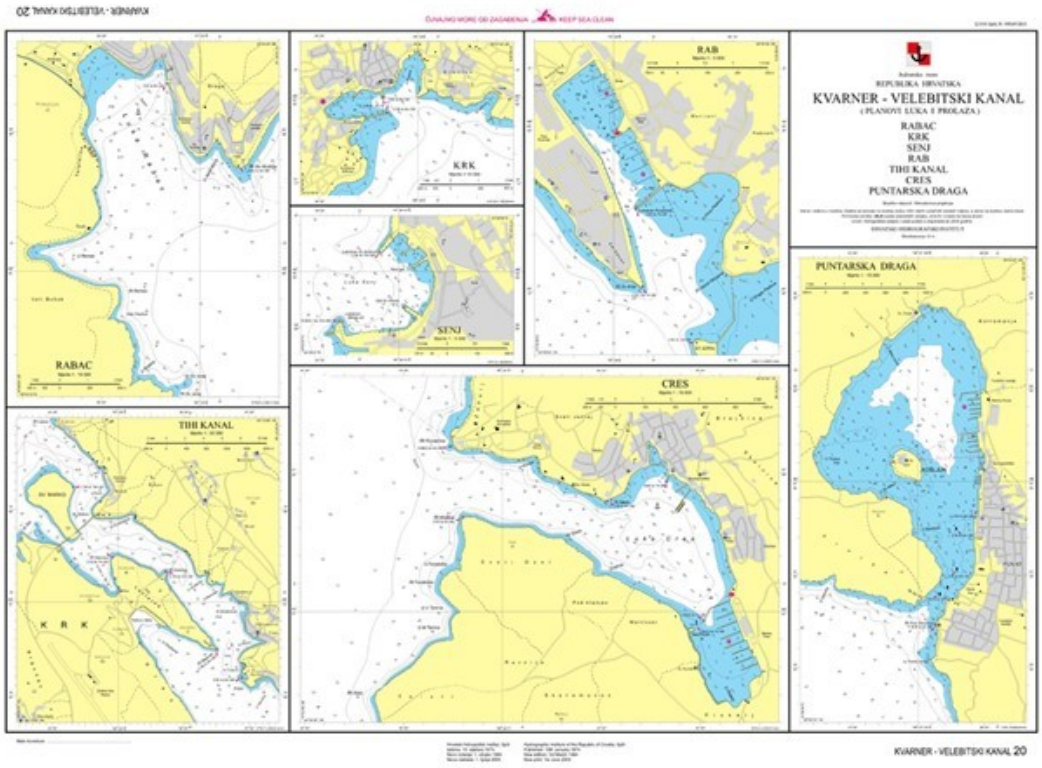


Figure 10. Plan No. 20 Kvarner − Velebitski kanal
Kvarner − Velebitski kanal (port plans) Rabac 1:10 000, Tihi kanal 1:30 000, Cres 1:10 000, Krk 1:10 000, Puntarska draga 1:15 000, Senj 1:5000, Rab 1:5000

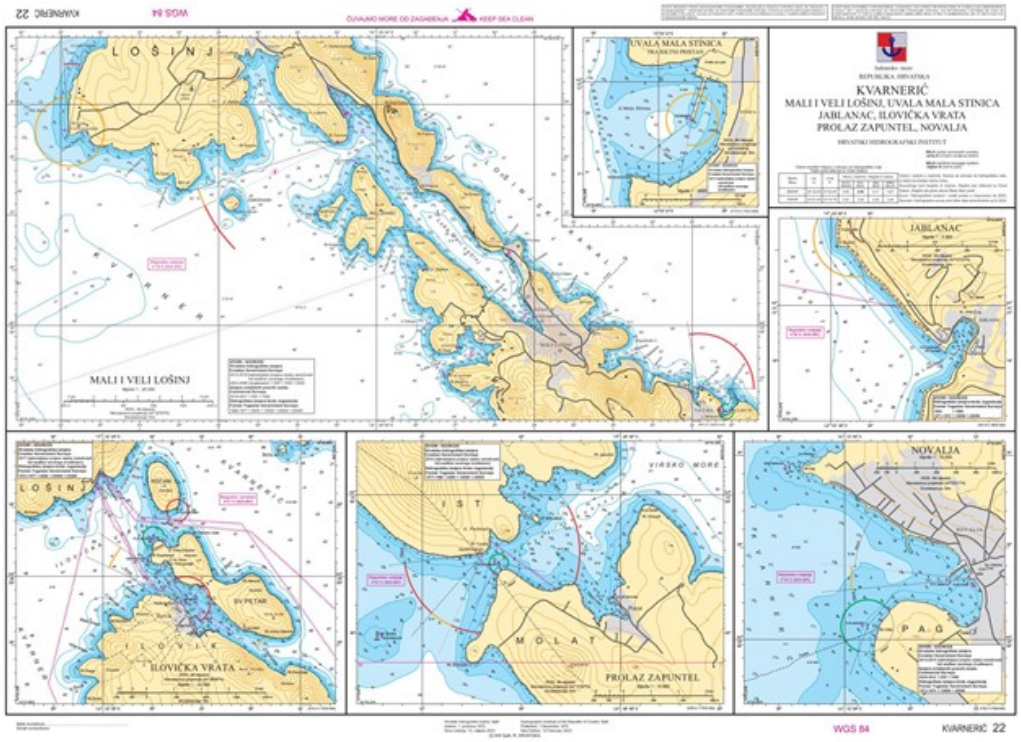


Figure 11. Plan No. 22 Kvarnerić

Kvarnerić (port plans): Jablanac 1:5000, Mali i Veli Lošinj 1:25 000, Novalja 1:15 000, Ilovička vrata 1:20 000, Prolaz Zapuntel 1:10 000, Uvala Mala Stinica − Trajektni pristan 1:3000

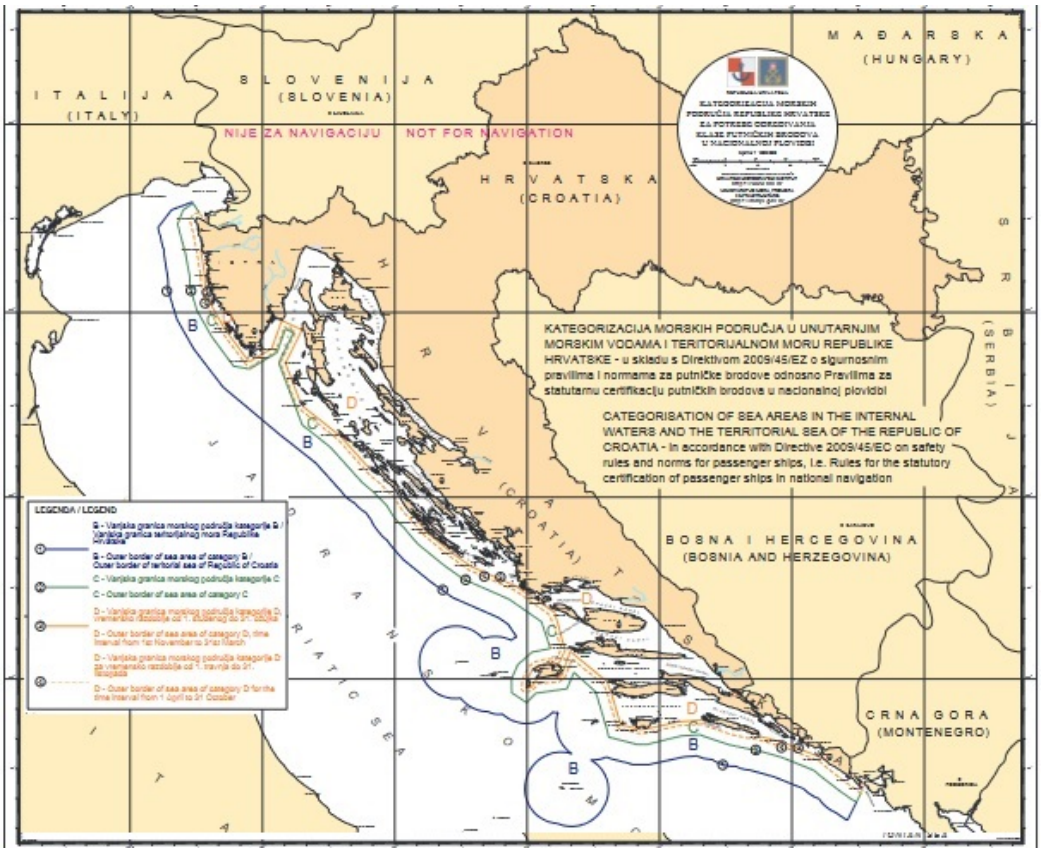


Figure 12. 101K Kategorizacija morskih područja RH za potrebe određivanja klase putničkih brodova u nacionalnoj plovidbi 1:800 000 (produced in cooperation with the MMPI)

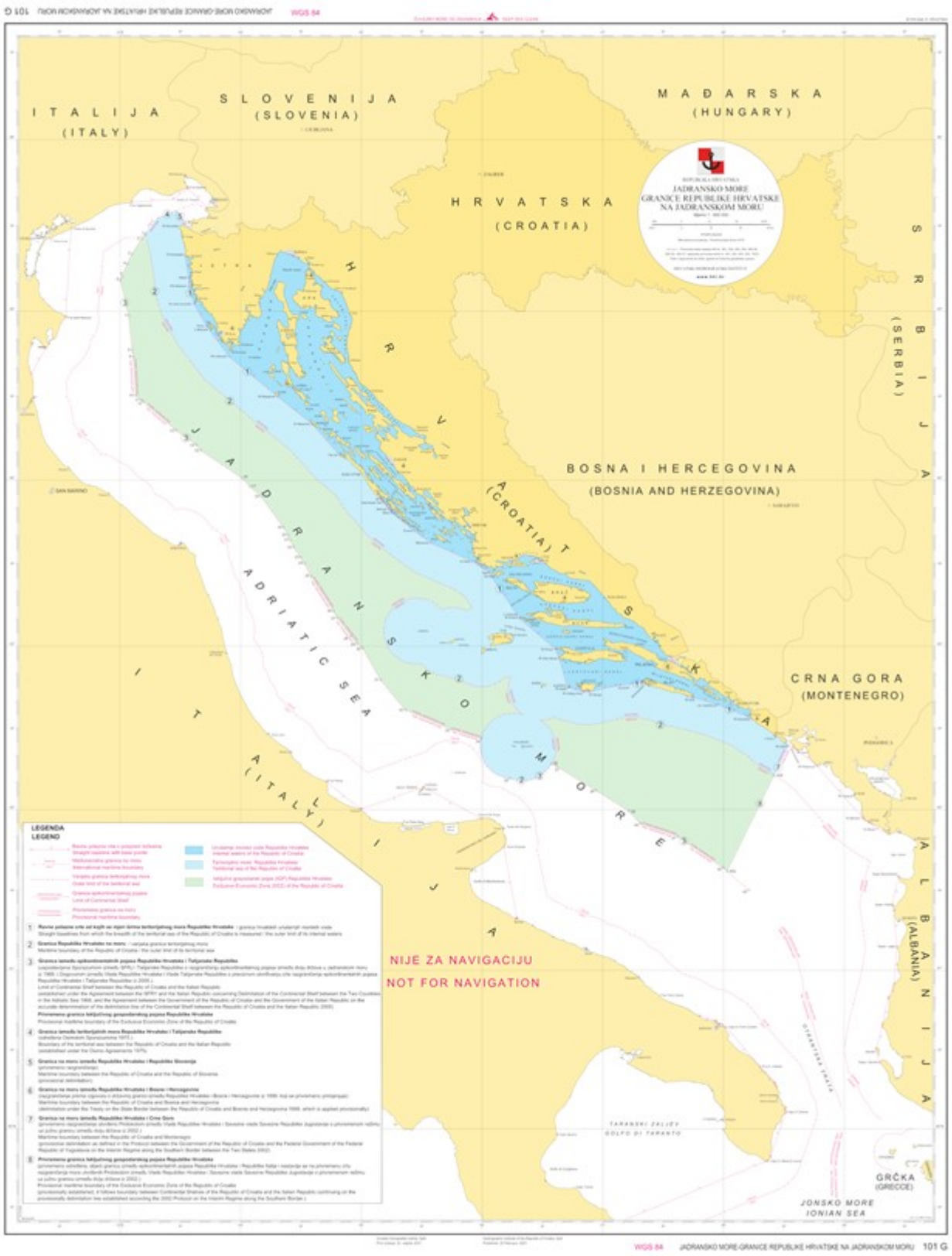


Figure 13. 101G Maritime Boundaries of the Republic of Croatia in the Adriatic Sea, 1:800 000

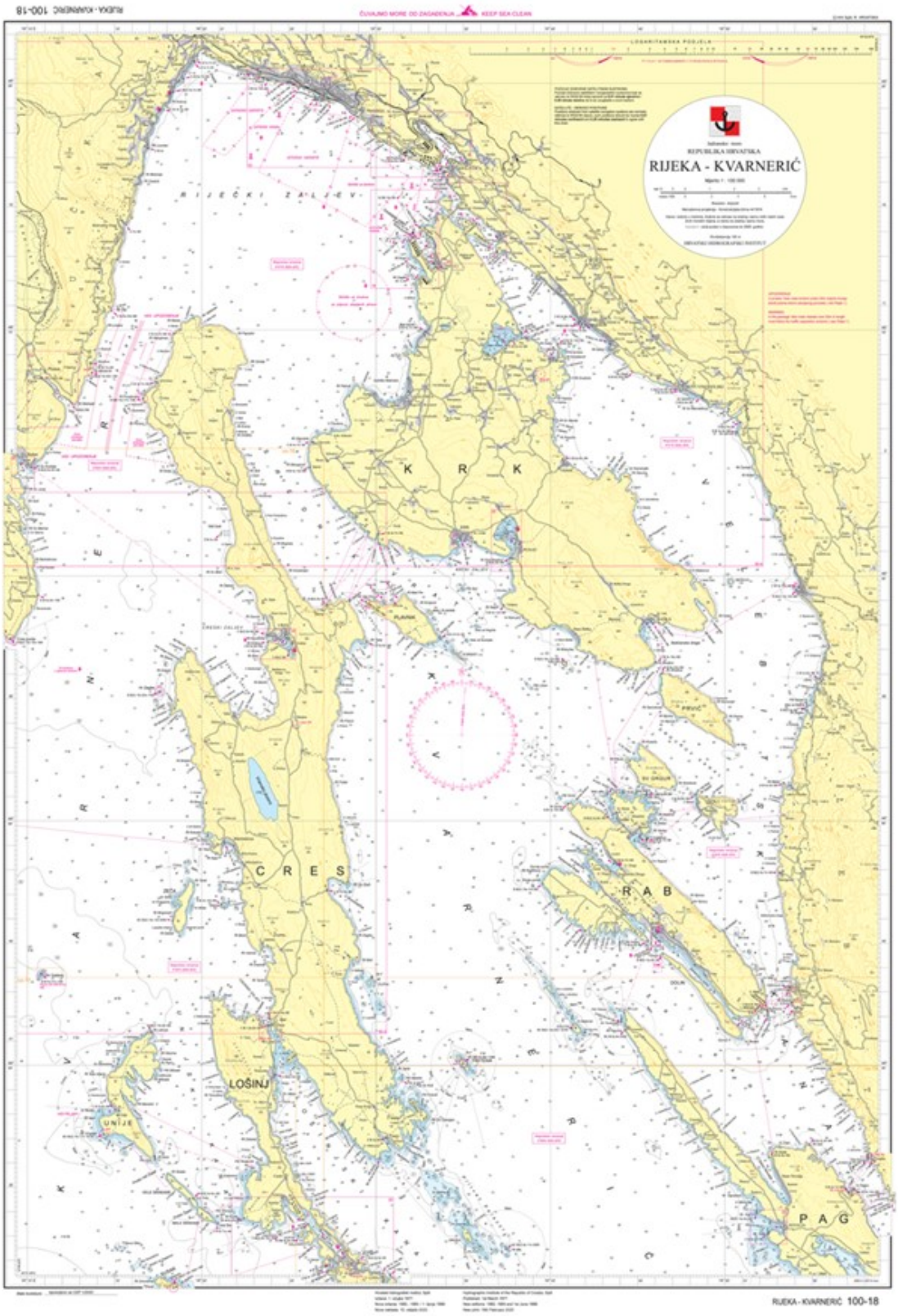


Figure 14. 100-18 / INT 3473 Rijeka − Kvarnerić 1:100 000

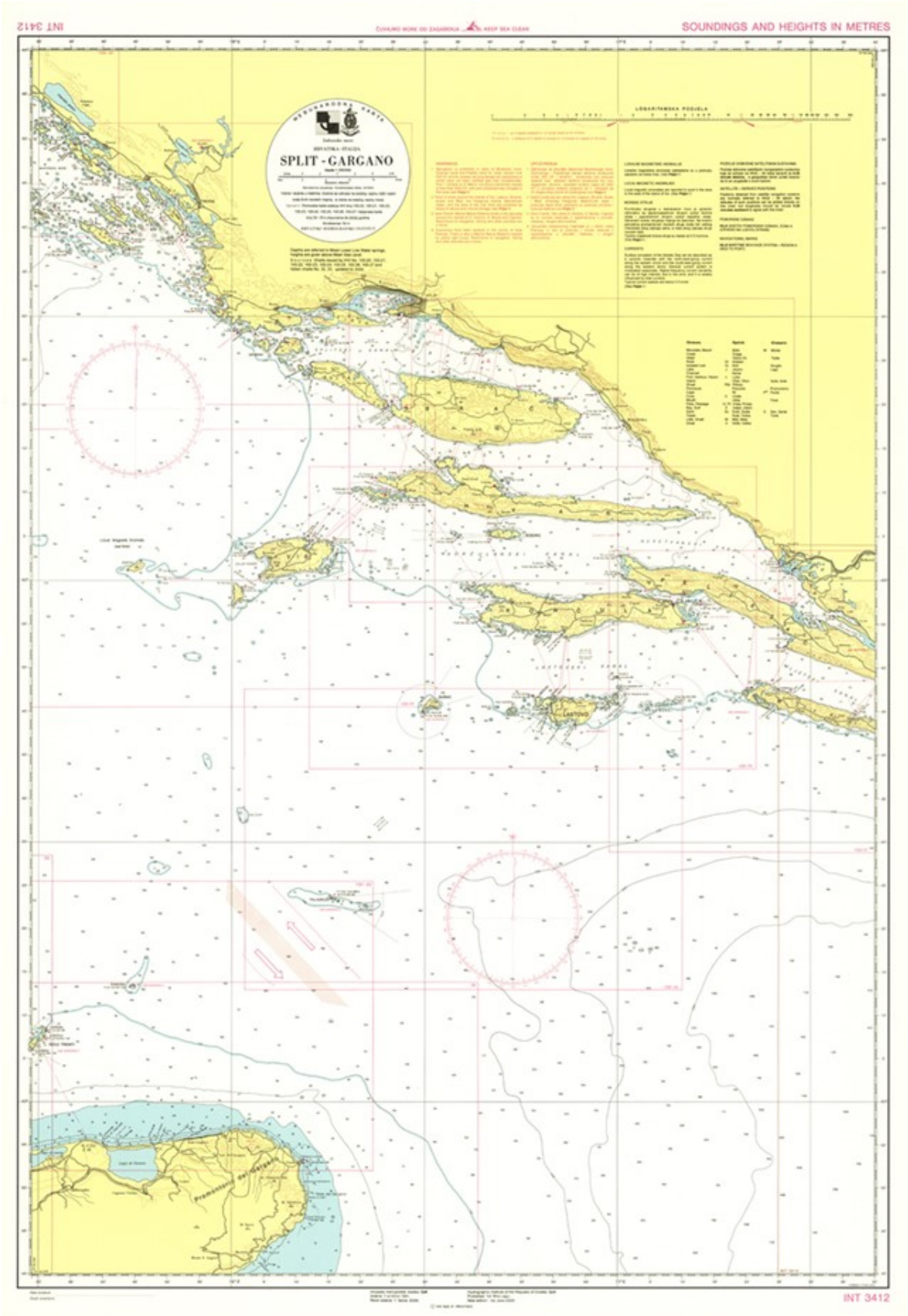


Figure 15. INT 3412 Split − Gargano 1:250 000

Revised reprint:
2023:
29 charts and 12 plans: MK I (12 charts), MK II (17 charts)
2022:
Chart No. 22 Kvarnerić (port plans), MK I (12 charts), MK II (17 charts)

Problems encountered

1. Some **inconsistencies observed between national (HR) paper charts and ENCs** are under constant consideration and deliberation. Furthermore, any feedback received from users, the IHO or other hydrographic offices is a matter of urgent examination and solving.

2. Problems of **implementation of attributes SCAMIN** have been recognized as a key task to be realized in the ongoing period. Therefore, all information about the methodological approach to the problem, organizational model and estimated time needed for implementation of attribute SCAMIN on HR ENC is of great importance and one of the objectives of the course. Regarding the issue of rescheming our UB3 ENCs, we made a thorough analysis and defined an implementation plan. Timeline of the plan is aligned closely with the procedure of transitioning from S-57 to S-101 and with a change from a file-based to a data-based production system for ENC cells with which we hope to eliminate discontinuities between products and elevate overall quality of the charts.

3. One of the challenges for the CHI will be **transition to the new generation of ENC produced according to S-101 standard.** The issue is almost equally demanding in organisational, technical-technological, and financial terms as the issue of transition from paper versions of navigational charts to digital ones (ENC). The transition issue is additionally complicated by the fact that it will be necessary to ensure maintenance and availability of both ENC generations (Dual Fuel) for several years. Some initial tasks are assigned to responsible staff which cooperates closely with PRIMAR and ECC staff through several initiated and approved S-100 projects. Training is recognized as a key element for realization of transition from S-57 to S-100 series products and services.

4. As regards navigation areas of non-SOLAS ships, particularly the areas of navigation and stay of leisure boats and yachts, a significant contribution towards improving the hydrographic-navigational element of navigational safety was made through publishing of new Croatian ENCs based on the data obtained from the new hydrographic survey. Entire ENC folio has been made available to end users on ships and to maritime administration worldwide through a network of authorised distributors by PRIMAR.

5. In the two-year period, the systematic hydrographic survey covered difficult areas such as shoals, coastal areas, harbour approaches, a large number of marinas and boat harbours, having achieved a significant progress in the survey of critical areas. This is evident from the total area surveyed, which includes the above-mentioned difficult parts (3,018 km^2). Based on the survey data collected, a minor part of new ENCs will be produced, and mostly the existing ENCs will be updated (current number of ENCs is 315), providing sufficient coverage in terms of maritime safety.

4. NAUTICAL PUBLICATIONS

National official nautical publications series

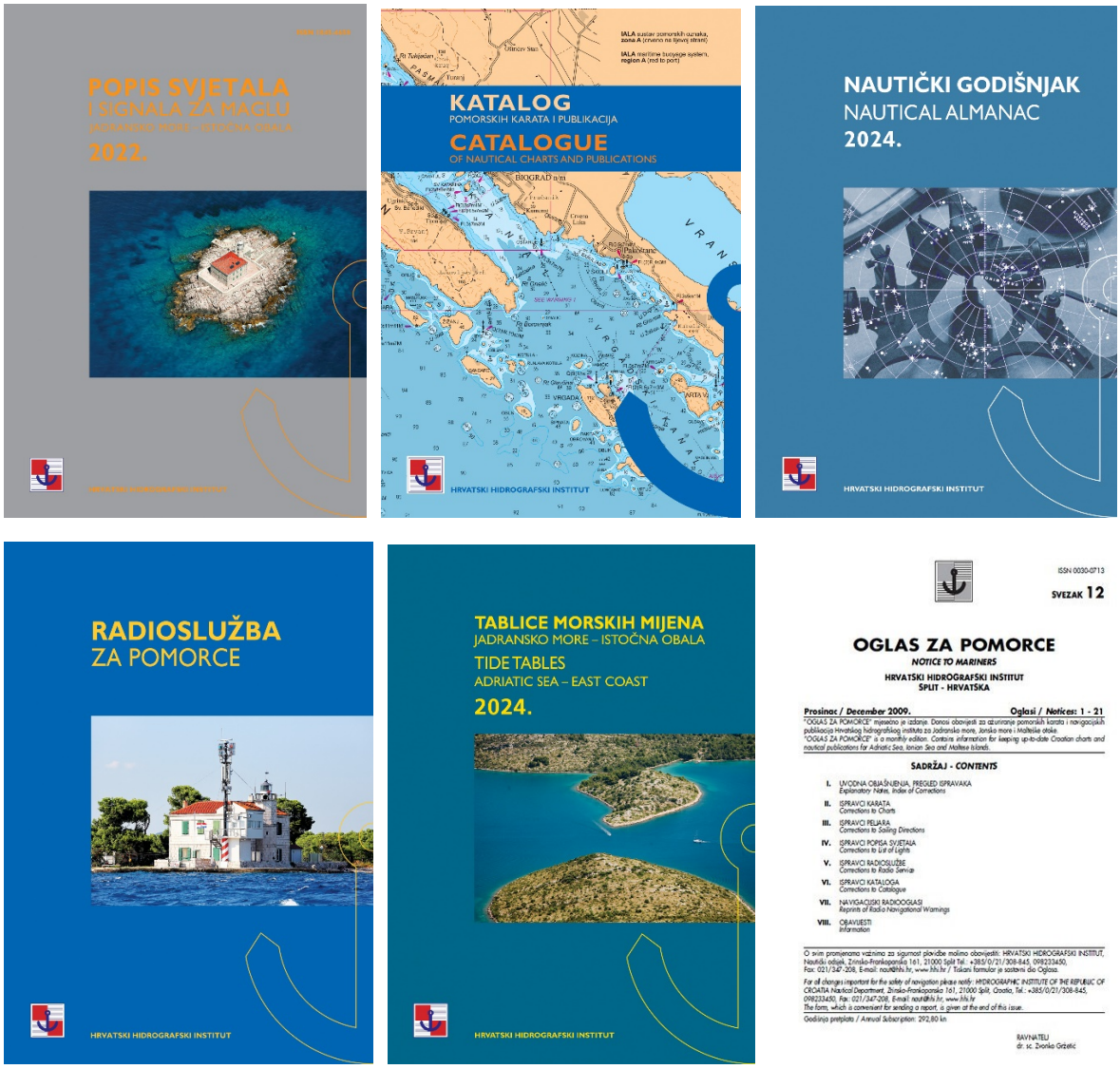


Figure 16. CHI official nautical publications

Issue of Nautical publications

Since the 23rd MBSHC Conference the following publications have been issued:

Tide Tables:
– Tide Tables 2022
– Tide Tables 2023
– Tide Tables 2024
Nautical Almanac:
– Nautical Almanac 2022
– Nautical Almanac 2023

List of Lights and Fog Signals 2022
Catalogue of Nautical Charts and Publications 2022/2024 (paper and digital editions)
Notice to Mariners (paper and digital monthly edition)
Radio Service

World Port Index (WPI)

The process of realizing MBSHC permanent action PA11 related to an update of the World Port Index (WPI) was initiated by Coordinator of the Region F INT Charting Coordination Working Group (FICCWG). The CHI has updated its port priority list and reported it to the Regional Charting Coordinator. The Port priority list includes a total of 98 ports of national importance, the highest percentage of which are covered by the appropriate ENC cell.

5. MARITIME SAFETY INFORMATION (MSI)

5.1. Existing infrastructure from MSI dissemination

In the Republic of Croatia MSI service (Navigational Warnings) is available 7/24/365. NAVTEX broadcasts are transmitted in English and Croatian. The MSI is transmitted regularly on VHF channels of coast radio stations.
Correctness of the promulgation of information is controlled on the NAVTEX receiver and VHF station installed in the CHI Nautical Department. There is no failure occurring during ordinary operation.

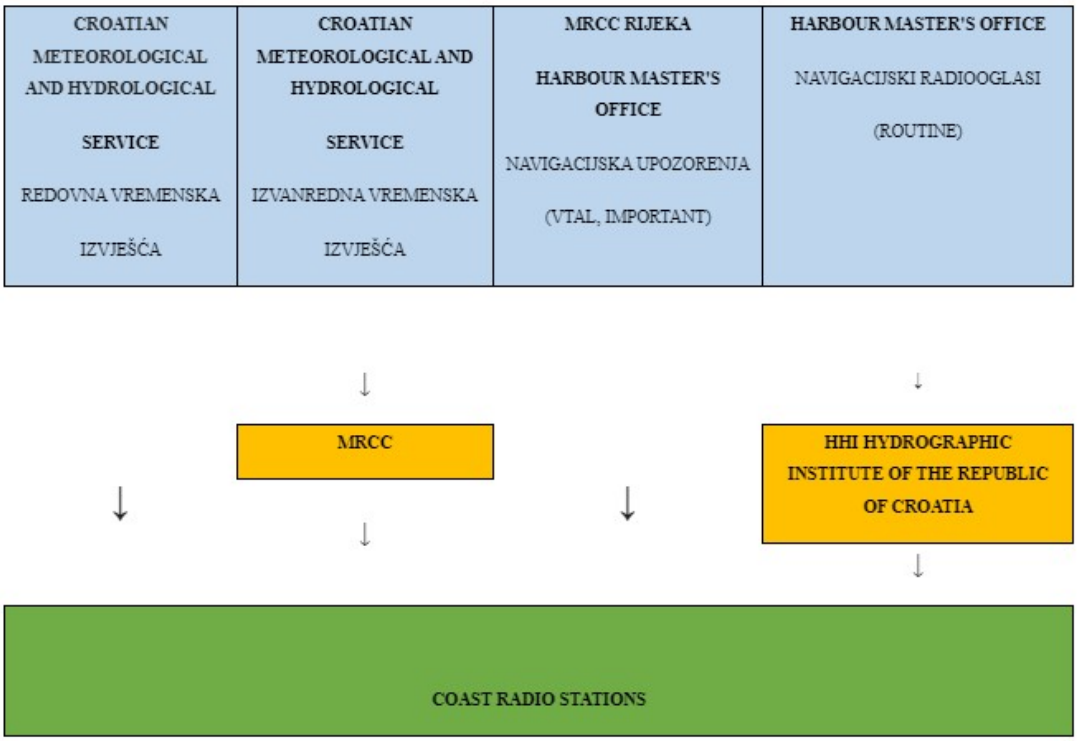


Figure 17. MSI organizational chart in Croatia

Notice to Mariners (NtM) is a monthly edition of the Hydrographic Institute of the Republic of Croatia. Notice to Mariners is used for the maintenance of charts and nautical publications. E-Service is available under digital formats on the CHI website (https://www.hhi.hr/en/e-services/notice-to-mariners).
Digital Notice to Mariners provides monthly updates for official editions, as well as archives of previously published digital notices.

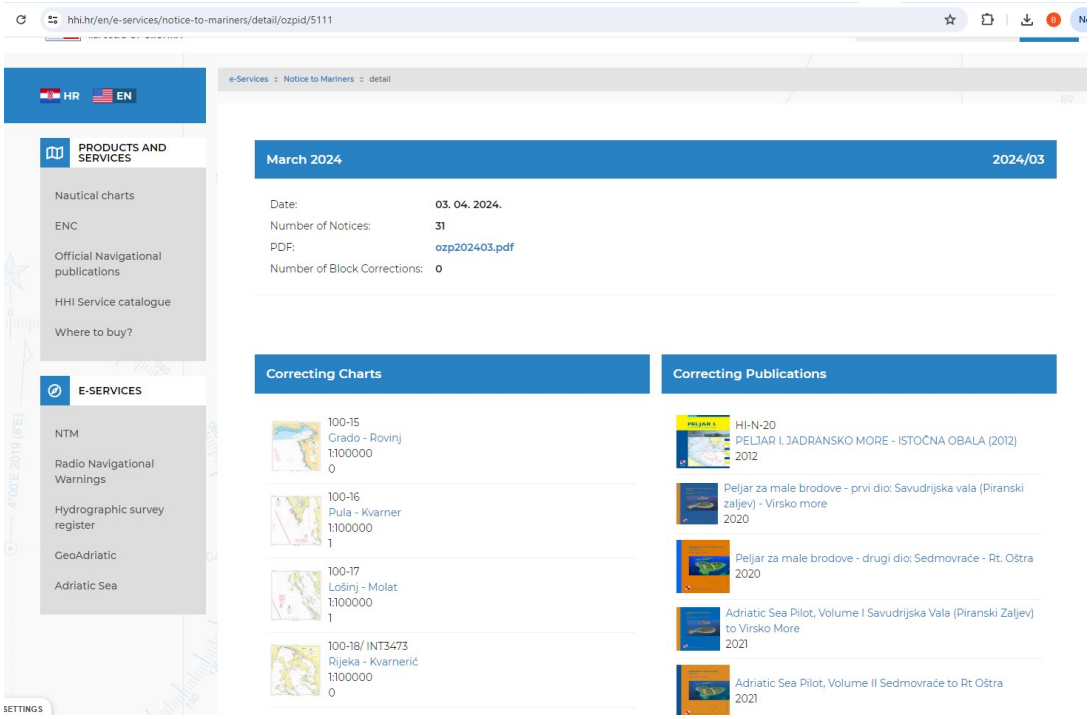


Figure 18. Display of Notice to Mariners on the CHI website

Production and digital distribution of Radio Navigational Warnings

The CHI Nautical Department cooperates intensively with relevant factors in the maritime domain, such as: harbour master's offices, coast radio stations, Croatian VTS and MRCC, Croatian Navy, shipowners, private boaters, etc. The main goal is to ensure safety of navigation by gathering the urgent safety information and issuing navigational warnings. Furthermore, the CHI Nautical Department cooperates with NAVAREA III Coordinator in Cadiz through Coast Radio Station Split, and no difficulties were identified in overall communication.

Navigational warnings are drafted according to the IHO publication S-53, and a high degree of unification and standardization has been achieved when it comes to general principles applied to message drafting. Hence, the CHI Nautical Department continuously contributes to overall quality and consistency of MSI messages.
E-Service Navigational Warnings is available on the CHI website. (Fig. 19)
For visualisation of radio navigational warnings, the CHI organizes the information according to the IHO draft standard for navigational warnings S-124.

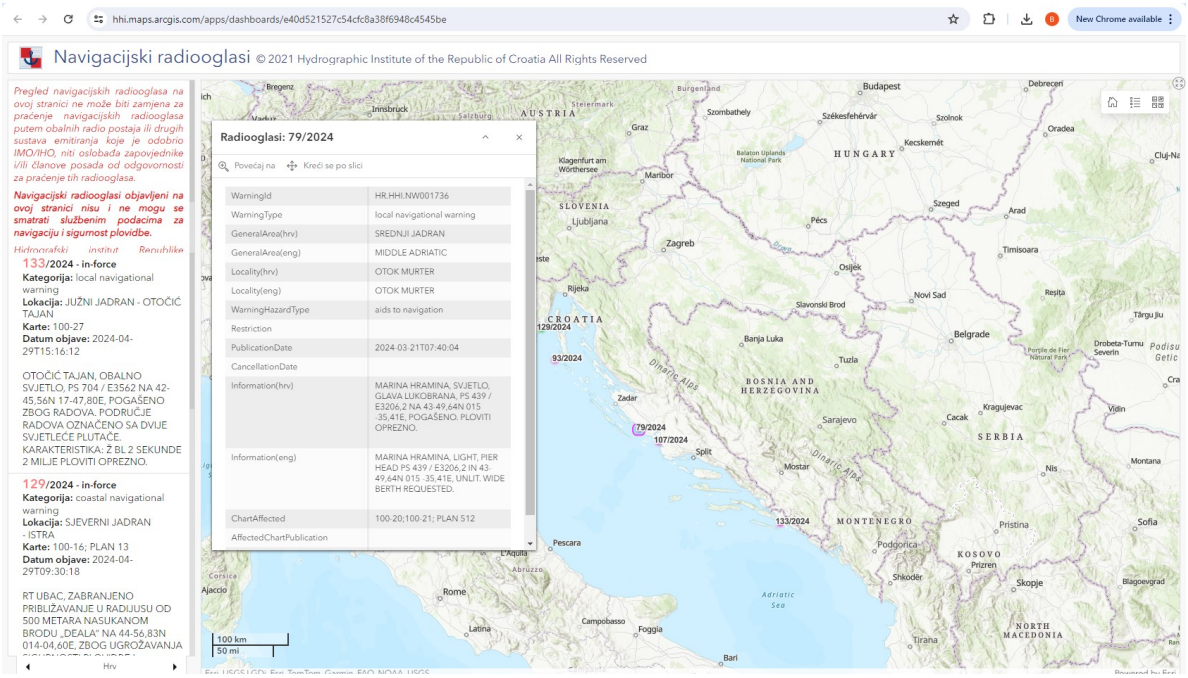


Figure 19. Display of digital distribution of Radio Navigational Warnings in force on the CHI data portal GeoAdriatic – Croatian Marine Spatial Data Portal (https://geoadriatic.hhi.hr/)

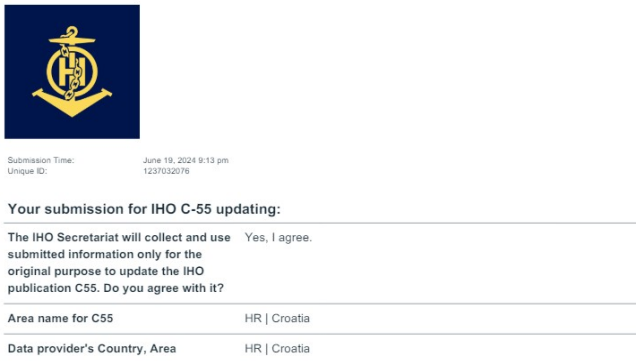
Schedule of navigational warnings is shown in the following table:

NAV. WARNINGS	2021	2022	2023	2024 (until 3 April)
NAVAREA	7	4	0	0
COASTAL*	169	151	165	24
TOTAL	**176**	**155**	**163**	**24**

* At the request of *ITALIAN NAVTEX SERVICE (CENTER)*, the CHI broadcast 88 notices relating to *MOSE SYSTEM VENICE.*

6. IHO PUBLICATION C-55

Updating information was provided on 19 June 2024 using a new IHO online submission functionality (Fig. 20).


Submission Time: June 19, 2024 9:13 pm
Unique ID: 1237032076

Your submission for IHO C-55 updating:

The IHO Secretariat will collect and use submitted information only for the original purpose to update the IHO publication C55. Do you agree with it?	Yes, I agree.
Area name for C55	HR | Croatia
Data provider's Country, Area	HR | Croatia

Figure 20. IHO C-55 online submission updates

7. CAPACITY BUILDING

New technologies

Equipment/instrument

The CHI continuously invests in the new equipment in order to collect on the spot as much data as possible on unsurveyed areas, to comply with the IHO standards. In the past two years, we acquired Reson SeaBat T50-R Multibeam Echosounder and EdgeTech 4205 Tri-frequency Side Scan Sonar (Figs. 21, 22)

Figure 21. Multibeam Reson SeaBat T50-R

Figure 22. Side Scan Sonar (SSS) EdgeTech 4205

The CHI has six permanent tide gauge stations for measuring sea level heights and recording sea level fluctuations (Rovinj, Rijeka, Zadar, Split, Ploče, and Dubrovnik). On the basis of collected and processed data, regular publications Report on Tidal Measurements and Tide Tables are published.

The Hydrographic Institute of the Republic of Croatia has set up a new permanent tide gauge station at Rijeka. The station is fitted with radar sensor for measuring sea level heights (Fig. 23).

The data obtained from this tide gauge station will be particularly important for regulation of navigation in the port of Rijeka. In addition to enhancing the safety at sea, it will facilitate the

production of new navigational charts of a wider sea area of Rijeka. The collected data are important for studying and estimating the rising trend of mean sea level, as well as for determining reference surfaces for hydrographic and land surveys.

Figure 23. New permanent tide gauge station at Rijeka

Vaisala PTB300 digital air pressure measuring device with an associated microcomputer was installed in Zadar (Fig. 24). The obtained data will contribute to the analysis of extreme floods in the Adriatic and will have, in addition to the scientific contribution, a strong social component in providing updated assessments of current and future flood risks along the Adriatic coast.

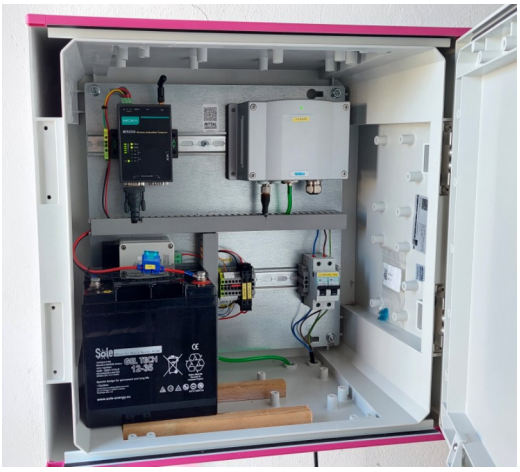


Figure 24. Microbarograph installed in Zadar

Datawell DWR MKIII 0.7 m waverider buoy was recently purchased (Fig. 25). It is the world's standard for measuring wave height and wave direction. The instrument is equipped with an HF antenna that provides the possibility of sending collected data on the height and direction of the wave at distances of up to 50 km. The data is additionally stored in the internal memory on a Compact Flash card with a capacity of 1 Gb. For better visibility in difficult weather conditions (night, rain, fog...), there is a yellow flashing LED light on the top of the antenna. The waverider buoy is also equipped with a GPS sensor that sends the precise position of the buoy. The temperature sensor measures the surface temperature of the sea. The instrument has an autonomy of one year but with the installed solar panels autonomy of the device is extended up to three years.

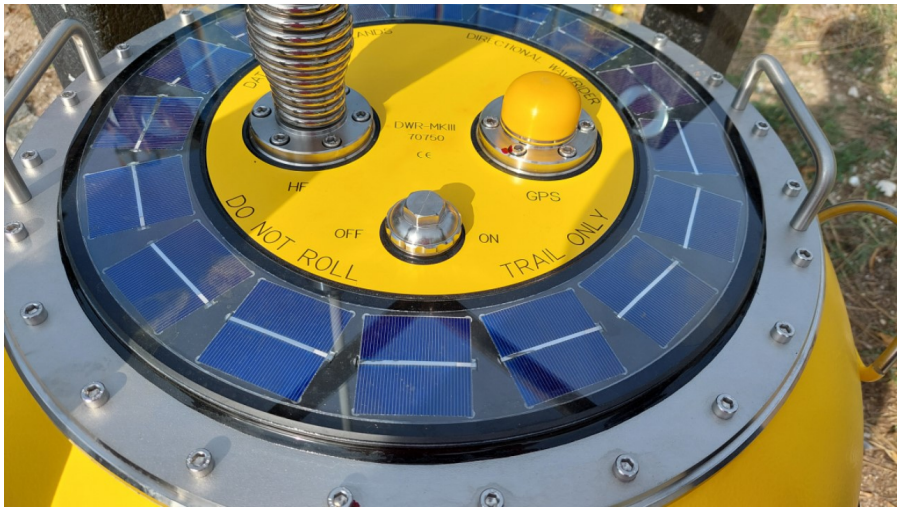


Figure 25. Datawell DWR MKIII 0.7m waverider

Computer and communication infrastructure

It is planned to implement new network equipment that would achieve higher data traffic speed within the CHI computer network. By upgrading the network, the speed of Internet access increases, which is a prerequisite for the use of new technologies and data storage services in the cloud. New and modern personal computer equipment is continuously acquired. Illustration of the CHI Data Centre (Fig. 26).

Figure 26. Server infrastructure in the CHI Data Centre

Print on Demand printing technology has been used for many years, using a large format plotter capable of producing high-quality paper charts printed to order (Fig. 27). Usage of the Print on Demand process is important because customers are receiving up-to-date nautical charts. After printing, the nautical paper chart shall be up to date with the latest NtM (Notice to Mariners).

Figure 27. Print on Demand

WEB Services

The official CHI website (https://www.hhi.hr/) is regularly updated on a daily basis, and new content is added (Fig. 28).

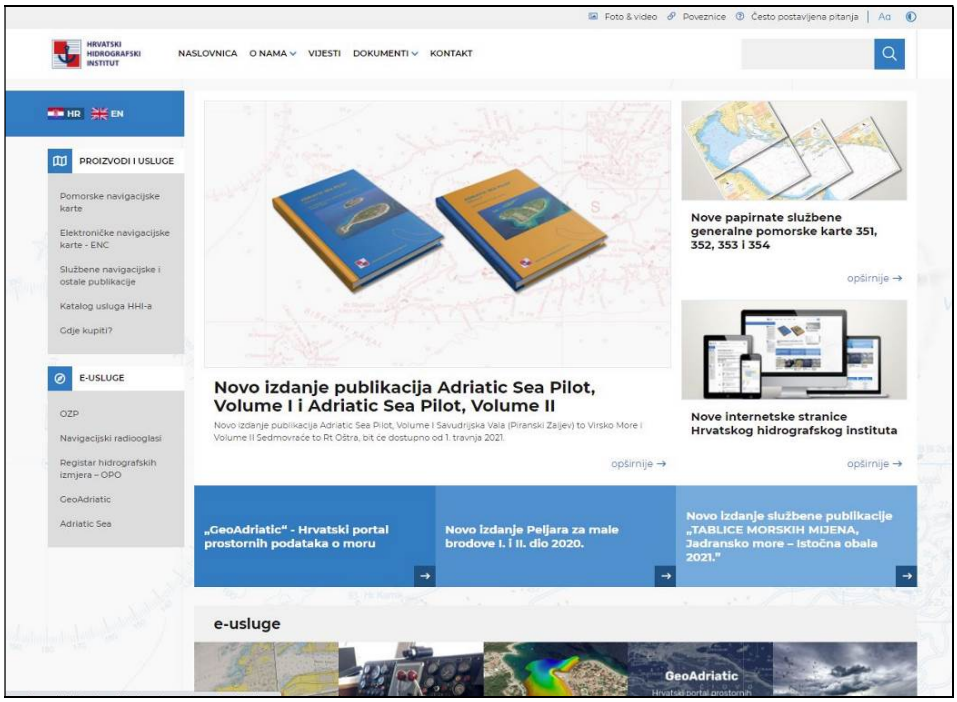


Figure 28. New CHI web pages

Croatian Marine Spatial Data Portal (https://geoadriatic.hhi.hr/) provides search and view services for marine spatial data, and e-services within the scope of the Hydrographic Institute of the Republic of Croatia (for more information see page 26).

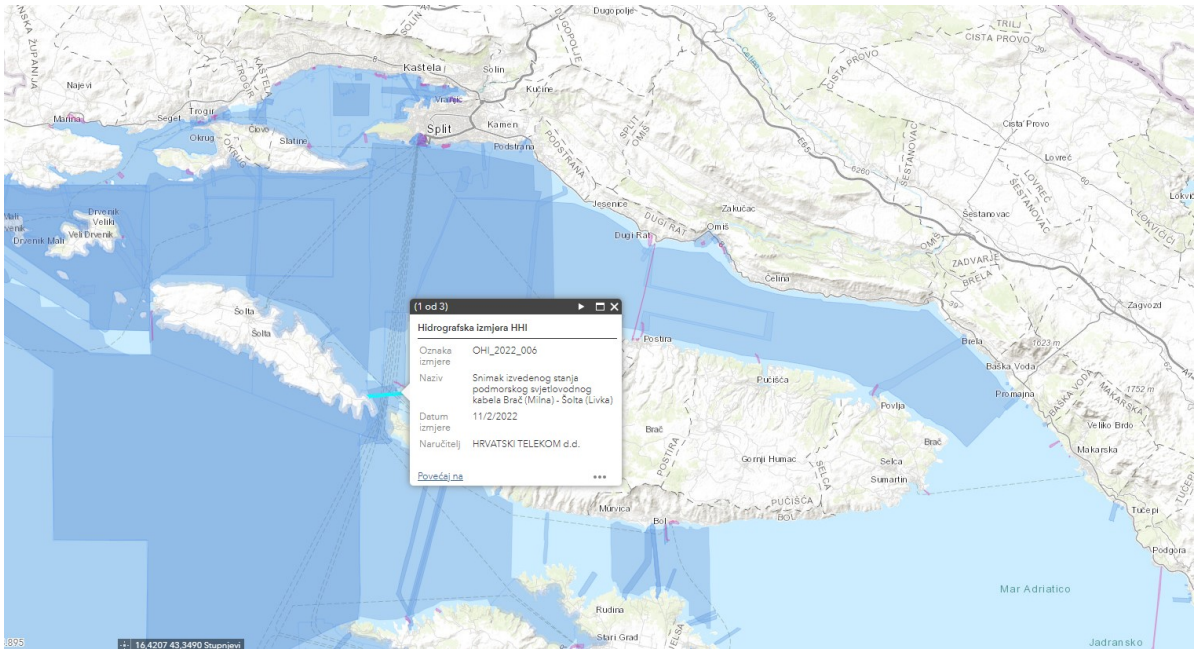


Figure 29. Official hydrographic survey browser (https://geoadriatic.hhi.hr/)

Online publication Catalogue of Nautical Charts and Publications is updated on a regular basis (Fig. 30).

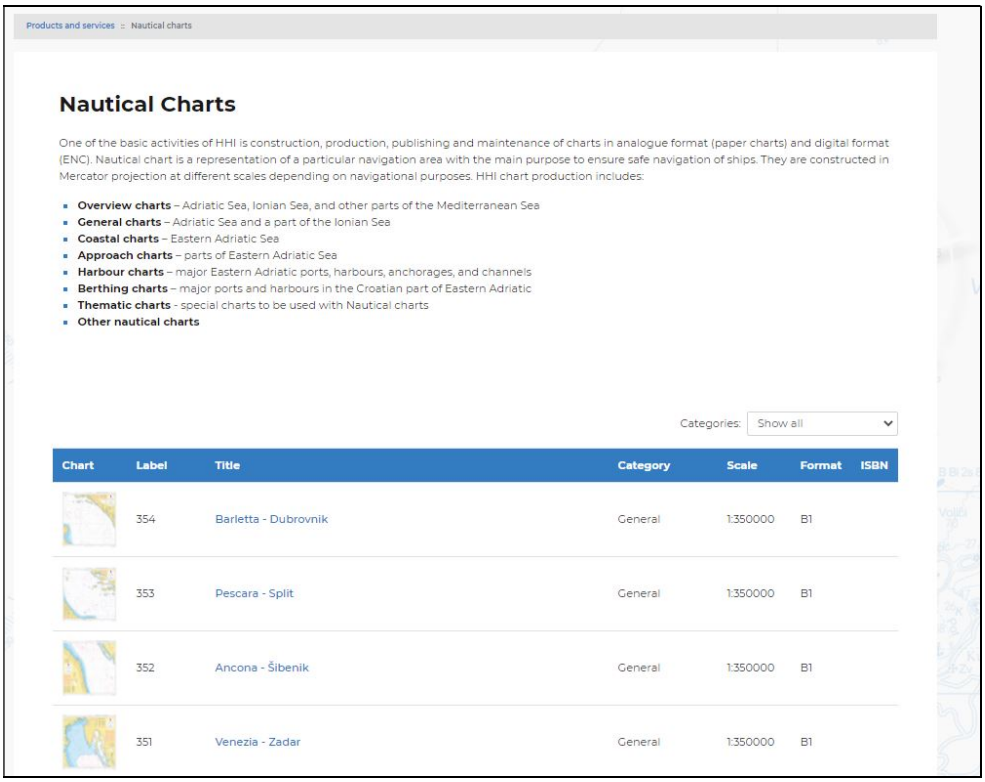


Figure 30. Online Catalogue of Nautical Charts and Publications

E-Services of Notice to Mariners and Navigational Warnings are available on the CHI website.

Navigational warnings are updated promptly on the CHI website, as soon as new information is reported and promulgated to mariners by ordinary means (NAVAREA, NAVTEX or VHF) (Fig. 31).

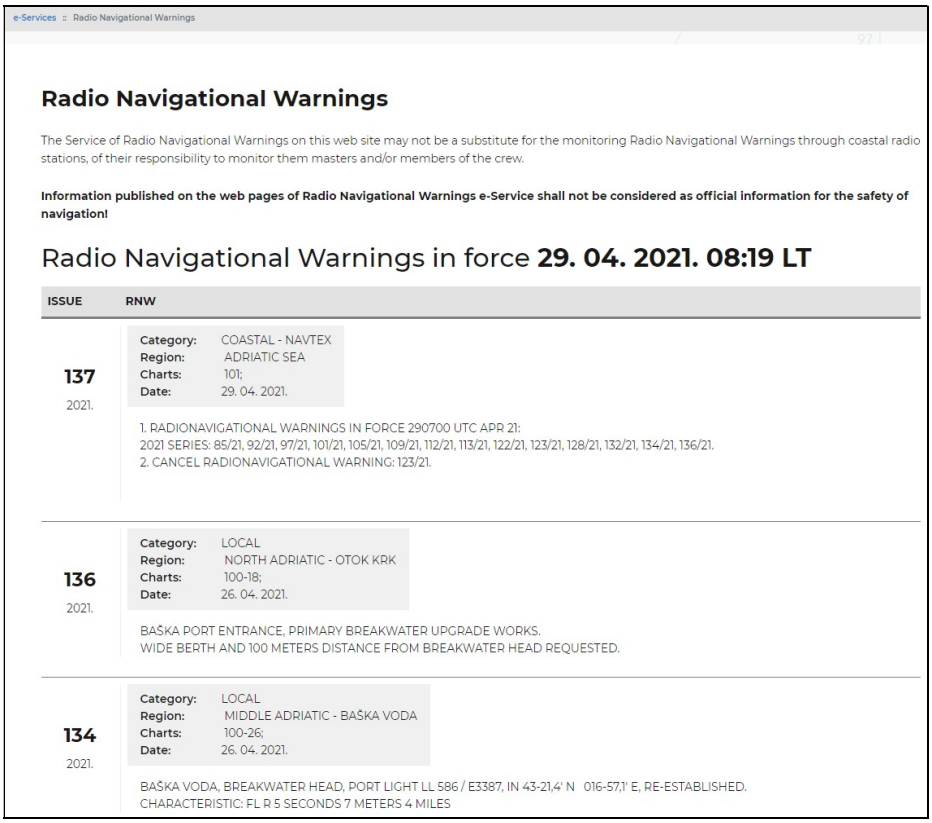


Figure 31. Navigational Warnings e-Service

GIS Component of RNW Service

RNW Service also got its GIS component, and now you can see Navigational Warnings and how they look on the map. (https://geoadriatic.hhi.hr) (Fig. 32).

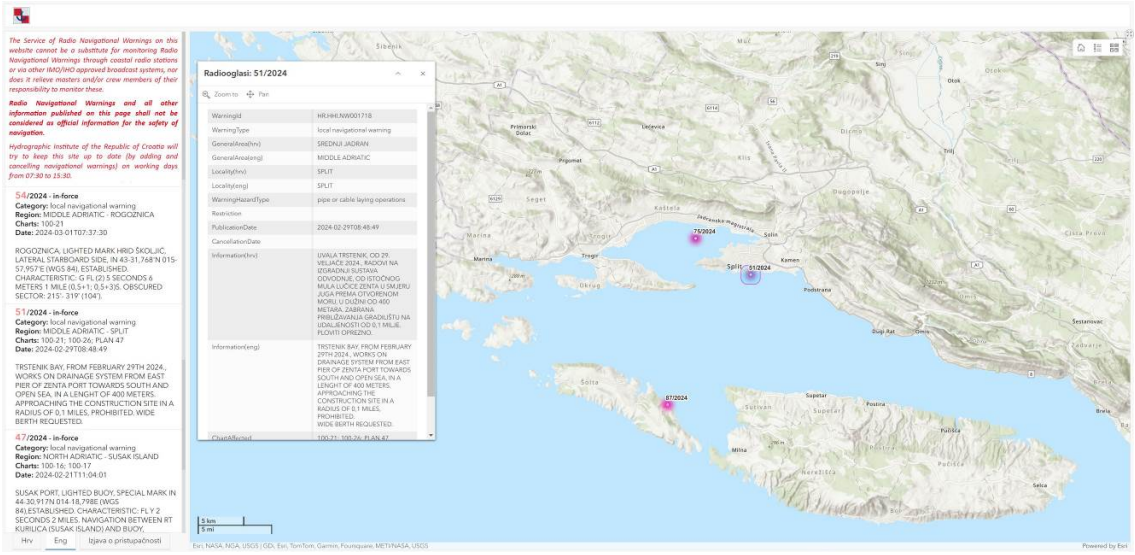


Figure 32. GIS Component of RNW Service

Mobile application Cro Nav Support

A new Cro Nav Support mobile application has been introduced, which brings the content to smartphones as well. The main contents are NtM and RNW. The application itself is accessible to people with disabilities, especially to people with dyslexia. (https://cns.hhi.hr) (Figs. 33, 34)

Figure 33. CNS – Home screen

Figure 34. CNS – RNW screen

Online Library Catalogue

Special library software package METELwin is upgraded aiming to promote the resources of the CHI Library, including several modules (cataloguing and classification, management of users' records, statistics, search of library catalogue by all criteria) to cover most library operations. This new software enables online access and search of library catalogue (Fig. 35).

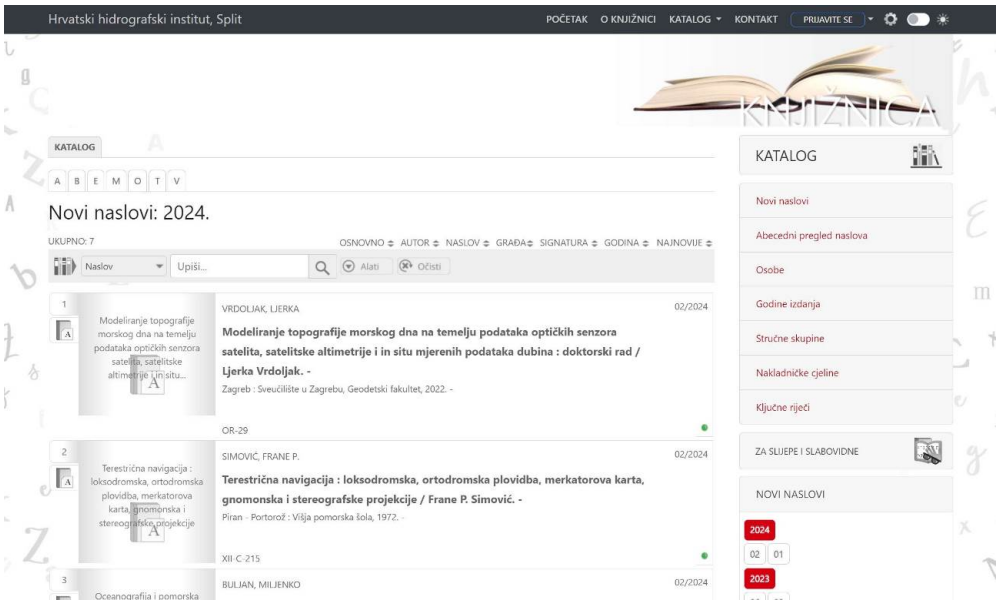


Figure 35. Online catalogue of the CHI Library

Oceanographic data acquisition system

Operational Oceanography Portal – Adriatic Sea Online is available on the new Institute website (http://adriaticsea.hhi.hr).

The traditional approach to oceanography is based on field research and data collection from remote coast stations or during research cruises, and subsequent post-processing and comparison with modelling results.

The importance of operational oceanography can be seen when studying climate change, disturbances in the marine food chain, safety of navigation, protection against flooding or protection against pollution. These are all problems that can occur in the Adriatic.

Having in mind all the above, the CHI has developed its own specialized web application called Operational Oceanography Portal – Adriatic Sea online. On this web page near real time measurements from tide gauge stations (Rovinj, Zadar, Split, Ploče, and Dubrovnik) and waverider stations in the Adriatic (Dubrovnik, Ploče, Split, and Rijeka) can be found. The application provides the ability to download measured data from web page directly. Also, CHI's intention is to establish new measuring stations and further upgrade the web application. Recently, a new module for displaying data collected from the meteorological station was developed and added to the Portal. This portal (Figs. 36, 37, 38) is the first step towards operational oceanography.

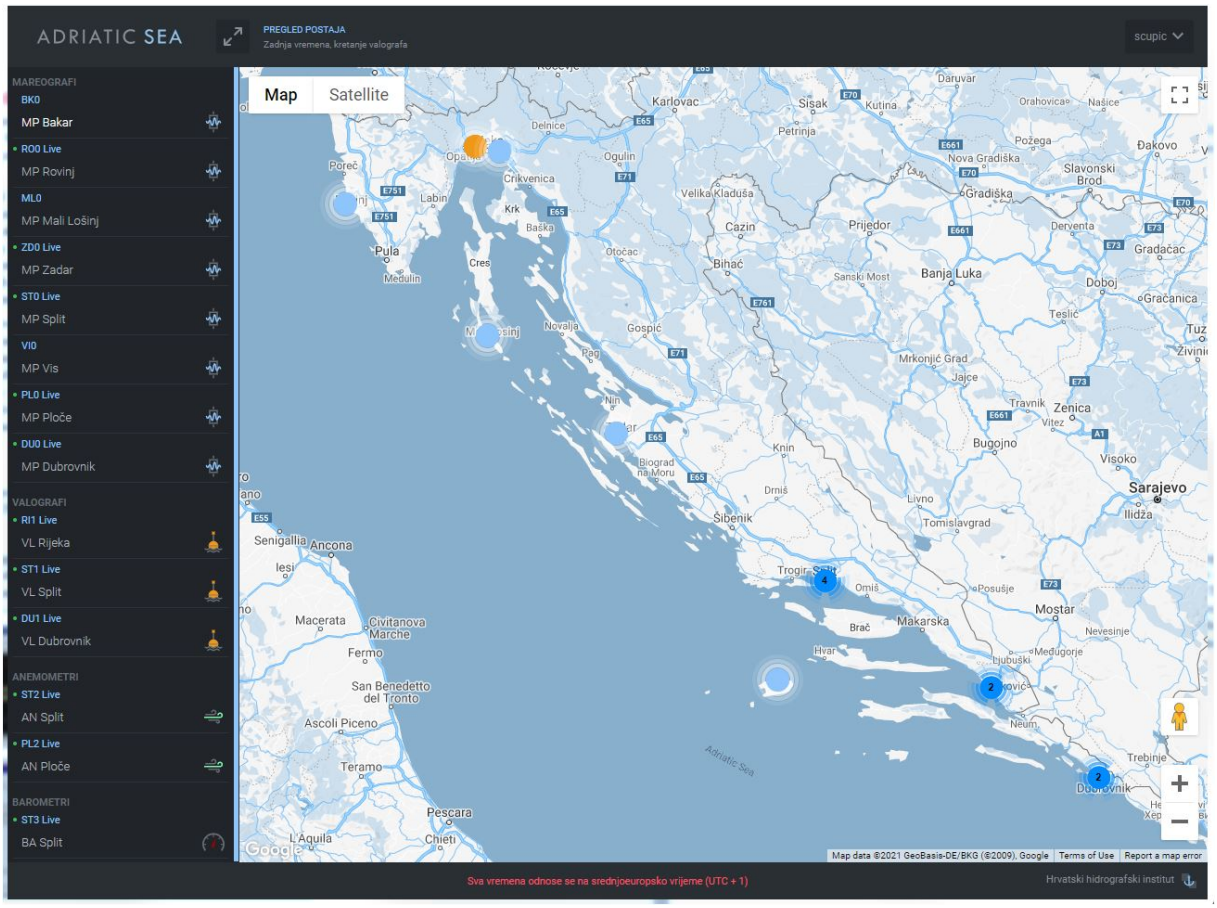


Figure 36. Operational Oceanography Portal – Adriatic Sea Online

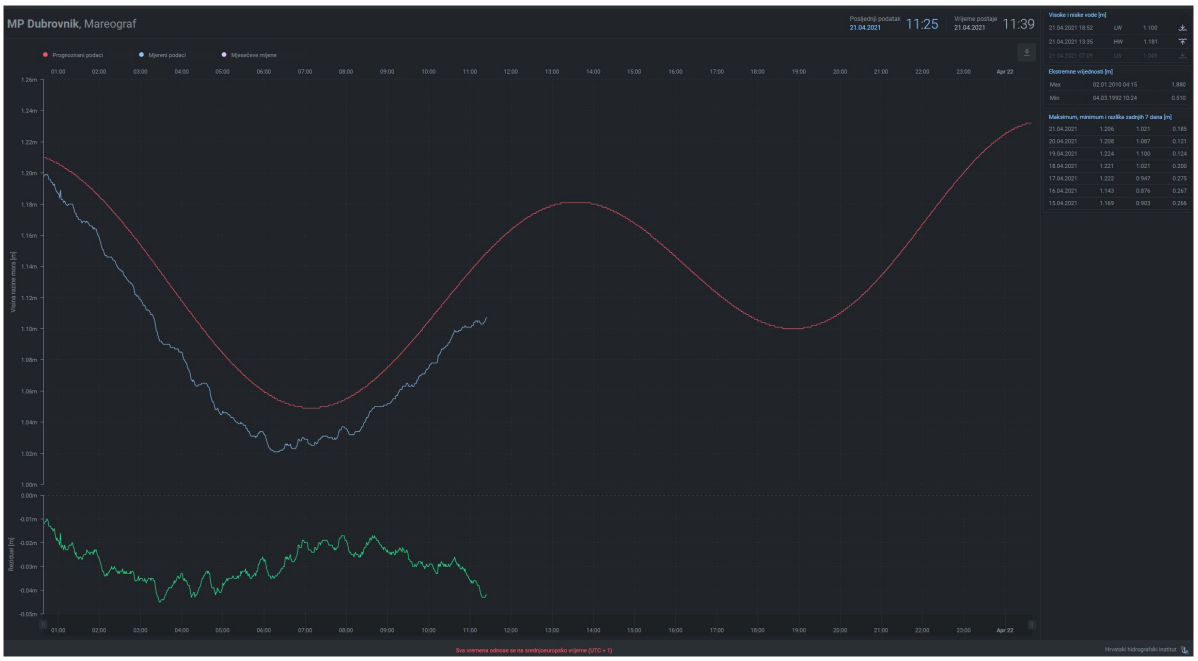


Figure 37. Tidal measurements and tide-gauge data e-Service

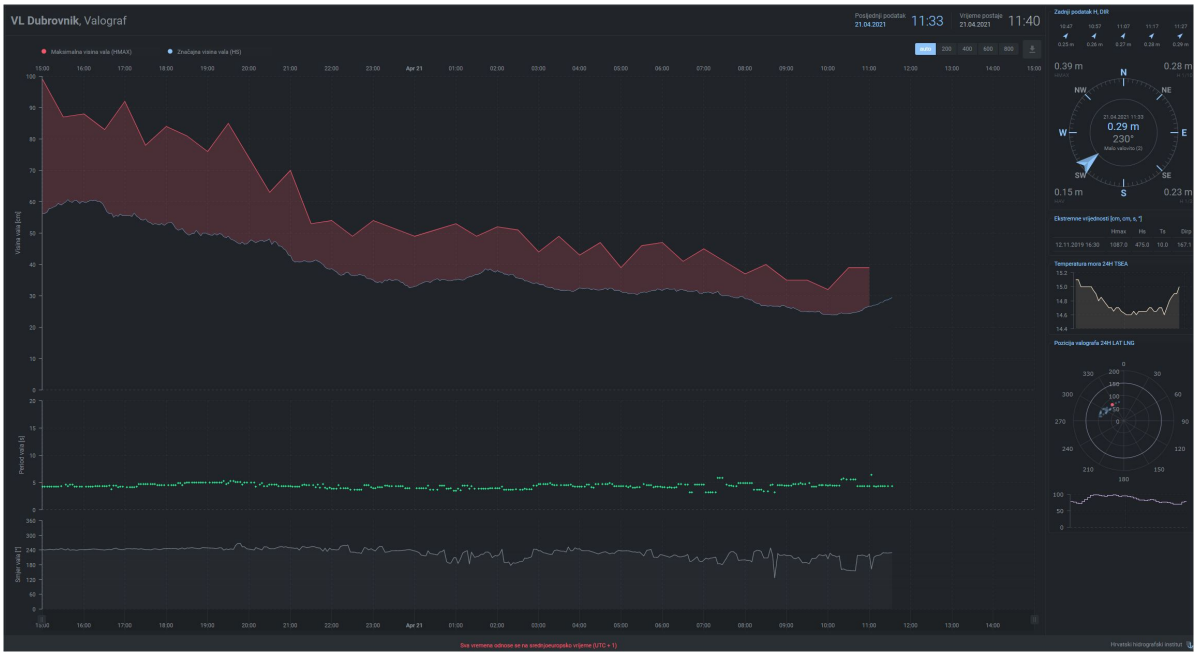


Figure 38. Wave measurements and tide-gauge data e-Service

MSDI

The CHI develops and maintains a MSDI, covering all maritime areas under Croatian jurisdiction. The information thus compiled is freely accessible on **C**HI's data portal GeoAdriatic – Croatian Marine Spatial Data Portal (https://geoadriatic.hhi.hr/).

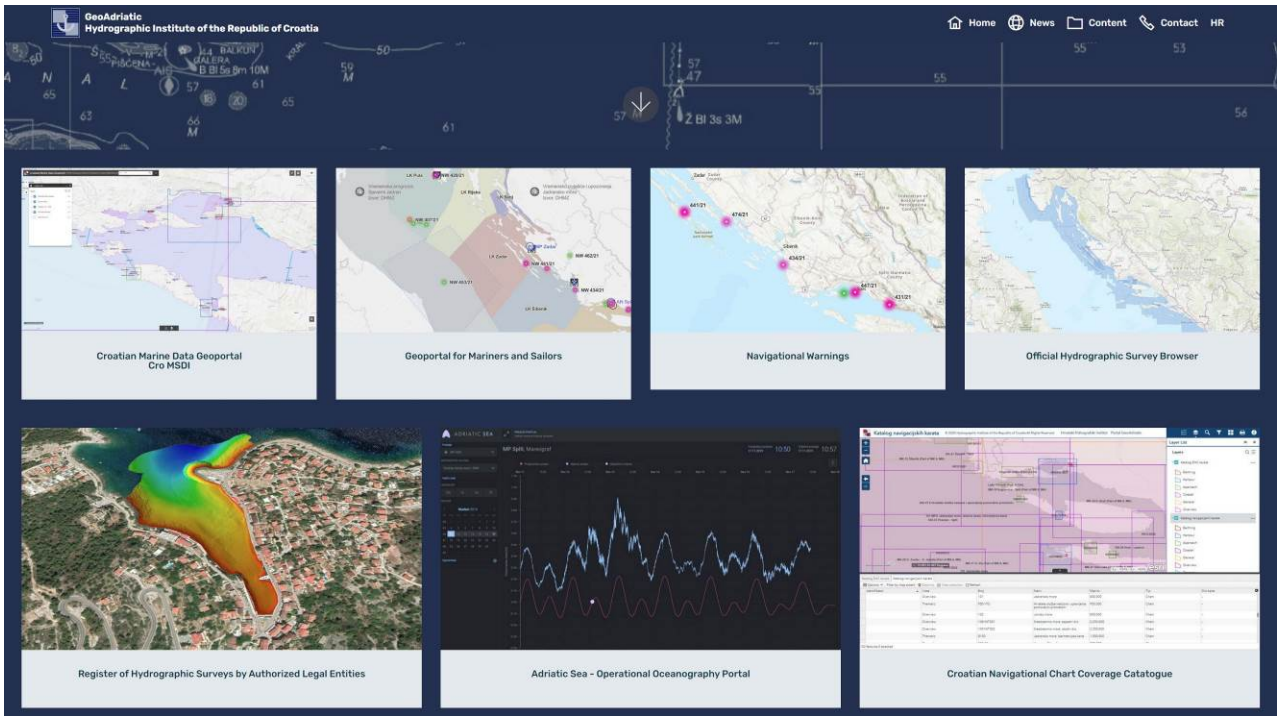


Figure 39. GeoAdriatic – Croatian Marine Spatial Data Portal

The data are organized to cover the following topics:

– Croatian Marine Data Geoportal Cro MSDI
– Geoportal for Mariners and Sailors
– Navigational Warnings
– Official Hydrographic Survey Browser
– Register of Hydrographic Surveys by Authorized Legal Entities
– Adriatic Sea – Operational Oceanography Portal
– Croatian Navigational Chart Coverage Catalogue
– Radio Navigational Warnings (WEB)
– Notice to Mariners (NtM)

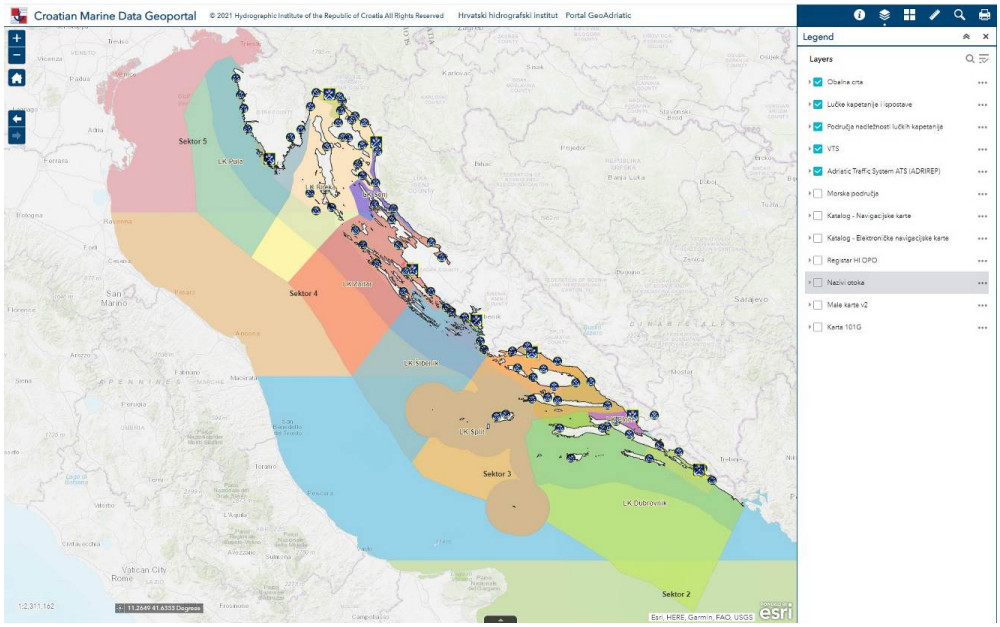


Figure 40. Croatian Marine Spatial Data Portal

Croatian Marine Spatial Data Portal (Fig. 40) provides search and view services for marine spatial data, and e-services within the scope of the Hydrographic Institute of the Republic of Croatia https://geoadriatic.hhi.hr/

The Portal is constantly populated with new data and services:

– Small Craft Charts (Adriatic Sea – Eastern coast) – WMTS
– Harbour master's offices and branch offices – WFS
– Harbour master's administrative areas – WFS
– Catalogue of Charts – WFS
– Catalogue of Official Electronic Navigational Charts (ENC) – WFS
– Catalogue of Official Electronic Navigational Charts (ENC) – WFS
– Marine areas of the Adriatic Sea – WFS
– Traffic separation scheme – WFS
– Vessel Traffic System administrative areas – VTS
– Coastline (by Counties) – WFS
– Hydrographic surveys
– Navigational warnings

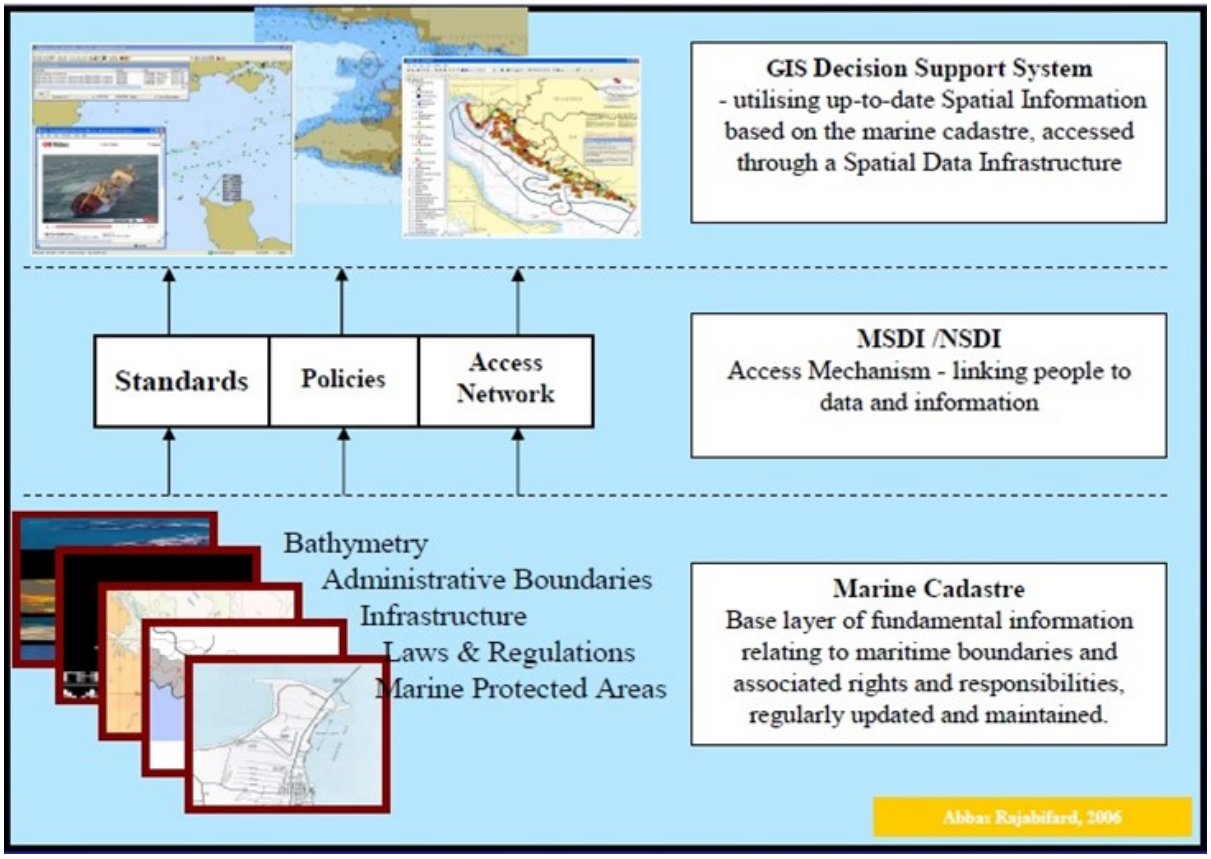


Figure 41. An overview concept of Croatian MSDI

In Croatia, Marine Spatial Data Infrastructure (MSDI) is a component of National Spatial Data Infrastructure, so currently the CHI provides metadata to the Croatian NSDI Geoportal that serves as a starting point for accessing spatial data sources that are, according to the NSDI Act (Official Gazette 56/2013), part of National Spatial Data Infrastructure (Fig.41)(http://geoportal.nipp.hr/en).

In future, the CHI plans to set up a conceptual framework for Croatian MSDI with other providers of marine data and partners. This includes building of a MSDI reference model and evaluating Metadata & Data geoportal.

Public release of "Coastline" by the Hydrographic Institute of the Republic of Croatia

Coastline has been publicly released on the CHI Geoportal, also allowing download services (WFS). For ease of use, the coastline is divided by counties.

The Adriatic Sea coastline is plotted on official nautical charts as a boundary between the land and the sea. The Hydrographic Institute of the Republic of Croatia defines coastline as the intersection of a land surface and a geoid surface determined by the mean high water on the tide gauges at Koper, Rovinj, Bakar, Split, and Dubrovnik for the epoch 1971.5 (Domijan et al., 2005). This definition is in accordance with the decision of the International Hydrographic Organization (IHO) on the delineation of coastline.

The coastline is derived from fair charts of different scales, being further periodically aligned with the new hydrographic survey data and the State Geodetic Administration digital orthophoto.

The publicly released coastline can be used without restrictions, with mandatory indication of sources.

The Hydrographic Institute of the Republic of Croatia, as subject of the National Spatial Data Infrastructure (NSDI), has published the coastline metadata in the NSDI Metadata Catalogue https://www.geohrvatska.hr/ (Fig. 42).

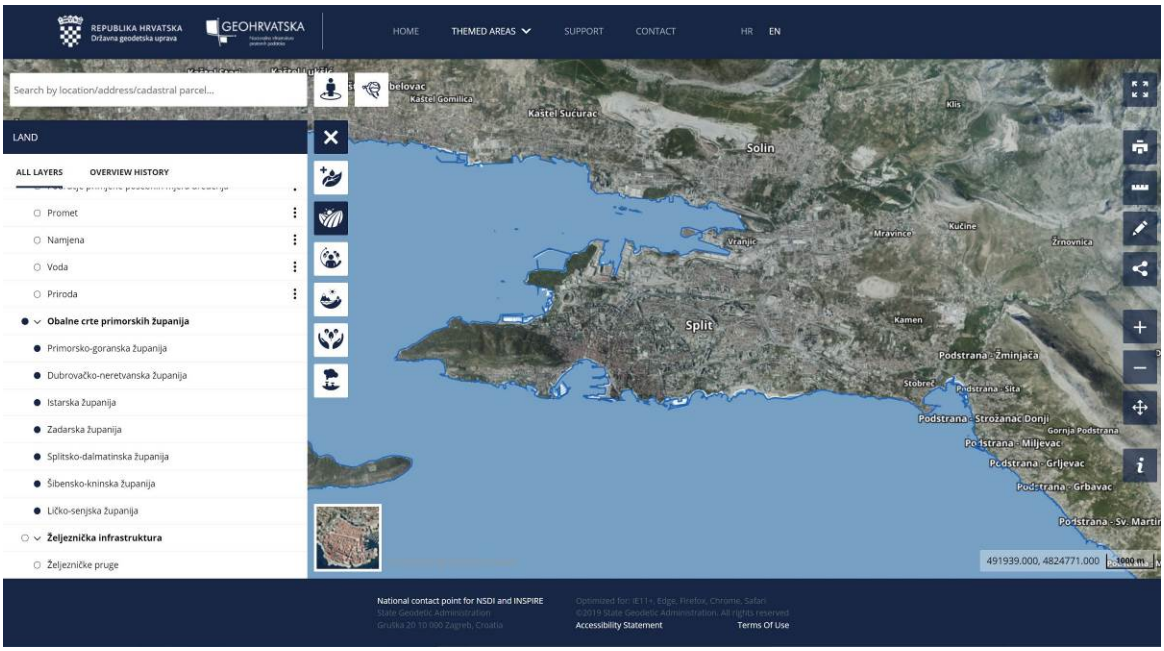


Figure 42 - www.geohrvatska.hr

Various maritime geographical information produced by the CHI is referenced on the Croatian NSDI (https://geoportal.nipp.hr/). Different kinds of CHI data are freely accessible on NSDI Geoportal.
https://geoportal.nipp.hr/geonetwork/srv/hrv/catalog.search#/search?facet.q=metadataPOC%2FHrvatski%2520hidrografski%2520institut&resultType=details&sortBy=relevance&from=1&to=20&fast=index&_content_type=json&any=hrvatski%20hidrografski%20institut&hitsPerPage=20)

Training

The CHI carries out training and capacity building activities on a continuous basis.

Participation in professional webinars and trainings

1. A total of 16 employees have registered to participate in a series of S-100-based online training courses organized by PRIMAR for its Member States.
2. Participation in a training course on Teledyne Reson T-50R Multibeam Sonar System Calibration and Testing (Murter, February 2022).
3. Participation in a training course on EdgeTech 4205 Side-scan Sonar System Training (Split, December 2023).
4. Participation in training courses on cartographic data management and Marine Spatial Data Infrastructure (MSDI). Representatives of the CHI participated in three-day training courses on cartographic data management and Marine Spatial Data Infrastructure (Istanbul, 5–9 December 2022), under the auspices of the International Hydrographic Organization (IHO), within capacity building activities in the Mediterranean and Black Seas Hydrographic Commission (MBSHC) region. These workshops presented options for managing cartographic data, adapting to new standards, and integrating spatial data and publishing them on geoportals through ESRI programmes.
5. Participation in a four-day seminar Python programming language, one-day seminar about GIMP application.
6. Participation in the Short Course on Marine Data Literacy, an intensive preparatory course on marine data offered by the European University of the Seas. The course provides the background on the value of data and its transformation into information and knowledge in the context of the digital age. It tackles the full range of data types covering the different data acquisition and generation platforms (e.g. observations and models), and including the merging of data of diverse nature (e.g. socio-economic and ecological) including non-scientific and qualitative data (e.g. resource tracking and mapping, demography, performance statistics, etc).
7. Participation in the workshop on MSDI Development & Implementation funded by the IHO CB Fund (Istanbul, 7–9 May 2024). This was a rewarding experience for Croatian representative, because MSDI is becoming more and more relevant due to marine spatial data integration and new standard S-100.
8. One CHI employee will participate in Category B Hydrographic Survey Programme at the Korea Hydrographic and Oceanographic Agency (KHOA) in Busan, from 17 June to 1 November 2024. This opportunity was offered by the IHO – Republic of Korea Programme of Technical Cooperation.

ISO Quality Management System

In 2022, recertification for the quality management standards ISO 9001:2015 and ISO 14001:2015 was successfully accomplished by the classification society DNV, and the certificates were renewed for the next period.

An external audit is performed on a yearly basis aiming to improve and confirm the certificates and ensure compliance of the CHI business processes with the ISO 9001:2015 and ISO 14001:2015 standards (Fig. 43).

Figure 43. Certificate of compliance with the ISO 9001:2015 and ISO 14001:2015 standards

Bilateral and Multilateral Cooperation

Bilateral agreements

In accordance with the Custodianship Agreement, which defines the licensing process for making the CHI data available to a third party, taking into account principles of the public service data and information regulations, successful cooperation is taking place with the UKHO (IPS).

Bilateral and multilateral meetings

Meeting of maritime administrations of Croatia, Slovenia, Bosnia and Herzegovina, and Montenegro in Split

The Hydrographic Institute of the Republic of Croatia on 4 and 5 March 2024 hosted the first working session of maritime administrations of the Eastern Adriatic countries: Croatia, Slovenia, Montenegro, and Bosnia and Herzegovina. Delegations from the four countries presented their institutions, legislative frameworks, organization, and procedures, exchanged experiences and discussed the possibilities of further cooperation (Fig. 44).

Figure 44. Meeting of maritime administrations in Split

IHO Council 7th Meeting, for the first time as permanent member

The 7th Meeting of the IHO Council was held in Monaco from 17 to 19 October 2023. The Republic of Croatia attended the Meeting for the first time as a permanent Council member (for the next three-year period).

The IHO Assembly

The CHI representative actively participated at the 3rd Session of the IHO Assembly 2023, which was held in Monaco from 1 to 5 May 2023.

Empowering Women in Hydrography – project by IHO and Canada

As part of the Third Session of the IHO Assembly in Monaco, an event connected to the project "Empowering Women in Hydrography" (EWH) was held on 1 May 2023. As the EWH project aims to encourage women's ability to excel in their careers and reach higher-level roles, the CHI supports this project and can boast not only a large representation of women employed in professional departments (cartography, navigation, hydrography, and geology), but also a woman at the head of the Institute, who is also the Chair of the largest IHO regional commission – Mediterranean and Black Seas Hydrographic Commission (MBSHC) and representing Republic of Croatia in the IHO Council.

CHI – IHM meeeting

On the premises of the Hydrographic Institute of Croatia (HHI), on 28 and 29 March 2023, a meeting was held with representatives of the Hydrographic Office of Spain (Instituto Hidrográfico de la Marina – IHM). The meeting was attended by the IHM Director Capt. Salvador Espinosa González-Llanos and Gustavo Adolfo Gómez-Pimpollo Crespo, representing Spain, while the HHI was represented by Director Vinka Kolić and her associates.

With the support and approval of the Ministry of Defence of the Republic of Croatia, representatives of the IHM and the HHI visited the military base Lora, where they were hosted by the Croatian Navy representatives. (Fig. 45)

Figure 45. Meeting with the representatives of the Hydrographic Office of Spain

PRIMAR Advisory Committee Meeting

The 29th ordinary meeting of the PRIMAR Advisory Committee was held in Split from 8 to 9 November 2022 under the Croatian chairmanship. The meeting was chaired by the CHI director Vinka Kolić and attended by more than 20 representatives of hydrographic offices and PRIMAR members. Director of the International Hydrographic Organization (IHO) Rear Admiral Luigi Sinapi participated in the meeting as observer and IHO representative (Fig. 46).

Figure 46. PAC 29 meeting in Split

CHI-IHO-EMPA-CMPA-MMPI meeting

A working meeting was held on the CHI premises on November 2022, with the participation of: IHO Director, President of the European Maritime Pilots' Association (EMPA), President and Secretary of the Croatian Maritime Pilots' Association (CMPA), representatives of the Ministry of the Sea, Transport and Infrastructure (MMPI). The meeting was attended by the CHI Director and representatives.

Following the example of other renowned hydrographic offices, regarding cooperation with maritime pilots, being important end users of S-100 products and participants in implementing the S-100 standard, the CHI signed an Agreement on technical cooperation with the Croatian Maritime Pilots' Association, relating specifically to the testing of future S-100 products. The EMPA representative praised the initiative and cooperation with maritime pilots, and emphasized the importance of implementing the S-100 model and testing the new products, especially S-101 (ENC) and S-102 (bathymetry) (Fig. 47).

Figure 47. CHI-IHO-EMPA-CMPA-MMPI meeting in Split

23rd MBSHC Conference – Croatia assumed the MBSHC chairmanship for the next two-year period

The 23rd Conference of the Mediterranean and Black Seas Hydrographic Commission (MBSHC) was hosted by Slovenia from 29 March to 1 April 2022.

The Republic of Croatia, whose delegation consisted of representatives from the Hydrographic Institute, participated as a full member.

At the conclusion of the Conference, Croatia took over the MBSHC chairmanship from Spain for the next two-year period, in which Croatia coordinated the implementation of decisions and actions adopted at the 23rd Conference. The previous Vice-Chair Vinka Kolić, Director of the Hydrographic Institute, took over as Chair of the MBSHC.

Conferences, meetings, and participation in work of the IHO working groups

Oceanology International 2024

Participation in the Oceanology International 2024 in London. The OI 24 brings together 500+ exhibitors in the only event that links the three key players in the industry: businesses, academics, and government and with the live on-water demonstrations and interactive seminars (Fig. 48).

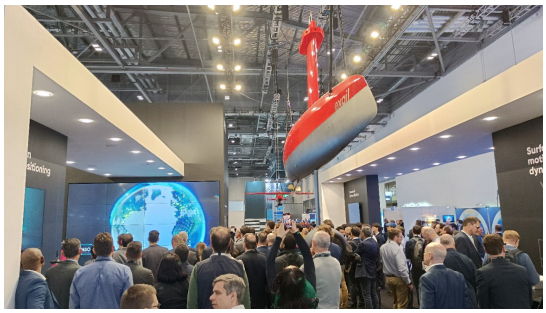


Figure 48. Oceanology International 2024 in London

HYDRO 23 Conference – Genoa

Participation in the HYDRO 23 Conference held from 7 to 9 November 2023 in Genoa, organized by the International Federation of Hydrographic Associations and the Italian Hydrographic Association. The focus of the HYDRO 23 Conference was on automation in hydrography (autonomous vessels) and the use of artificial intelligence in the processing of raw hydrographic data. The statuses and development plans of the new IHO standards (S-100) were presented, as well as new seminars for hydrographers (Fig. 49).

Figure 49. HYDRO 23 Conference – Genoa

European Geosciences Union – Vienna

Participation in the European Geosciences Union (EGU) General Assembly. The EGU is the leading organisation for Earth, planetary and space science research in Europe. We participated in two sessions (Climate and Ocean Literacy, Natural Hazards and Climate Change Impact in Coastal Areas).

Cres 2023 – scientific expert meeting

Online participation in the scientific expert meeting on 30 November 2023, with the topic "The possibility of defending the historic core of the city of Cres against storm surges and high tides". The focus of the meeting was on negative consequences of climate change and their possible effects on the seacoast using the example of the city of Cres.

Third CHART Project Alumni Seminar

The third CHART Project Alumni Seminar, organised by the International Hydrographic Organization (IHO), under the auspices of the Nippon Foundation, took place in London from 25 to 27 October 2023.

The seminar was attended by participants from national hydrographic offices who have already attained the status of Category B Nautical Cartographer, the level of competence highly desirable to hydrographic offices worldwide. Among numerous activities (strategy and development of Capacity Building Programme, CHART Project, cooperation with the Nippon Foundation, and network cooperation between all participants in the future), special attention should be given to presentations of participants on their work in their national HOs. They used this opportunity to discuss working methods of their national HOs, as well as challenges they face in daily work. The CHI was represented by its staff member Mr Ante Kolić, who was selected by the IHO (Fig. 50).

Figure 50. Representatives of IHO, NIPPON Foundation, UKHO trainers and students

13 IHO IEN Working Group Meeting

The 13th Meeting of the IHO-EU Network Working Group (IENWG) was held in Brest (France) on 23 May 2023. The Working Group deals with issues of cooperation between the IHO and the EU in the field of hydrography, in particular concerning models of cooperation for the purpose of collecting hydrographic data and availability of such data for wider use at EU Member State level. During and after the meeting, the CHI representative participated in the meetings with SHOM experts to discuss implementation of S-100 standard and exchange experiences on this topic (Fig. 51).

Figure 51. IENWG Meeting and European Maritime Day in Brest

13th Meeting of Worldwide ENC database working group

The IHO Worldwide ENC database working group (WENDWG) gathered at the 13th regular annual meeting in Aalborg, Denmark, 21–23 February 2023. The meeting was hosted by the Danish Geodata Agency (DGA). Croatia was represented in the work of WENDWG by the CHI delegate Dejan Lovrinčević. In the absence of representative and ENC charting coordinator for the Region F (Mediterranean and Black Seas Hydrographic Commission – MBSHC), Croatia, as Chair of the MBSHC, together with the IHO representative presented up-to-date information on activities undertaken and plans for implementation of S-100 products in the MBSHC region (Figure 52).

Figure 52: WENDWG meeting in Aalborg, Denmark

14th Meeting of the IHO Marine Spatial Data Infrastructures Working Group (MSDIWG)

The 14th Meeting of the IHO Marine Spatial Data Infrastructures Working Group (MSDIWG) took place in Genoa, Italy, from 30 January to 3 February 2023, hosted by the Italian Hydrographic Institute. As part of the IHO cooperation with the UN and OGC, the following joint meetings were also held: 4th Meeting of the UN Working Group on Marine Geospatial Information (WG-MGI) and OGC Annual Meeting of the Marine Data Working Group (MDWG). With more than 40 participants from 19 countries, the CHI representatives presented Croatian solution for MSDI as well as current achievements in the presentation and sharing of data within the CHI competence. The most important topics on the agenda were future development of MSDI in the light of upcoming standard S-100, production of new version (3.0) of publication C-17, further development of MSDI as Digital Twin of the reality of marine environment and infrastructure (Figure 53).

Figure 53. MSDIWG meeting in Genoa

Hydro 22 Conference and EMODnet Meeting

The HYDRO 22 Conference took place in December 2022 at the Grimaldi Forum, Monaco, organised by the International Federation of Hydrographic Societies (IFHS) and the French Hydrographic Society (Association Francophone d'Hydrographie – AFHY).

As part of the Conference, the meeting of the bathymetric working group within the EMODnet project (European Marine Observation and Data Network) was held. Project leaders presented the status of integration of regional digital terrain models (DTM) into a high-resolution EMODnet DTM (1/16 * 1/16 arc minute, about 115 * 115 metres), ready to be released as the final product of this project during the two-year period (2020–2022) (Figure 54).

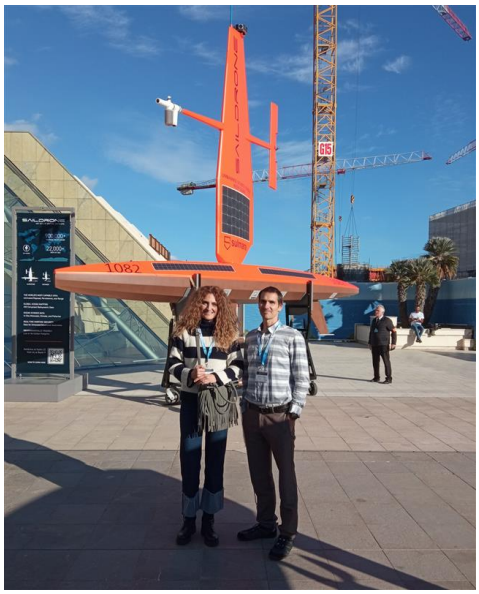


Figure 54. Hydro 22 Conference and EMODnet Meeting in Monaco

EU projects

1. The European Marine Observation and Data Network (EMODnet) Project

The EMODnet initiative has been launched by the European Commission – DG MARE as part of its Marine Knowledge 2020 strategy and is implemented in partnership with over 120 European organizations. Within the EMODnet, associated organizations are working together to bring together various sea information from a variety of sources and resources to enable searching and browsing to the wider public. More than 120 partner organisations located along the European seas are currently involved in the EMODnet programme. Most organizations include marine research institutes and national hydrographic offices, with the involvement of other experts from different research and ICT fields. These organisations work together to observe the sea, process the data according to international standards and make that information freely available as interoperable data layers and data products.

The CHI has been partnering in the project since May 2017. Croatia supplied part of the data Bathymetry and Geology layers in accordance with the national regulations and contributed to the administration of the project. More information about the project can be found at the following link: www.emodnet.eu

For the project EMODnet Bathymetry HRSM2, DTM's (Digital Terrain Model), SHP files and CDI (Common Data Index) files were created. For the EMODnet Bathymetry HRSM2, 1 CDI file for 1 DTM was created in 2024 (Fig. 55).

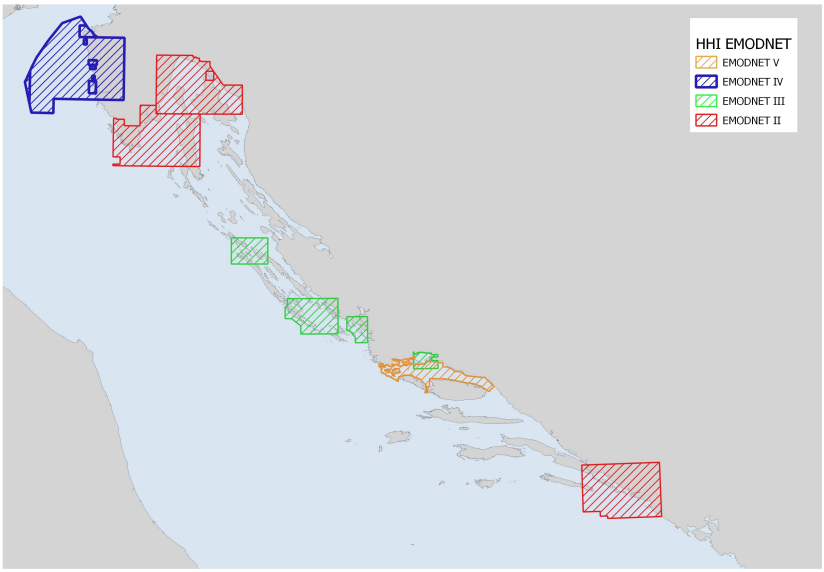


Figure 55. EMODnet Bathymetry 2017–2024 contribution https://portal.emodnet-bathymetry.eu

2. OPCC project Mapping of Coastal and Seabed Marine Habitats in the Area of the Adriatic Sea Under National Jurisdiction – Group 1: Service of mapping coastal sea areas

In 2022 and 2023, the CHI participated in the implementation of the project *Service of Mapping Coastal and Seabed Marine Habitats in the Croatian Coastal Sea and Seabed Marine Habitats on the Continental Shelf of Croatia, as part of the OPCC project Mapping of Coastal and Seabed Marine Habitats in the Area of the Adriatic Sea Under National Jurisdiction – Group 1: Service of mapping coastal sea areas.* This project covered a surface of 51% of coastal and seabed marine habitats in the Croatian territorial sea and continental shelf, and a complete map was produced to improve knowledge on the state of biodiversity, with the purpose of improving the conservation status of marine eco-systems, restoration of biodiversity, conservation and sustainable use of marine resources.
The CHI also participated in the CRONOS project of surveying the seafloor in Hvarski Kanal using sub-bottom profiler, as part of the geophysical and seismic investigation of seismically vulnerable areas in Croatia. Bathymetric survey was carried out as well as geological profiling of the seabed sediment layers around an estimated earthquake epicenter from 1962 in Hvarski Kanal (off Makarska) in order to locate possible active faults.
Survey of the situation of 56 submarine fiber optic cables routes was carried out (total length 313 km) and plotted in nautical charts and publications.

3. MED OSMoSIS Project

Under the project MED OSMoSIS, Pilot study 3 – Navigational warning module S-124 API, the CHI presented its own project of web production and presentation of radio navigational warnings. On the CHI web portal, radio navigational warnings are updated daily and presented in real time, with a graphic overview of position, content and precise spatial positioning (point and polygon). All the above-mentioned is intended to ensure preparation for the implementation of standard S-124 (Navigational Warnings) (Fig. 56).

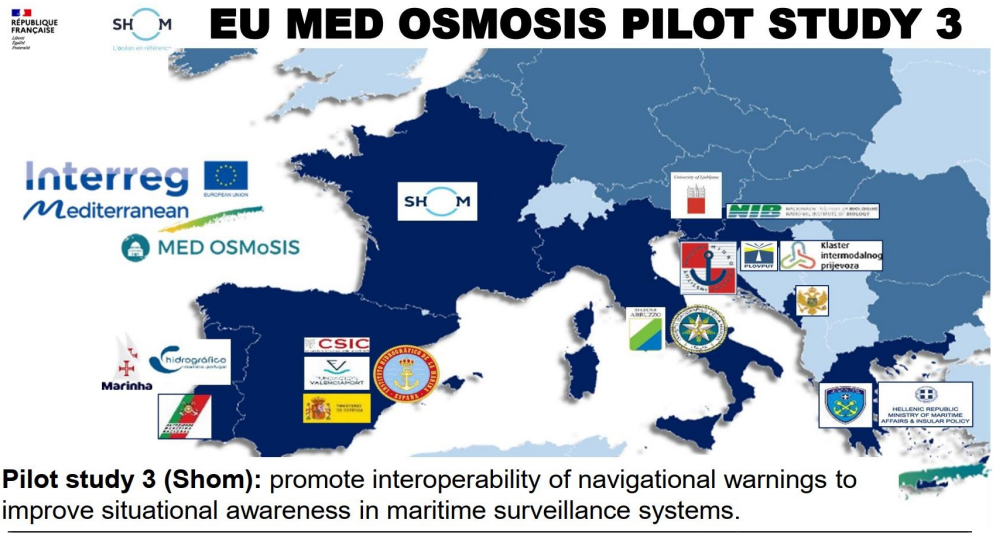


Figure 56. MED OSMoSIS project, Pilot study 3 – Navigational warning module S-124

8. OCEANOGRAPHIC ACTIVITIES

Cooperation and contribution to Permanent Service for Mean Sea Level (PSMSL)

Monthly mean of sea level data from five stations (Rovinj, Zadar, Split, Ploče, Dubrovnik) are sent to Permanent Service for Mean Sea Level (PSMSL) https://psmsl.org/, responsible for the collection, publication, analysis and interpretation of sea level data from the global network of tide gauges, based in Liverpool at the National Oceanography Centre (NOC), United Kingdom.

The CHI is in the process of expanding the tide gauge network. New tide gauges will be equipped with radar sensors and meteorological stations.

StVar-Adri Project

Scientists from Oceanographic Department of the CHI are part of the research team in the Strength and Variability of the Adriatic Sea Level Extremes in Present and Future Climates (StVar-Adri) Project, funded by the Croatian Science Foundation. The research team consists of scientists from the University of Split, Faculty of Science (PMFST), Hydrographic Institute of the Republic of Croatia, University of Zagreb, Faculty of Science (PMF), Institute of Oceanography and Fisheries (IOF), Split, and Institute of Ocean Sciences, Department of Fisheries and Oceans (IOSFO, Canada), Shirshov Institute of Oceanology of Russian Academy of Sciences (IORAS, Russia). The aim of the project is to estimate contribution of selected components of extreme sea levels to present-day and future-day floods. To accomplish this goal, the project focuses on: (i) cataloguing the strongest known events; (ii) estimating contribution of individual processes to extreme sea levels using statistical tools and numerical modelling; (iii) linking extreme sea levels to atmospheric processes; and (iv) assessing future strength and variability of extreme sea levels using outputs of Regional Climate Models (RCMs).
Within the framework of the project, several scientific papers were published.

1) Ruić, K., Šepić, J., Mlinar, M. et al. Contribution of high-frequency (T < 2 h) sea level oscillations to the Adriatic sea level maxima. Nat Hazards 116, 3747–3777 (2023). https://doi.org/10.1007/s11069-023-05834-0.
2) Balić, M., Šepić, J., Ćatipović, L., Čupić, S., Kim, J., Međugorac, I., Omira, R., Pellikka, H., Ruić, K., Vilibić, I., Zemunik, P., 2022. Sub-hourly sea level quality-controlled dataset

to quantify extreme sea levels along the European coasts. EGU22, Vienna, Austria, 23–27 May 2022.
3) Šepić, J., Balić, M., Čupić, S., Didenkulova, I., Heidarzadeh, M., Karlović, M., Kim, J., Matić, F., Međugorac, I., Mihanović, H., Mlinar, M., Omira, R., Pellikka, H., Ruić, K., Vilibić, I., Vojković, M., Zemunik, P., 2022. Contribution of the short-period sea level oscillations (T < 2 h) to the flooding events along the European coasts. OSM 2022, 28 February – 4 March 2022.
4) Šepić, J., Pasarić, M., Međugorac, I., Vilibić, I., Karlović, M., Mlinar, M., 2022. Climatology and process-oriented analysis of the Adriatic sea level extremes. Progress in Oceanography, 209. doi: https://doi.org/10.1016/j.pocean.2022.102908
5) Ruić, K., Šepić, J., Mlinar, M., Međugorac, I., 2022. Storm surges and meteotsunamis of the Adriatic Sea: interplay and quantification of hazard level. EGU22, Vienna, Austria, 23–27 May 2022.

There are also more than 60 smaller projects (e.g. outfall preparation studies, electric cable preparation studies, etc.) in which oceanographic data were measured and analysed.

Oceanographic publications

Annual publication "Tide Tables – Adriatic Sea, East Coast" (Fig. 37) is also available in a digital format (Fig. 57).

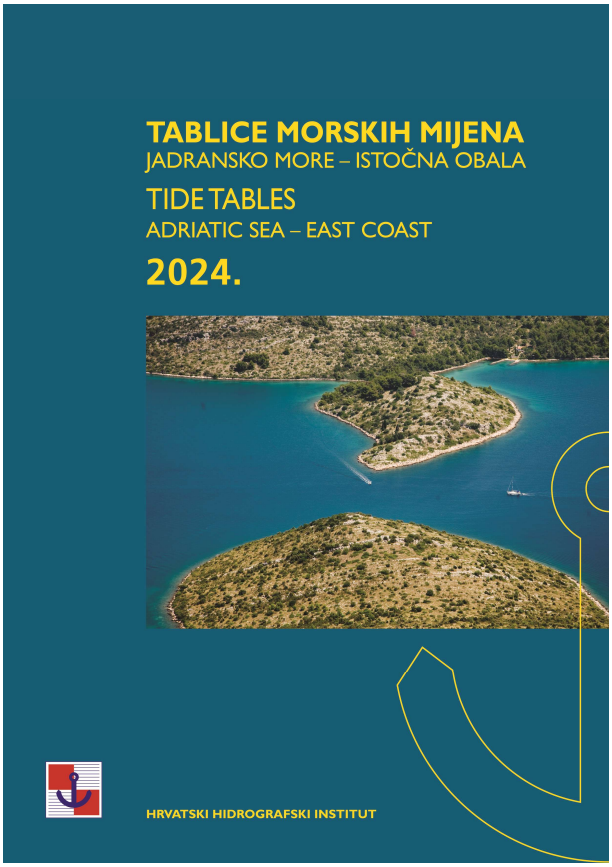


Figure 57. Tide Tables – Adriatic Sea, East Coast 2024

9. OTHER PROJECTS AND ACTIVITIES

The CHI staff members participated in several international scientific and technical conferences presenting hydrographic and oceanographic papers.

Supporting marine policies for efficient protection, use and disaster management

The CHI continuously participates in multiple projects designated by the competent administrations providing high-quality support.

10. CONCLUSIONS

Operational Level - status

At the 23rd MBSHC Conference the Republic of Croatia took over the two-year chairmanship of the regional Mediterranean and Black Seas Hydrographic Commission from the Kingdom of Spain. On behalf of the Republic of Croatia, its Hydrographic Institute performed these duties from 2022 to 2024. This included the preparation of circular letters and documentation, and continuous communication with the Commission members, observers and associate members.

As the MBSHC chair, the CHI prepared reports and presentation on the work of the MBSHC, on achievements and important findings in the MBSHC region, on the work of active thematic working groups, and important proposals were submitted for the 14th, 15th and 16th Meeting of the IHO Inter-Regional Coordination Committee (IRRC).

The year 2022 was the last year for the CHI to perform the duty of chairing the PRIMAR Advisory Committee (PAC). The CHI hosted the 29th regular annual meeting of the PRIMAR Advisory Committee.

In 2023, the Republic of Croatia participated in the work of the IHO Council for the first time as permanent member.

In the past two-year period, the status of hydrographic-navigational element of maritime safety was at an optimal level.

The entire area of responsibility of the Republic of Croatia for the hydrographic-navigational safety of vessels has been covered by relevant official editions of navigational charts and publications – paper and digital ones. This particularly applies to navigation areas of SOLAS ships.

Navigational warning service is in good working order, efficiently cooperating with all navigational safety entities in Croatia, its neighbouring countries and the NAVAREA III Coordinator.

Paper editions of official navigational charts are updated through monthly editions of Notices to Mariners, and ENCs through weekly updates.

New edition of Small Craft Charts (scale 1:100 000, total of 29 charts) was issued in April 2024. They differ from previous editions as they are constructed on Mercator projection WGS 84 ellipsoid, and the data comply with INT 1 and S-4 (V4-9-0_March_2021) standards. An overview is available on the link:

https://hhi.maps.arcgis.com/apps/webappviewer/index.html?id=4f4f42fb922b4cd5b8729f26e4117b2d

In the two-year period, systematic hydrographic survey covered difficult areas, such as shoals, coastal areas, approaches to harbours, a large number of marinas and boat harbours, having achieved a significant progress in the survey of critical areas. This is evident from the largest area so far surveyed, which includes the above-mentioned difficult parts (3,018 km^2). Based on the survey data collected, a minor part of new ENCs will be produced, and mostly the existing ENCs will be updated (current number of ENCs is 315), providing sufficient coverage in terms of maritime safety. This is also a significant improvement for leisure users (boats and yachts).

New data will be used to update and complete the database, for the purpose of preparing for implementation of the new standard S-100.

A significant contribution towards improving the hydrographic-navigational element of navigational safety was made through publishing of a considerable number of new Croatian electronic navigational charts (ENC), based on the data obtained from the new hydrographic survey. In the period from May 2021 to December 2023, 45 new ENCs were released. Entire ENC folio has been made available to end users on ships and to maritime administration worldwide through a network of authorised distributors by PRIMAR.

Since the end of 2016 Croatian ENCs have been made available on the Croatian Navy vessels through the **Navy Agreement**. Agreements were concluded with the Directorate for the Safety of Navigation of the **Ministry of Maritime Affairs** and the **Croatian Navy** on ENC usage **for administrative-office purposes (WMS for ENCs)**. Ongoing support is provided to ensure the provision of timely and high-quality ENC service.

The CHI is continously developing IT infrastructure as an integral part of the Hydrographic Information System (HIS). Data prototypes are developed, and the data are entered and arranged in the spatial databases to develop spatial data models as prerequisites for the development of HIS.

We have also developed the system of production of bathymetric models for the Adriatic Sea, and harmonized the spatial database of undersea infrastructure to comply with the State Geodetic Administration cadastre of infrastructure. Significant data for the register of infrastructure were obtained within the hydrographic survey of submarine fiber optic cables throughout the Adriatic

The CHI has developed its own geoportal GeoAdriatic (Croatian Marine Spatial Data Portal), as a central site for the display and view of publicly available spatial layers within the competence of the CHI, which is continuously upgraded and completed. Access to Geoportal is publicly available enabling online services of data viewing (WMS) and downloading (WFS). Besides regular updating of existing layers, we developed the layer Coastline, which was released around mid-2022, and the layers Marine Geographical Names and Traffic Separation Scheme (TSS), to be released on the new version of the platform in 2024.

It is important to emphasize the development of GIS layer for the display of radio navigational warnings in real time, and adapting the data structure to the IHO standard S-124. Radio navigational warnings are updated by Nautical Department as National Coordinator.

Operational Level – challenges

Most of the overlaps have been resolved. There are some remaining minor overlaps in UB3 with the LOW status regarding overall risk severity. Also, there is one overlap with MEDIUM risk status in UB3, which is currently being reviewed and resolved. Potential new overlaps are continuously monitored and the process of resolving them through negotiations with the respective countries is immediately initiated.

Some inconsistencies observed between national (HR) paper charts and ENCs are under constant consideration and deliberation. Furthermore, any feedback received from users, the IHO or other hydrographic offices is a matter of urgent examination and solving.

Problems of implementation of attributes SCAMIN have been recognized as a key task to be realized in the ongoing period. Therefore, all information about the methodological approach to the problem, organizational model and estimated time needed for implementation of attribute SCAMIN on HR ENC is of great importance and one of the objectives of the course. Regarding the issue of rescheming our UB3 ENCs, we made a thorough analysis and defined an implementation plan. Timeline of the plan is aligned closely with the procedure of transitioning from S-57 to S-101 and with a change from a file-based to a data-based production system for ENC cells with which we hope to eliminate discontinuities between products and elevate overall quality of the charts.

In the past two-year period, within the project "Improving hydrographic services and increasing availability of hydrographic information", financed by EU funds, a feasibility study financed from the MMPI Technical Assistance was elaborated: "Feasibility study with a cost-benefit analysis for the procurement of ships and associated equipment for the Hydrographic Institute of the Republic of Croatia". The study detected the CHI needs for replacement of existing ships, and through analysis of other countries' best practices, optimal solution was proposed for the CHI in financial and operational-technical terms. The study is the basis for the process of design of the main vessel, selected according to the results of the Study. Thereby, one of expected project results has been achieved, i.e. the preparatory phase for procedure of the fleet renewal and procurement of equipment for the hydrographic and oceanographic survey.
The project contributes towards achievement of several specific objectives of Cohesion policy, namely objectives of policies Smart Croatia (specific objective 1.ii) and Green Croatia (specific objective 2.iv, 2.v, 2.vii).

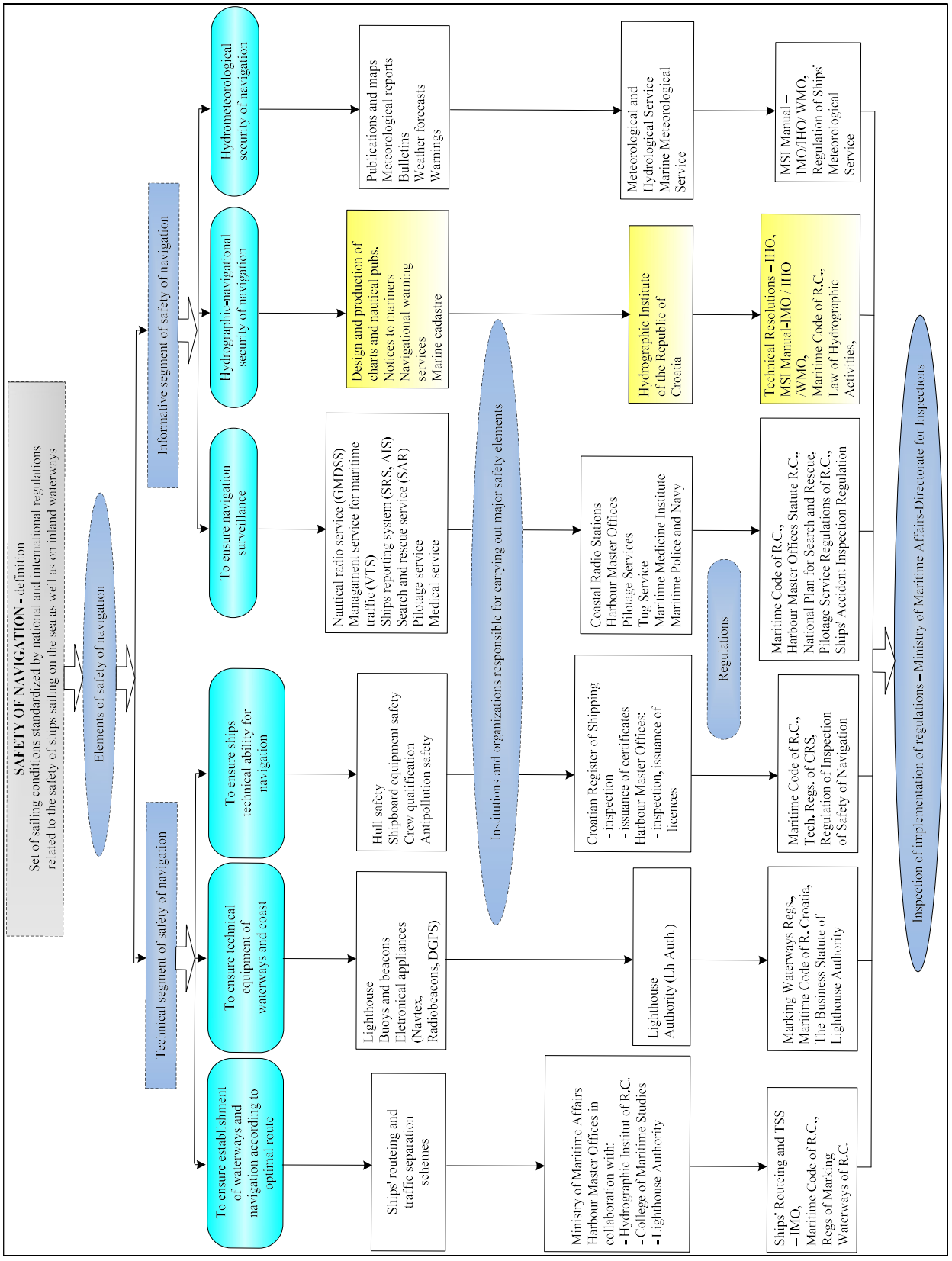
One of the challenges for the CHI will be transition to the new generation of ENC, produced according to S-101 standard. The issue is almost equally demanding in organisational, technical-technological, and financial terms as the issue of transition from paper versions of navigational charts to digital ones (ENC). The transition issue is additionally complicated by the fact that it will be necessary to ensure maintenance and availability of both ENC generations (Dual Fuel) for several years. Some initial tasks are assigned to responsible staff which cooperates closely with PRIMAR and ECC staff through several initiated and approved S-100 projects. Training is recognized as a key element for realization of transition from S-57 to S-100 series products and services.

The CHI continuously participates in multiple projects designated by the competent administrations providing high-quality support. The CHI personnel participated in several international scientific and technical conferences presenting hydrographic and oceanographic papers.

Following the example of other renowned hydrographic offices, regarding cooperation with maritime pilots as relevant end users of S-100 products and participants in the implementation of S-100 standard, the CHI signed an Agreement on technical cooperation with the Croatian Maritime Pilots' Association, relating specifically to the testing of future S-100 products, especially S-101 (ENC) and S-102 (bathymetry).

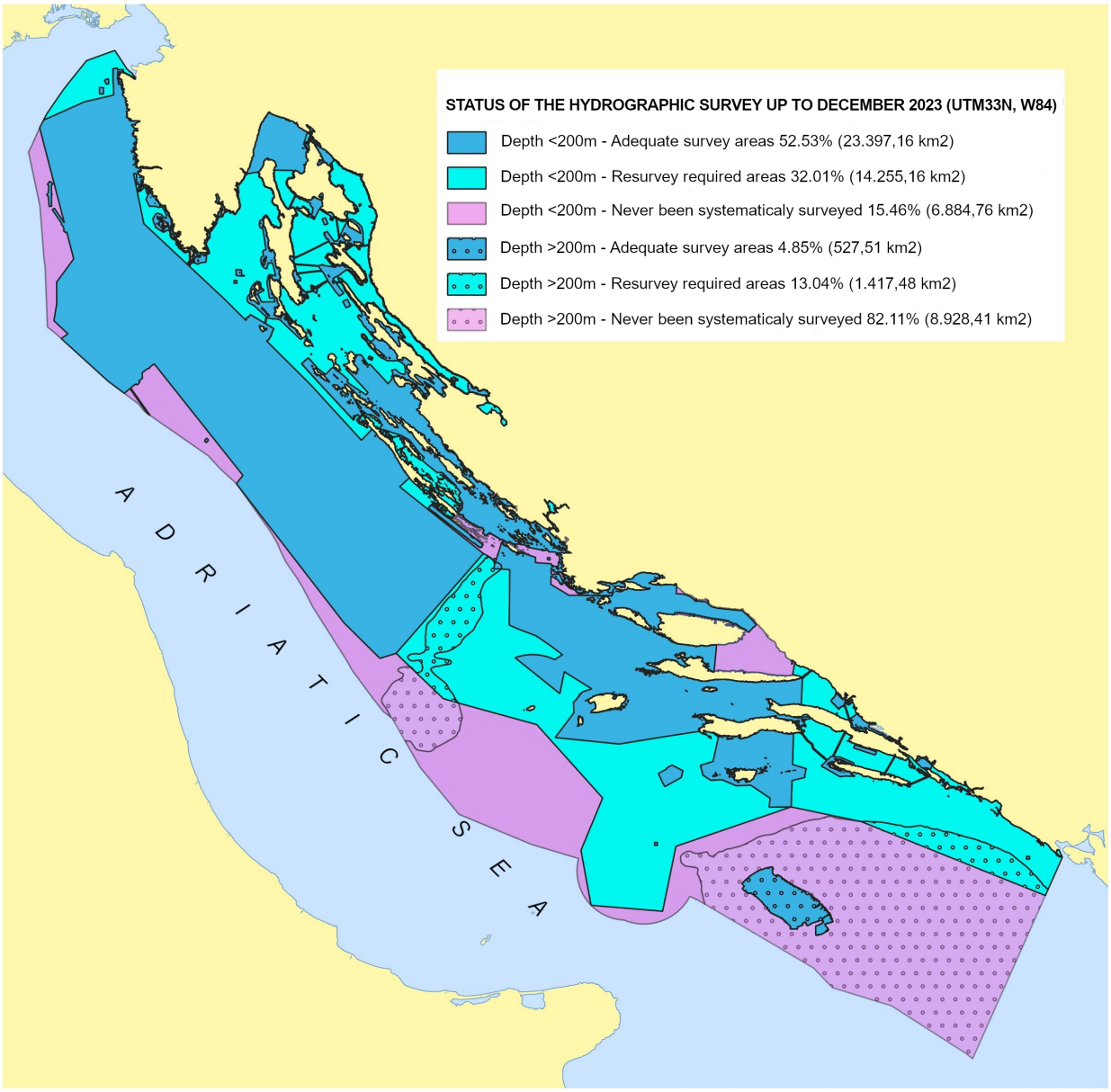
Recognizing a wider use of hydrographic data, the CHI constantly improves the established licensing model, keeping in mind obligations arising from the public service information regulations.

ANNEX 1 – CHI position in the structure of Croatian administration



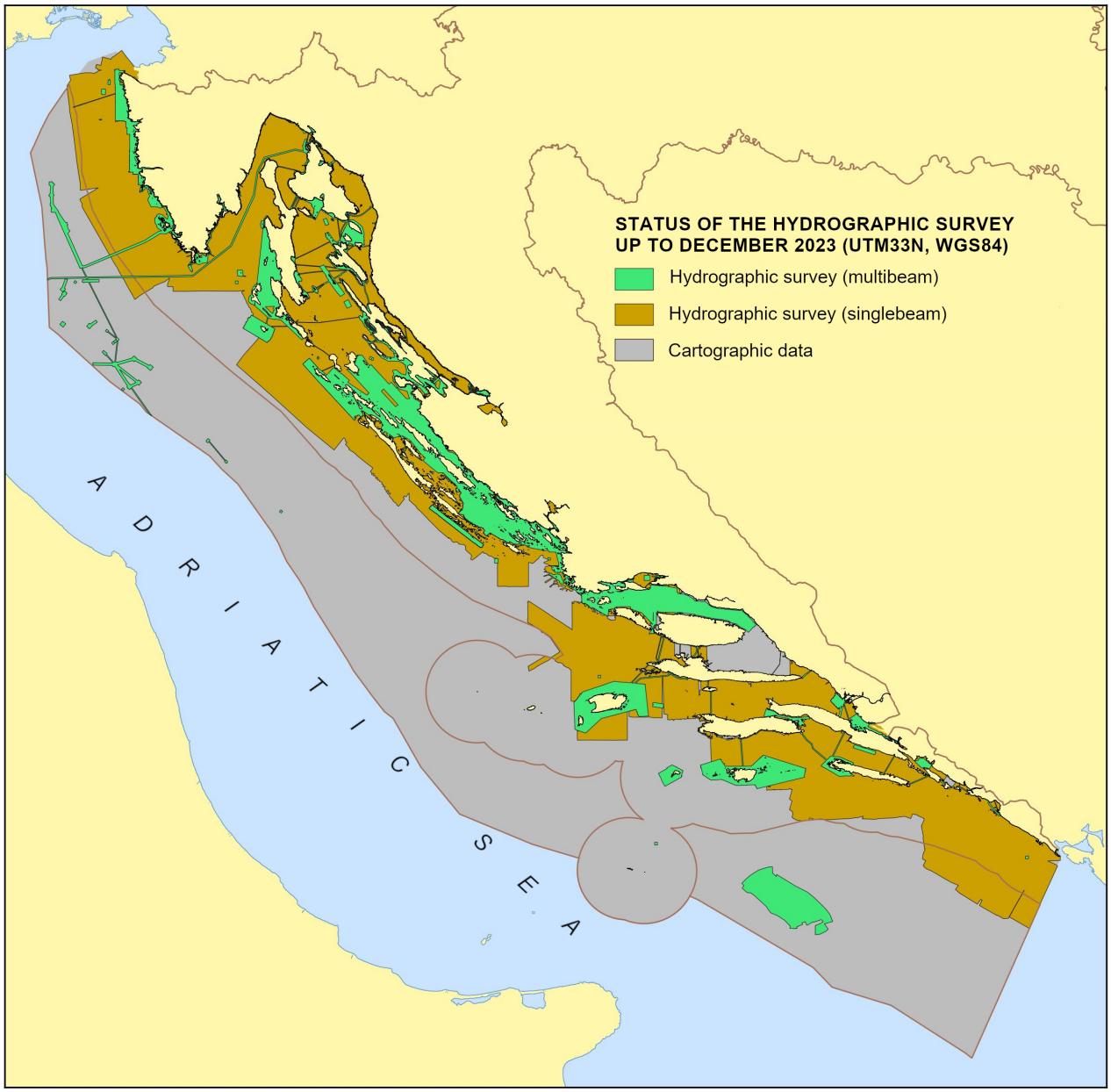
ANNEX 2 – Status of hydrographic survey in accordance with the IHO C-55 criteria

	Adequate survey		Resurvey required		Never been systematically surveyed	
Depth	**A1** (<200m)	**A2** (>200m)	**B1** (<200m)	**B2** (>200m)	**C1** (<200m)	**C2** (>200m)
Percentage (%)	**52.53**	**4.85**	**32.01**	**13.04**	**15.46**	**82.11**
Area (sq. km)	23,397.16	527.55	14,255.16	1,417.48	6,884.76	8,928.41

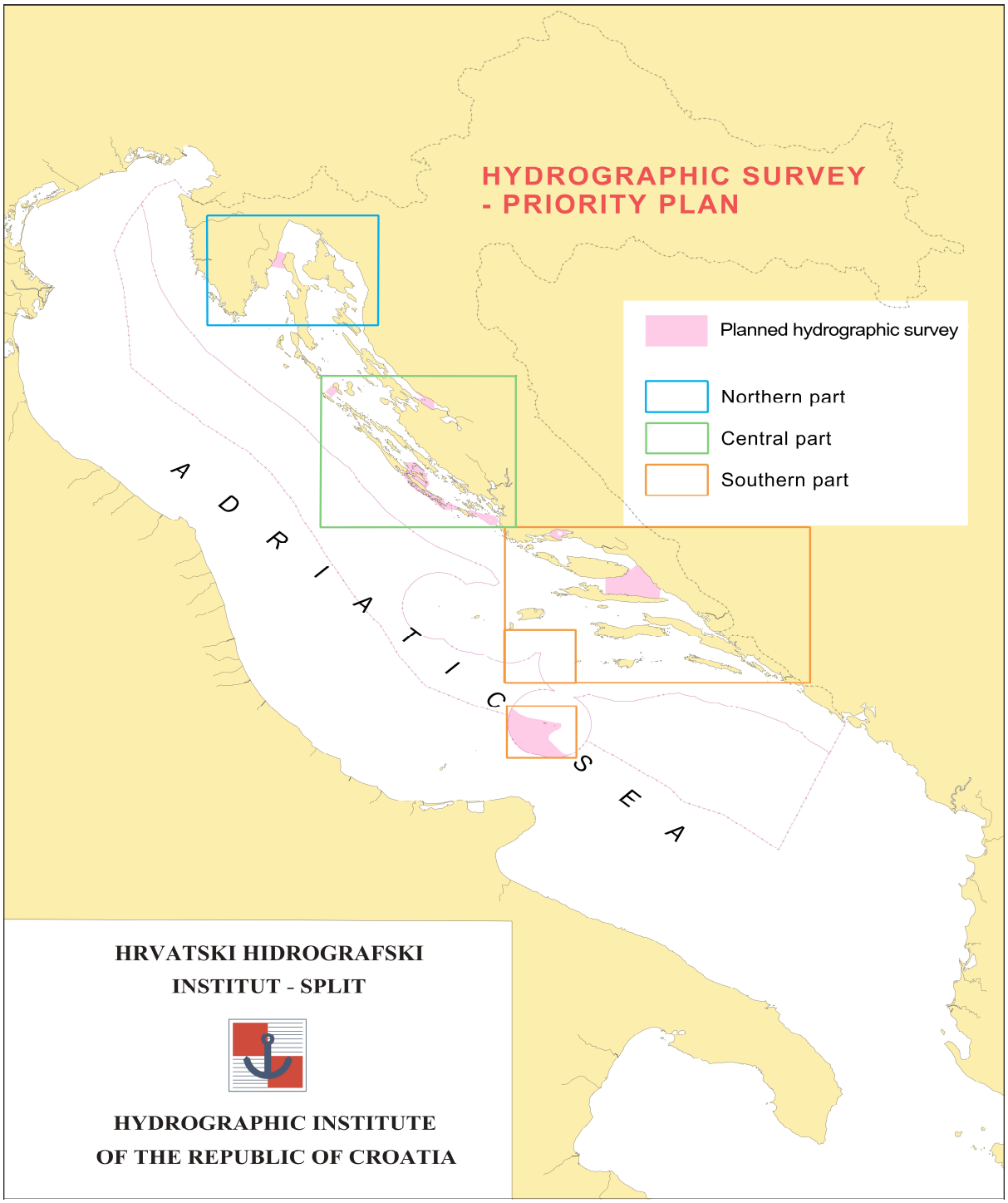


Status of hydrographic survey in accordance with the IHO C-55 criteria

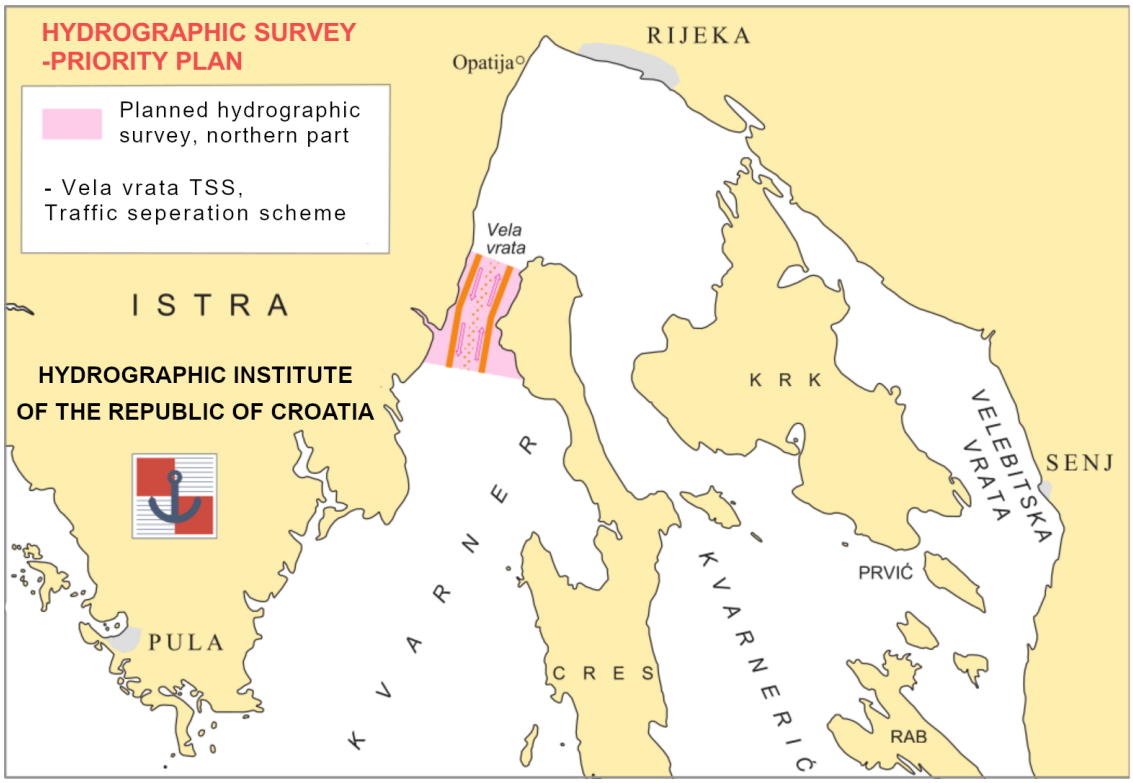
ANNEX 3 – Hydrographic survey (type of survey) – situation on 31.12.2023



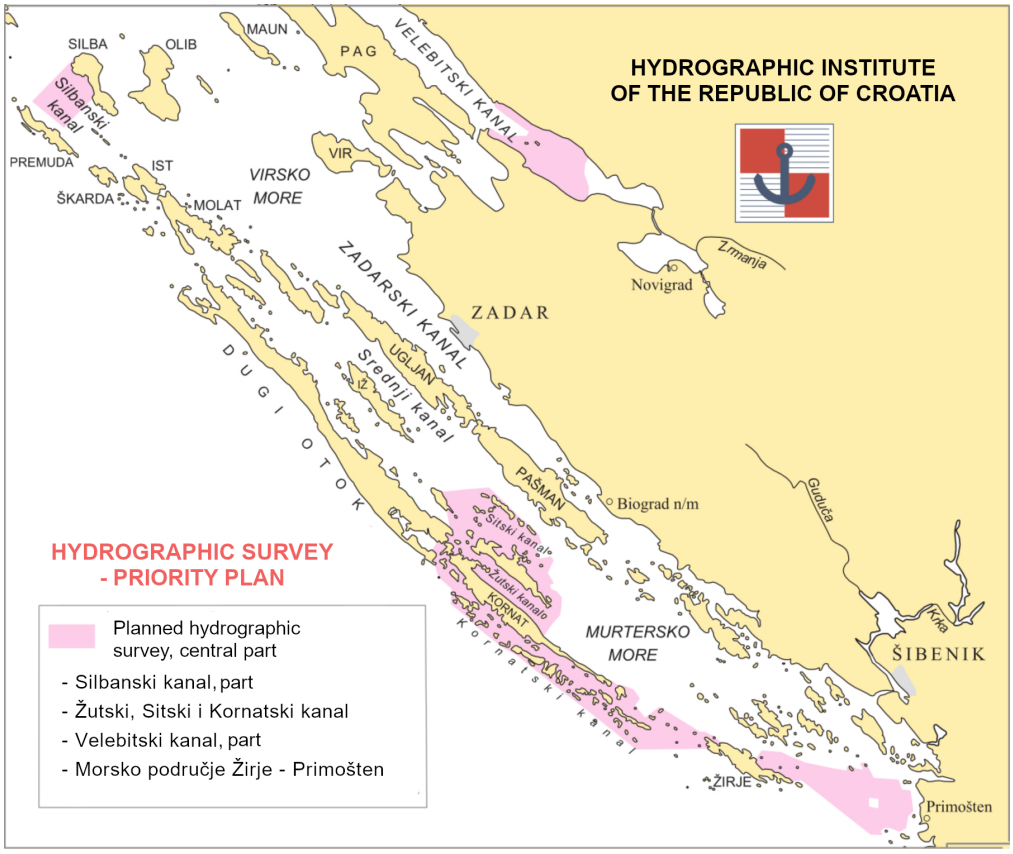
ANNEX 4 – Hydrographic survey 3-year priority plan (2024–2026)



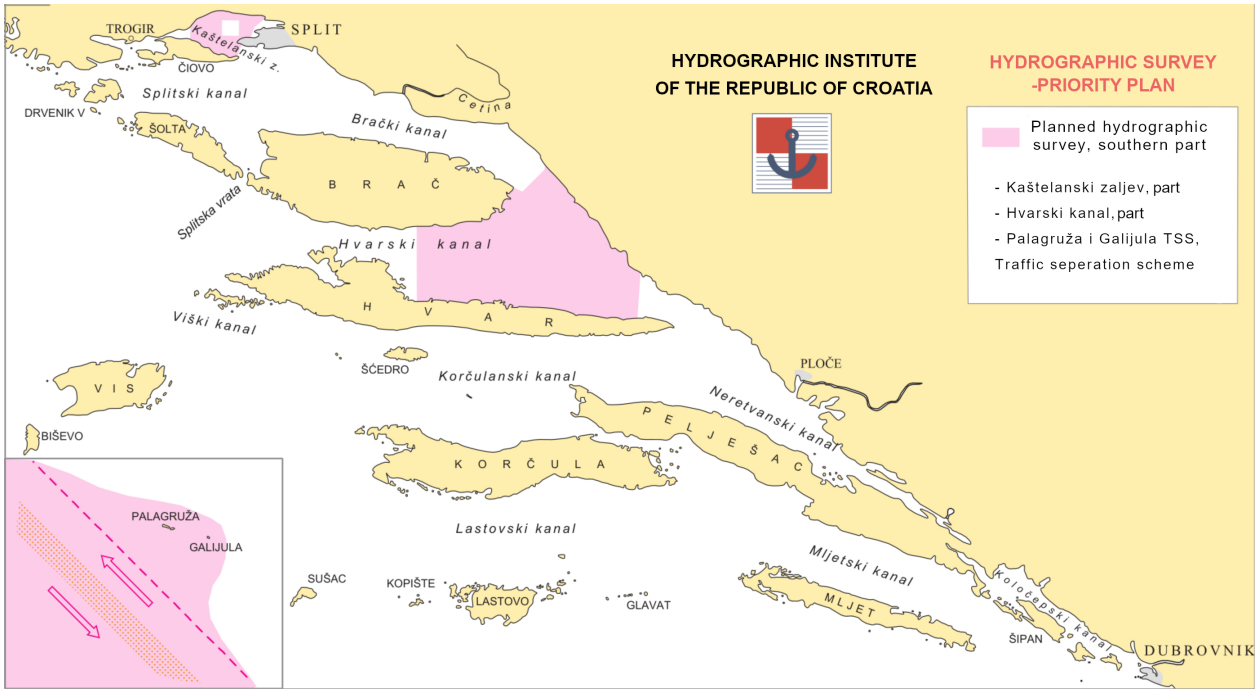
ANNEX 4a – Hydrographic survey 3-year priority plan (2024–2026) – northern part



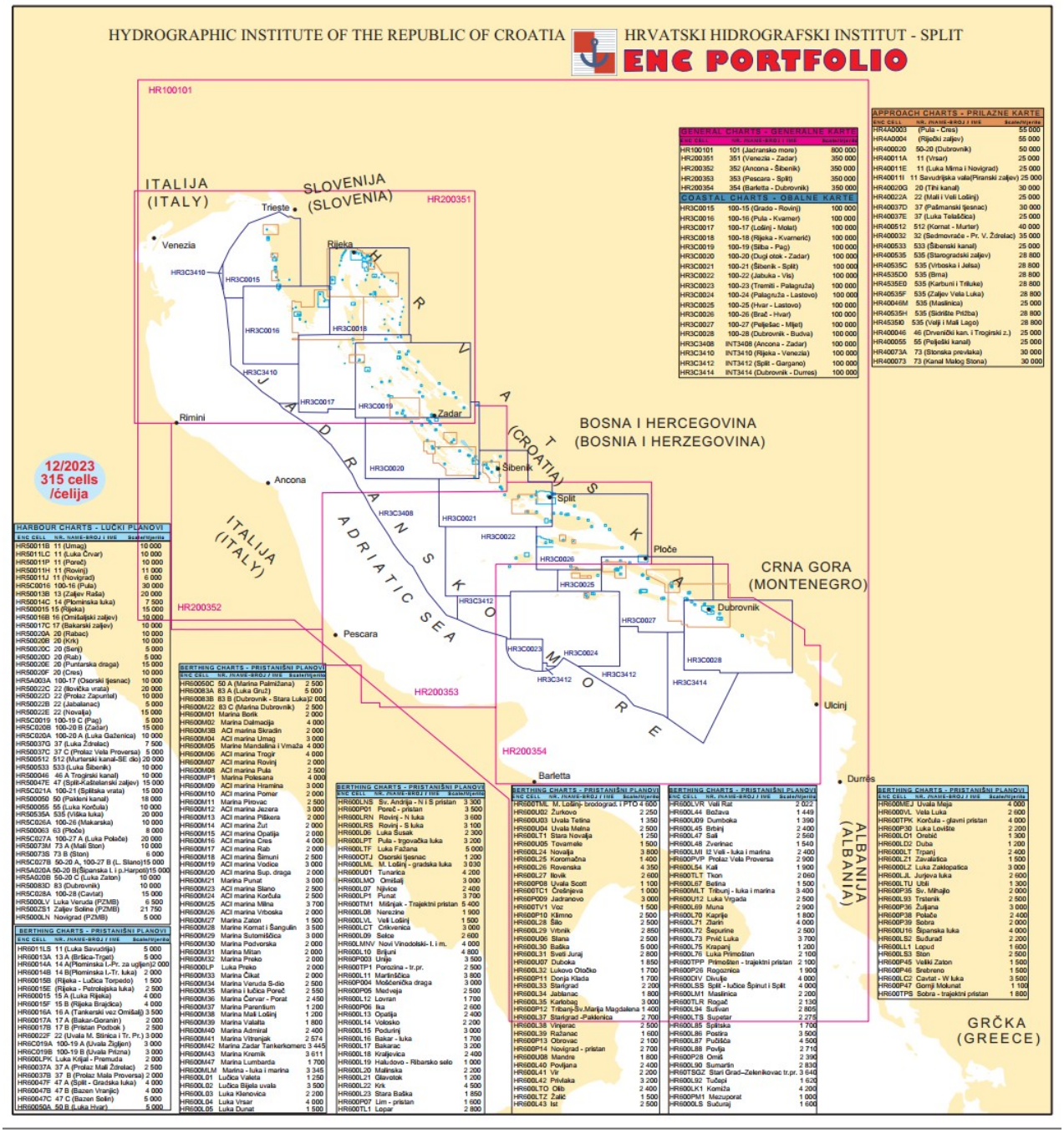
ANNEX 4b – Hydrographic survey 3-year priority plan (2024–2026) – central part



ANNEX 4c – Hydrographic survey 3-year priority plan (2024–2026) – southern part

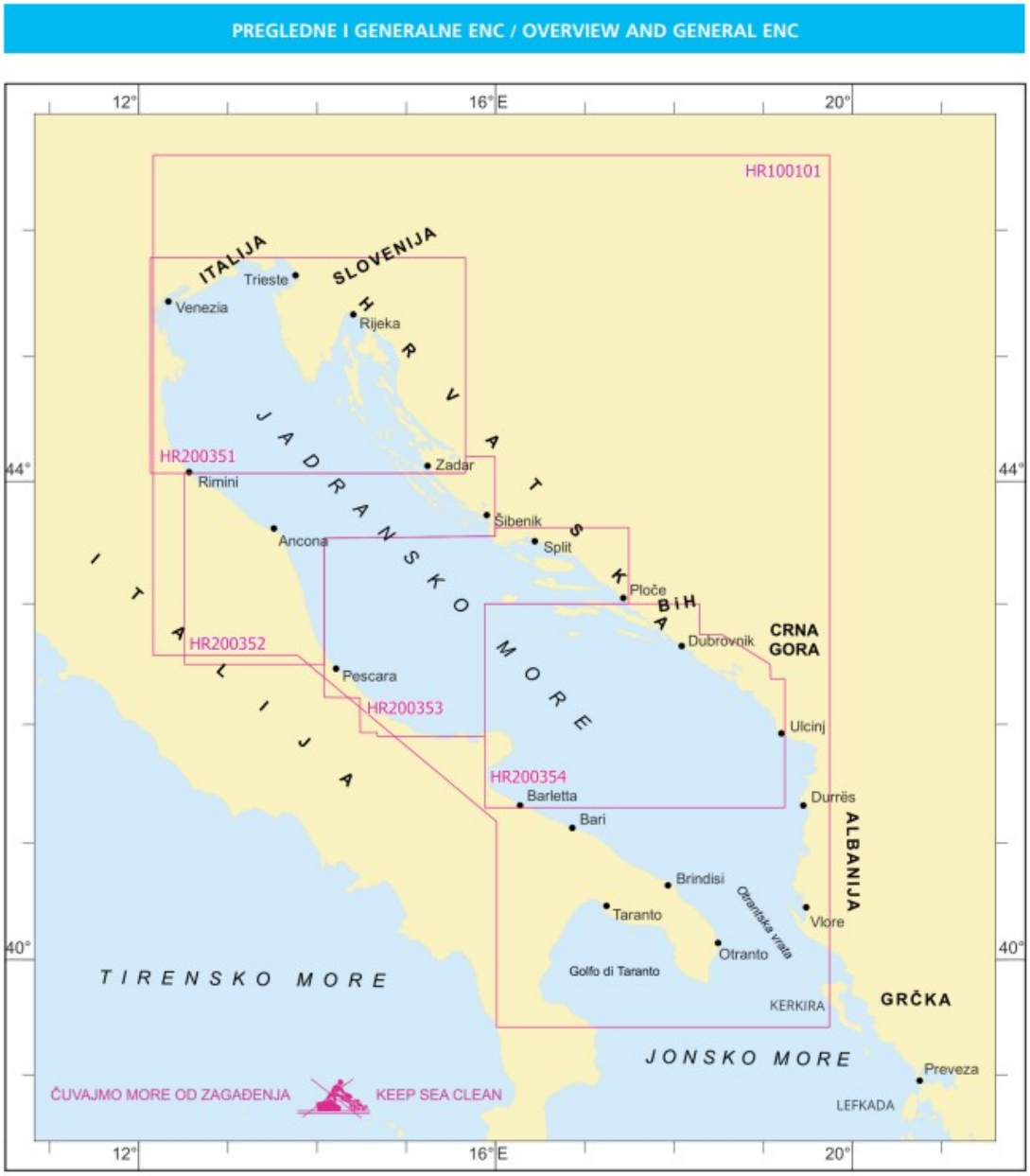


ANNEX 5 – Current ENC portfolio

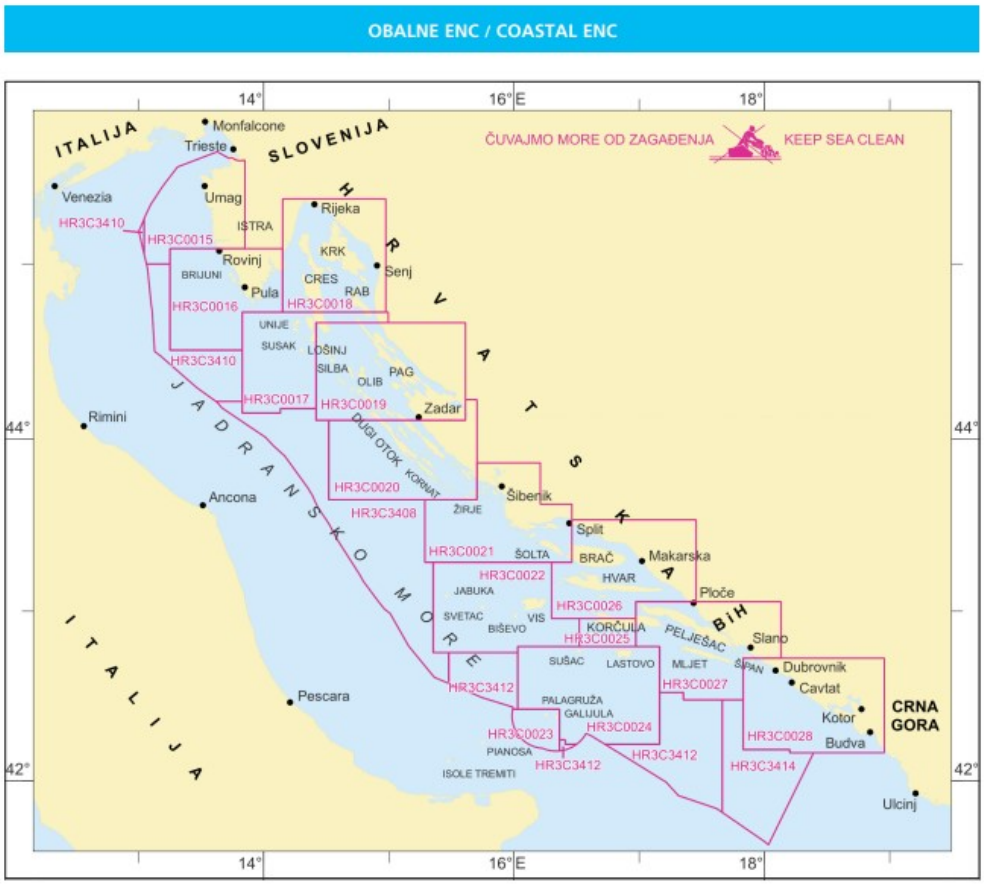


ANNEX 6 – Current ENC release status

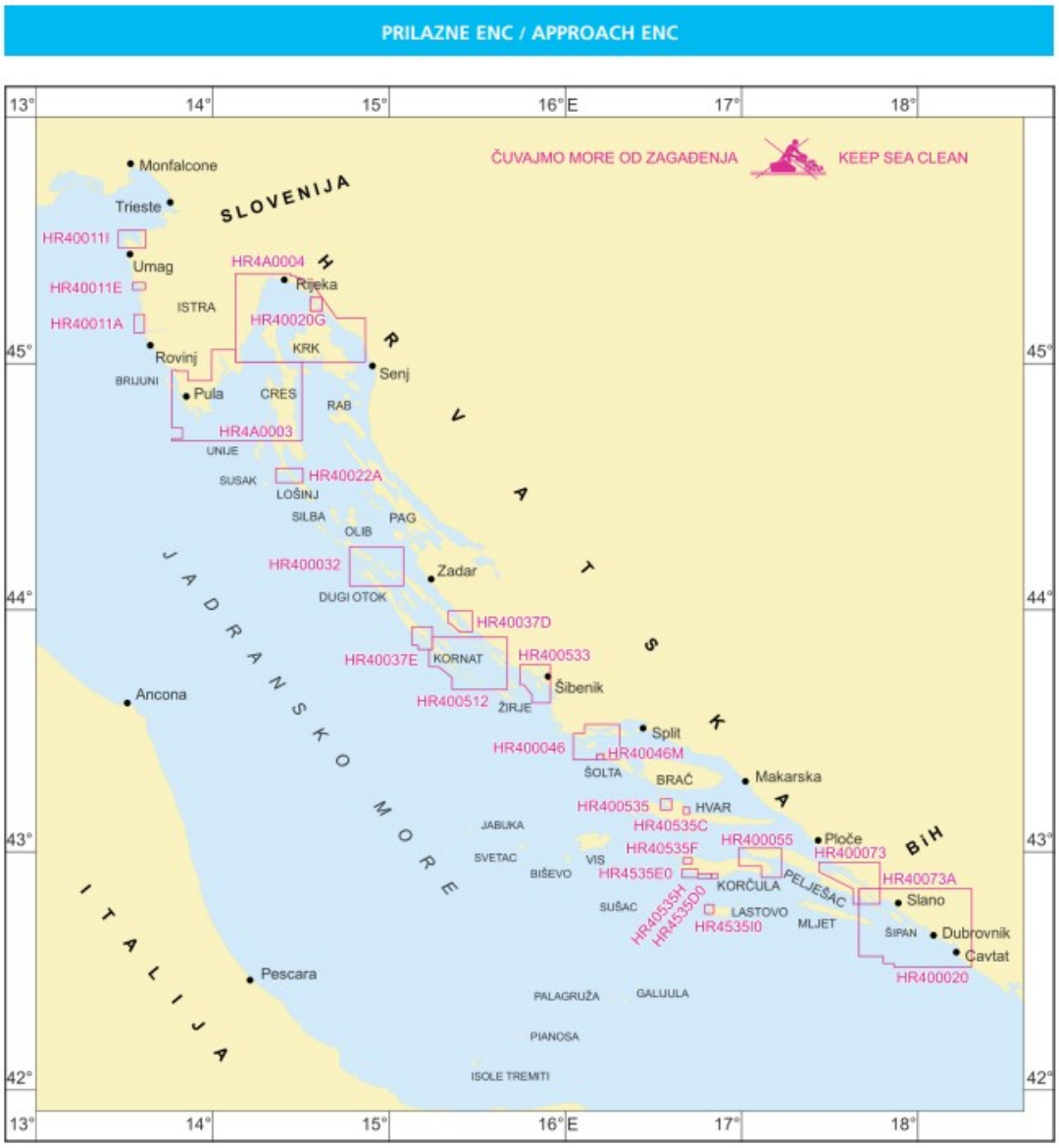
Status of ENC Coverage UB2 General



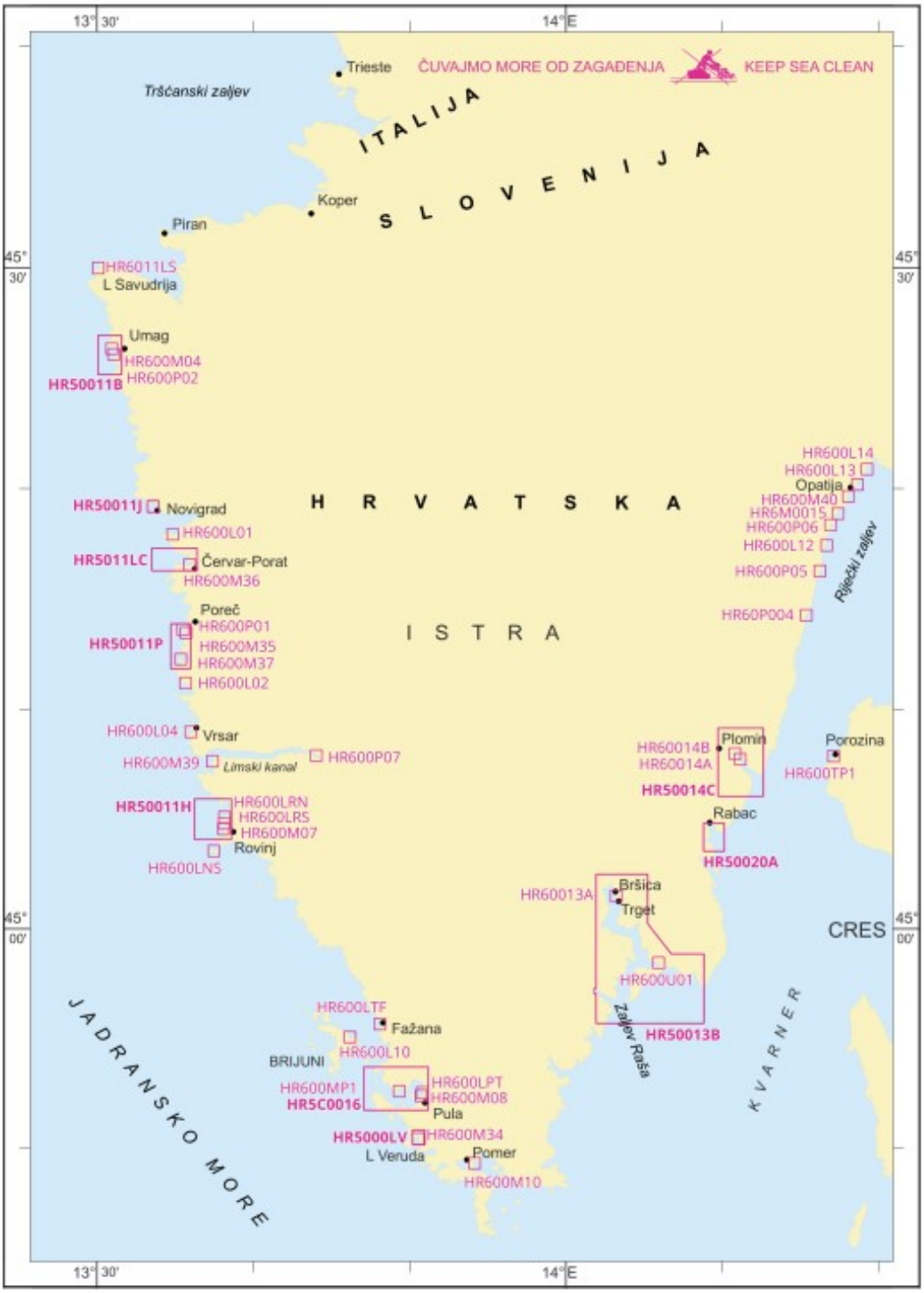
Status of ENC Coverage UB3 Coastal



Status of ENC Coverage UB4/5/6

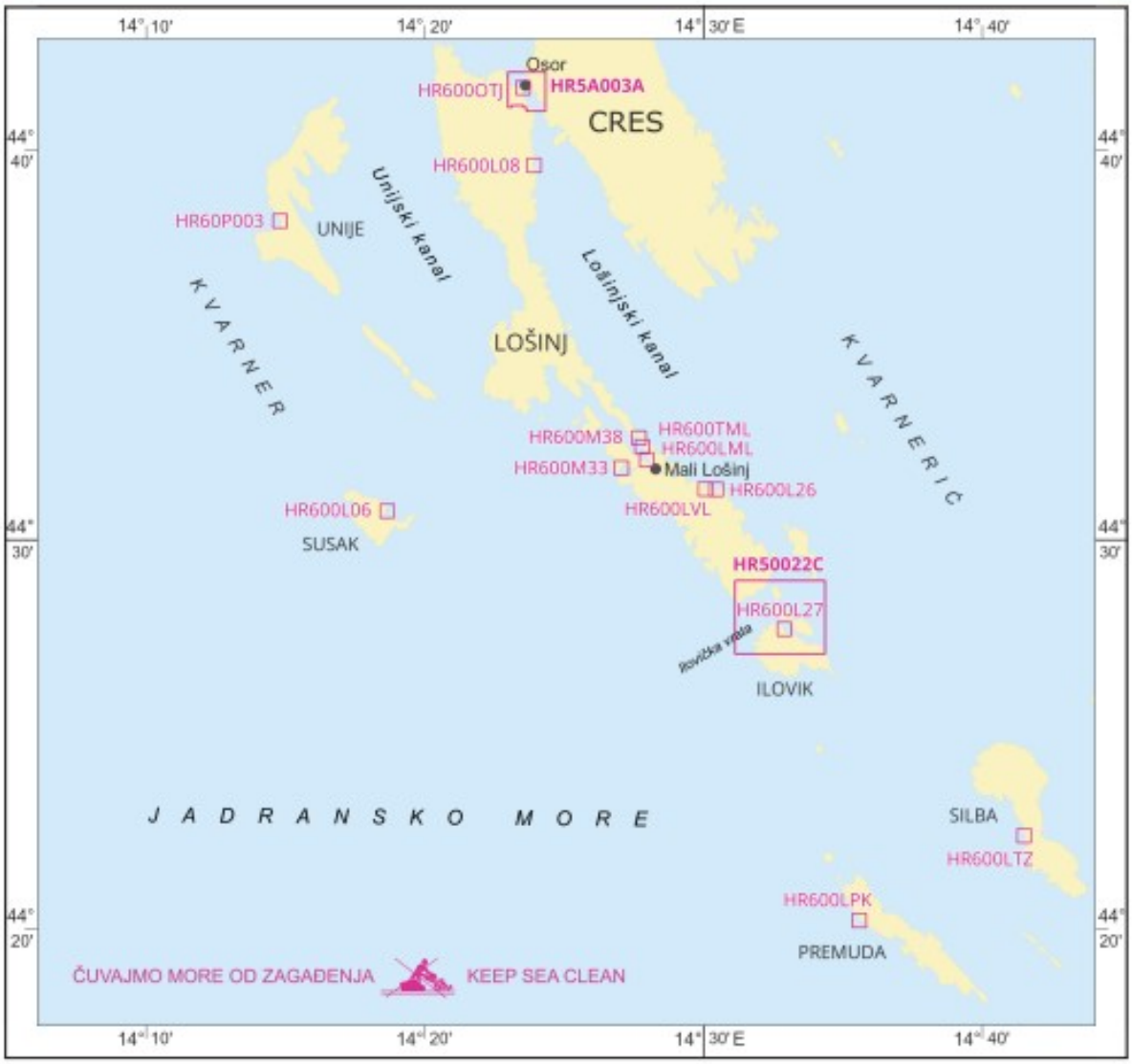


LUČKE I PRISTANIŠNE ENC / HARBOUR AND BERTHING ENC

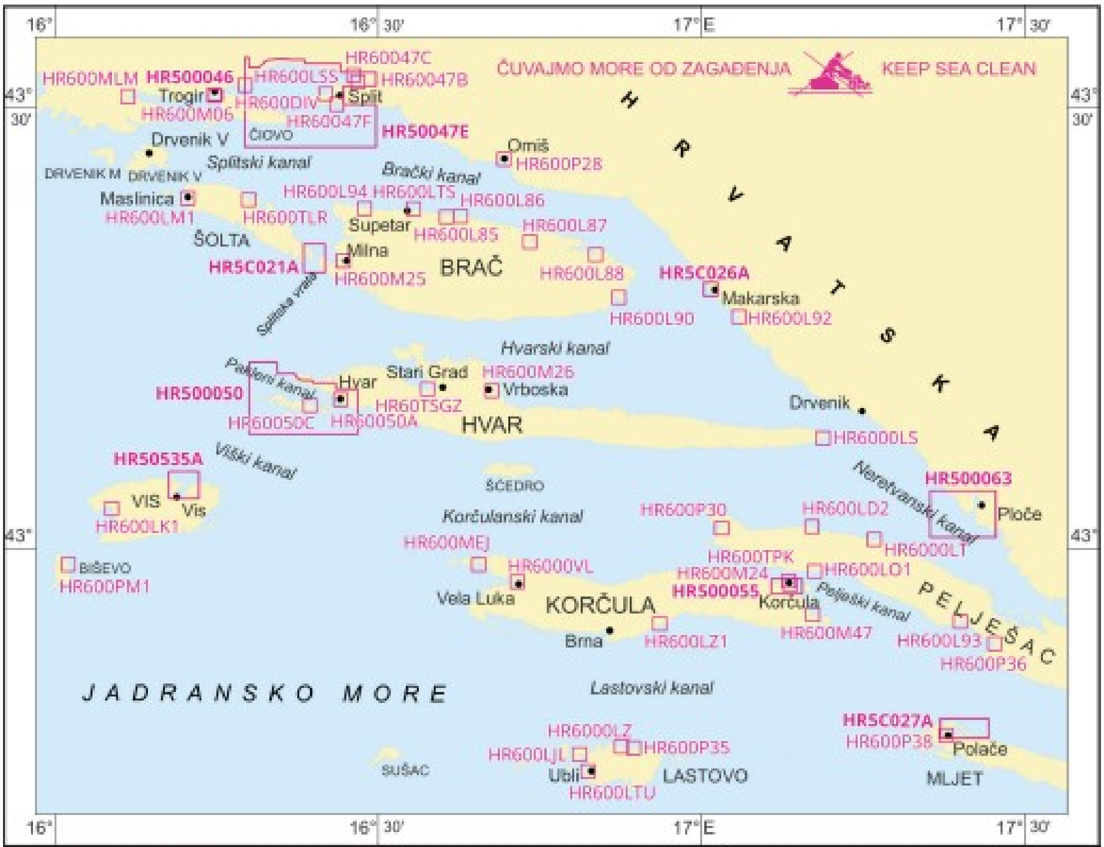


LUČKE I PRISTANIŠNE ENC / HARBOUR AND BERTHING ENC

LUČKE I PRISTANIŠNE ENC / HARBOUR AND BERTHING ENC



LUČKE I PRISTANIŠNE ENC / HARBOUR AND BERTHING ENC


ČUVAJMO MORE OD ZAGAĐENJA
KEEP SEA CLEAN
H R V A T S K A
HR600MLM
HR500046
Trogir
HR600M06
HR600LSS
HR60047C
HR60047B
HR600DIV
Split
HR60047F
ČIOVO
HR50047E
Drvenik V
DRVENIK M
DRVENIK V
Splitski kanal
Brački kanal
Omiš
HR600P28
Maslinica
HR600LM1
HR600TLR
HR600L94
HR600LTS
HR600L86
Supetar
HR600L85
HR600L87
ŠOLTA
Milna
HR5C021A
HR600M25
BRAČ
HR600L88
HR5C026A
Makarska
HR600L90
HR600L92
Splitska vrata
Hvarski kanal
Pakleni kanal
Hvar
Stari Grad
HR600M26
Vrboska
HR500050
HR60050C
HR60050A
HR60TSGZ
HVAR
Drvenik
HR6000LS
HR50535A
Viški kanal
VIS
Vis
HR600LK1
ŠĆEDRO
Korčulanski kanal
HR600P30
HR600LD2
HR500063
Neretvanski kanal
Ploče
HR600MEJ
HR6000LT
BIŠEVO
HR600PM1
HR6000VL
HR600TPK
HR600M24
HR600LO1
HR500055
Korčula
Pelješki kanal
Vela Luka
KORČULA
Brna
HR600LZ1
HR600M47
HR600L93
HR600P36
P E L J E Š A C
J A D R A N S K O   M O R E
Lastovski kanal
HR5C027A
HR600P38
Polače
HR6000LZ
HR600P35
HR600LJL
SUŠAC
Ubli
HR600LTU
LASTOVO
MLJET
16°
16° 30'
17° E
17° 30'
43° 30'
43°


ČUVAJMO MORE OD ZAGAĐENJA
KEEP SEA CLEAN
P E L J E Š A C
Kanal Malog Stona
B i H
H R V A T S K A
HR600L93
HR600P36
HR50073M
Mali Ston
Ston
HR600LS3
HR500735
Mljetski kanal
Slano
HR600M23
HR5C027A
HR600P38
Polače
HR600TPS
HR600P39
HR5A020A
HR600U16
HR5C027B
Koločepski kanal
MLJET
ŠIPAN
Prolaz Harpoti
HR600LS2
HR600LL1
HR600P45
HR5A020B
Veliki Zaton
HR600M22
HR60083A
HR60083B
Dubrovnik
HR50083D
HR600P46
HR5C028A
Cavtat
HR600LC2
CRNA GORA
J A D R A N S K O   M O R E
Herceg Novi
HR600P47
Molunat
Rt Oštra
Boka kotorska
17° 30'
18° E
18° 30'
42° 50'
42° 40'
42° 30'
42° 20'

Table 1. INT charts - Croatia Printer Nation

INT No.	PR	Nat No.	Date		Scale		For	Printer Nation	Chart title	Chart limits				Status
			Publ	New Edition	1:	Latitude (N)				S	N	W	E	
300	IT	360	1984	1997	4 200 000	41°30'	A0	ES, FR, GB, HR	Mare Mediterraneo e Mar Nero	25°00.00'	49°50.20'	07°00'00"	42°15.30'	Available
301	IT	340	1972	2001	2 250 000	41°30'	A0	FR, DE, ES, GB, US, PT, HR	Mare Mediterraneo. Bacino Occidentale	32°45.00'	45°52.22'	06°44.00'	19°40.48'	Available
302	IT	350	1982	2001	2 250 000	41°30'	A0	FR, DE, ES, GB, US, HR	Mare Mediterraneo. Bacino Orientale	30°05.00'	43°39.25'	09°55.00'	36°19.50'	Available

Table 2. INT charts - Croatia Producer Nation (Pro)

INT No.	PR	Nat No.	Date		Scale		For	Printer Nation	Chart title	Chart limits				Status
			Publ	New Ed.	1:	Latitude (N)				S	N	W	E	
3410	HR		1988	2007	250 000	45°00'	A0	FR	Rijeka – Venezia	44°13.00'	45°50.00'	12°08.00'	15°28.00'	Available
3412	HR		1991	2000	250 000	42°50'	A0	FR	Split – Gargano	41°40.00'	44°00.00'	15°29.00'	17°40.00'	Available
3414	HR		1998		250 000	41°55'	A0	FR	Dubrovnik – Durrës	40°45.00'	43°04.00'	17°25.00'	19°38.00'	Available
3472	HR	100 -16	1973	1998	100 000	44°50'	B1		Pula – Kvarner	44°30.60'	45°05.20'	13°15.40'	14°27.00'	Preparation
					30 000	44°52.60'	B1		A – Pula	44°51.73'	44°53.71'	13°47.35'	13°51.46'	
3473	HR	100 -18	1977	1996	100 000	44°55'	B1		Rijeka – Kvarnerić	44°31.40'	45°22.00'	14°09.40'	14°58.80'	Available
3474	HR	15	2004	2020	15 000	45°18.50'	A0		Rijeka	45°16.59'	45°20.59'	14°22.32'	14°30.52'	Available
		15	2017	2020	4 000	45°19.67'	A0		A-Luka Rijeka	45°19.15'	45°20.20'	14°24.53'	14°26.73'	
		15	2004	2020	4 000	45°19.20'	A0		B- Brajdica-kontejnerski terminal	45°18.99'	45°19.39'	14°26.66'	14°27.59'	
3476	HR	100 -21	1973	2003	100 000	43°35'	B1		Šibenik – Split	43°17.20'	43°51.80'	15°17.50'	16°28.00'	Preparation
					15 000	43°19.80'	B1		A – Splitska vrata	43°18.79'	43°20.77'	16°23.37'	16°25.38'	
3477	HR	47	2002	2017	15 000	43°30.50'	A0		Split – Kaštelanski zaljev	43°27.33'	43°33.42'	16°17.62'	16°29.80'	Available
					4 000	43°30.23'	A0		A – Split -Gradska luka	43°29.97'	43°30.50'	16°25.61'	16°26.66'	
					4 000	43°31.70'	A0		B – Bazen Vranjic	43°31.60'	43°31.91'	16°27.73'	16°28.46'	
					5 000	43°32.20'	A0		C –Bazen Solin	43°32.07'	43°32.35'	16°27.18'	16°28.23'	
3480	HR	100 -25	1972	2003	100 000	42°55'	B1		Hvar – Lastovo	42°38.40'	43°13.00'	16°12.00'	17°21.60'	Preparation
3482	HR	154	1955	1975	200 000	42°35'	B1		Pelješac – Rt Oštra	42°01.00'	43°09.00'	16°54.00'	19°10.00'	Cancelled
3484	HR	100 -27	1970	1999	100 000	42°51'	B1		Pelješac – Mljet	42°28.80'	43°03.40'	16°58.60'	18°08.20'	Preparation
					20 000	42°47.70'	B1		A – Luka Polače	42°46.98'	42°48.34'	17°22.45'	17°26.92'	
					15 000	42°46.80'	B1		B – Luka Slano	42°46.22'	42°47.35'	17°52.29'	17°53.83'	
3485	HR	83	2001		10 000	42°40'	A0		Dubrovnik	42°36.71'	42°40.81'	18°00.80'	18°08.50'	Preparation
					5 000	42°39.58'	A0		A – Dubrovnik -Luka Gruž	42°39.16'	42°40.05'	18°04.47'	18°05.37'	
					2 000	42°38.42'	A0		B – Dubrovnik -Stara luka	42°38.31'	42°38.55'	18°06.60'	18°06.87'	
					2 500	42°40.22'	A0		C –Marina Dubrovnik	42°40.13'	42°40.33'	18°07.32'	18°07.78'	

ANNEX 8 – MEDINTCHART Catalogue – HR Status – Figure

ANNEX 9 – INT Paper Charts – HR Status – IHO INToGIS manager