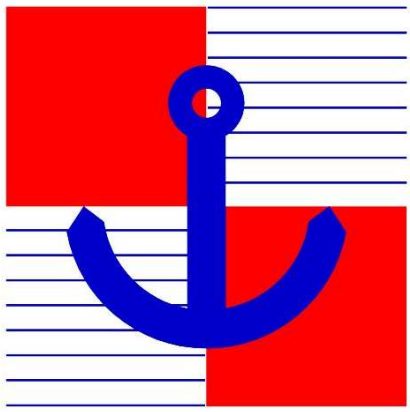
MEDITERRANEAN AND BLACK SEAS HYDROGRAPHIC COMMISSION

XXI CONFERENCE

REPORT BY CROATIA

HRVATSKI HIDROGRAFSKI



INSTITUT

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HYDROGRAPHIC INSTITUTE
OF THE REPUBLIC OF CROATIA

MEDITERRANEAN AND BLACK SEAS HYDROGRAPHIC COMMISSION

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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), 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. CHI is appointed National Coordinator for navigational warnings. Position of the CHI in the structure of Croatian (maritime) administration is shown in Annex 1. CHI is registered as a public institution of the Republic of Croatia in accordance with 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, territorial sea and the Ecological and Fisheries Protection Zone (ZERP) 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).

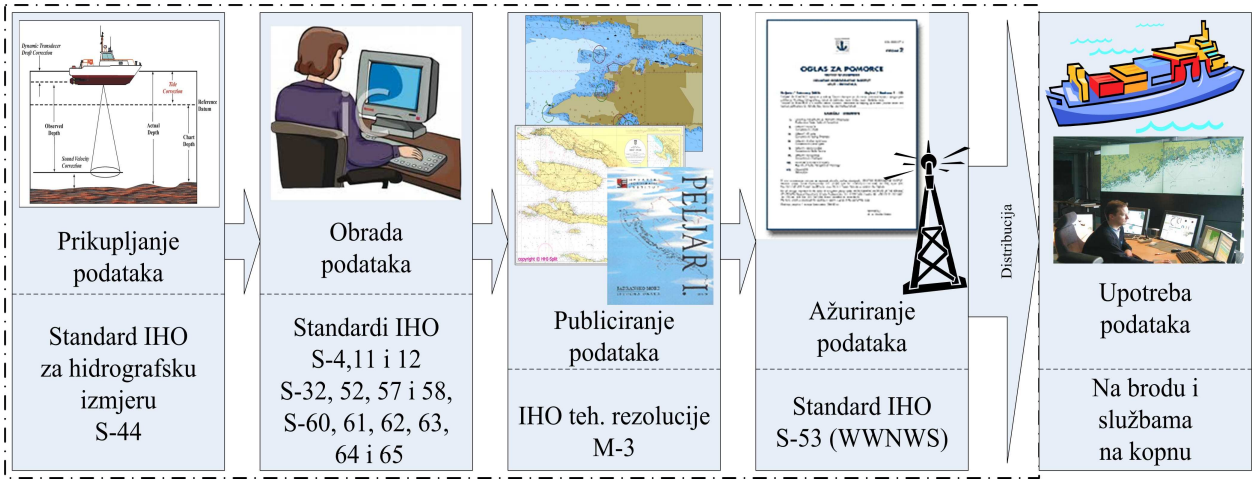


Figure 1. Data flow and working processes

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 the ENCs. Nautical Department as National Coordinator for Navigational Warnings monitors and complies on a daily basis all the navigational warnings important for the safety at sea. Reproduction Department is responsible for publishing and printing of paper charts and publications.

Figure 2. Structure in Cartographic department through various work process

2. HYDROGRAPHIC SURVEY

Hydrographic Survey Vessels

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.
Smaller 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), due to 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

Status of hydrographic survey

Hydrographic surveys conducted along the Croatian coast since the XX MBSHC Conference were focused to selective parts of the coastal areas and to principal ports and passages in accordance with defined priorities. Numerous hydrographic profiles have been surveyed in order to elaborate underwater installations. A significant number of existing and new marinas (39), port areas (18), shoals and underwater rocks (9) were surveyed. Total surveyed area is 500 km^2.
Annex 2 summarizes the status of hydrographic surveys in accordance with the criteria in the IHO C-55 publication. Annex 3 shows new hydrographic survey of marinas, small ports, shoals and underwater rocks.

3. CHARTS

CHI produces official paper and electronic navigational charts (ENCs) covering the waters within the national responsibility (http://www.hhi.hr/en/staticpages/index/catalogue).

ENCs

In the period between two conferences the CHI produced 83 ENC cells based on the existing paper charts and new hydrographic survey.
As it was planned, the CHI achieved adequate coverage, availability, consistency and quality of ENCs by 1 July 2012. An ongoing project was launched in 2014 to resolve observed cross-border inconsistencies between the ENCs of different usage bands and improve the existing ENCs. Status of the CHI ENC production is shown in the following table:

		1 July 2008		**1 June 2011**		**1 July 2013**		**1 May 2017**		**31 May 2019**	
User band	Navigational purpose	No of Cell	Area coverage (%)	No of Cell	Area coverage (%)	No of Cell	Area coverage (%)	No of Cell	Area coverage (%)	No of Cell	Area coverage (%)
1	Overview	1	100%	1	100%	1	100%	1	100%	1	100%
2	General	4	100%	4	100%	4	100%	4	100%	4	100%
3	Coastal	15	100%	15	81%	15	100%	15	100%	18	100%
4	Approach	9	72%	12	84%	13	85%	14	88%	19	91%
5	Harbour	31	77%	37	80%	37	84%	40	88%	44	91%
6	Berthing	20	74%	22	91%	24	85%	50	95%	121	98%
TOTAL		**80**	**87%**	**91**	**91%**	**94**	**92 %**	**124**	**96%**	**207**	**97%**

Annex 4 shows Croatian ENC 5-year ENC production priority plan based on new hydrographic survey - Overall. Annex 5 shows ENC 5-year ENC production priority plan based on new hydrographic survey – Regional. Annex 6 shows current ENC release status.

ENC distribution method

CHI distributes its ENCs through the PRIMAR RENC. The first Croatian ENCs were released in February 2007.
By the Navy Agreement, since the end of 2016 Croatian ENCs have also been available on Croatian Navy ships.
In the period between the two MBSHC conferences, the CHI produced 83 new ENCs, 9 ENC new editions, and 300 updates (ERs).

WMS for ENCs

CHI as a member of PRIMAR RENC actively participates in the project WMS for ENCs together with other PRIMAR member states. At the moment, 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. 5).

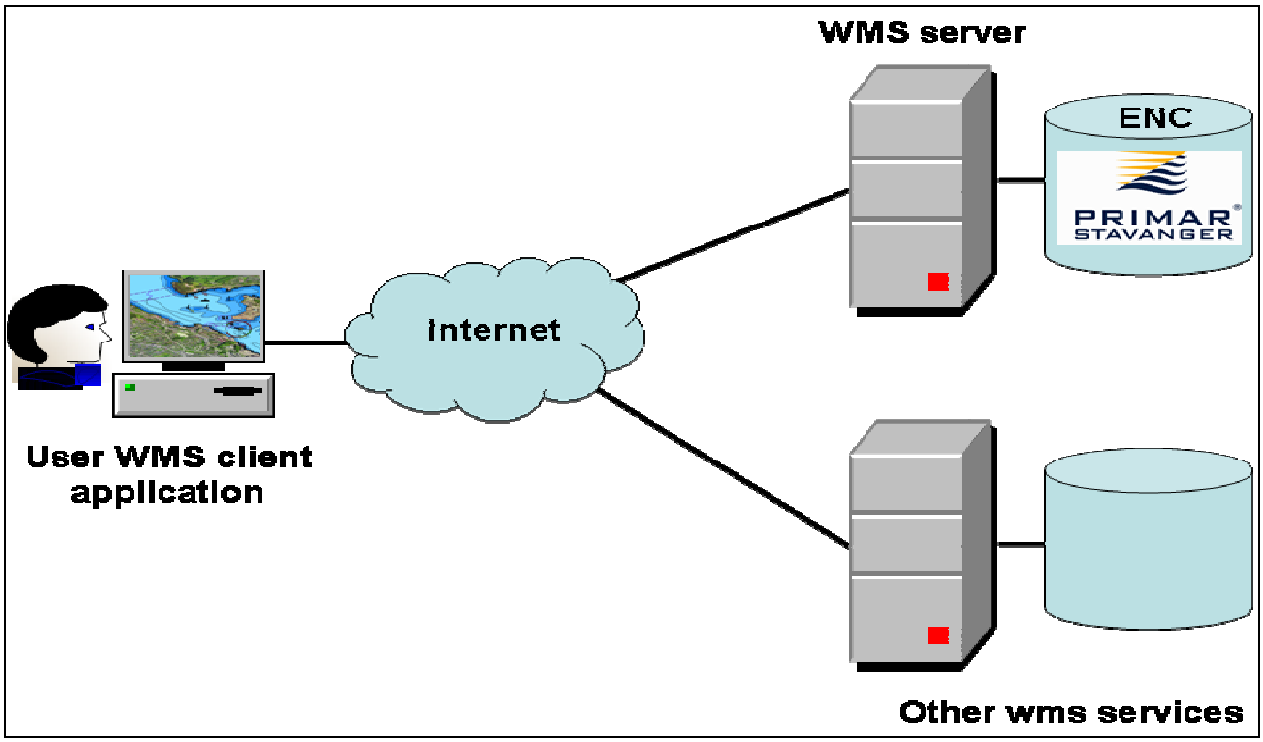


Figure 5. PRIMAR WMS for ENCs

INT ENC scheme

The current third draft proposal solution (ENC scheme for UB 1 and UB 2) for the Adriatic Sea area, which is based on HR first proposal presented during the XVII MBSHC Conference, is still under the process of harmonization between IT and HR, approaching the final solutions.
An intensive communication is underway between CHI and Montenegro HO to resolve an overlap case in usage band 3.

RNCs

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

INT paper charts

HR status of INT paper charts is shown in the table in Annex 7 and in the figure in Annex 8. CHI made input of current INT Charts status (May 2019) using the IHO INToGIS manager (figure in Annex 9).

National paper charts

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

New chart (Fig. 6):

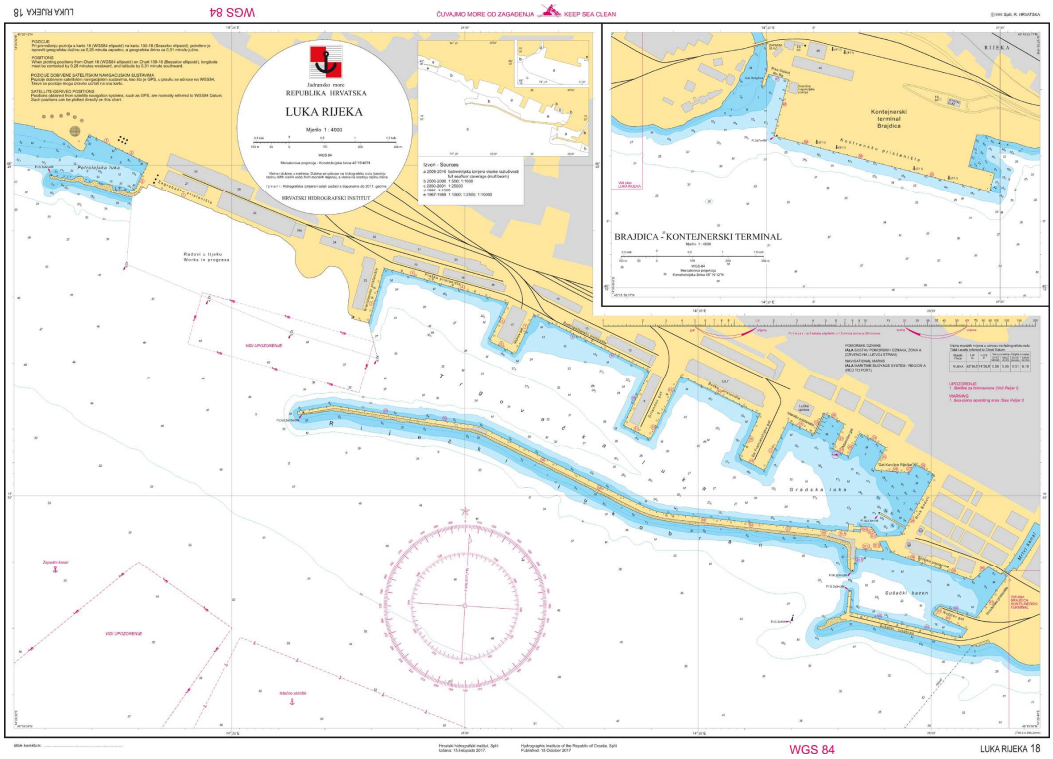


Figure 6. 18 Luka Rijeka, 1:4 000, Rijeka – Brajdica, kontejnerski terminal, 1: 4 000

New edition (Fig. 7, 8):

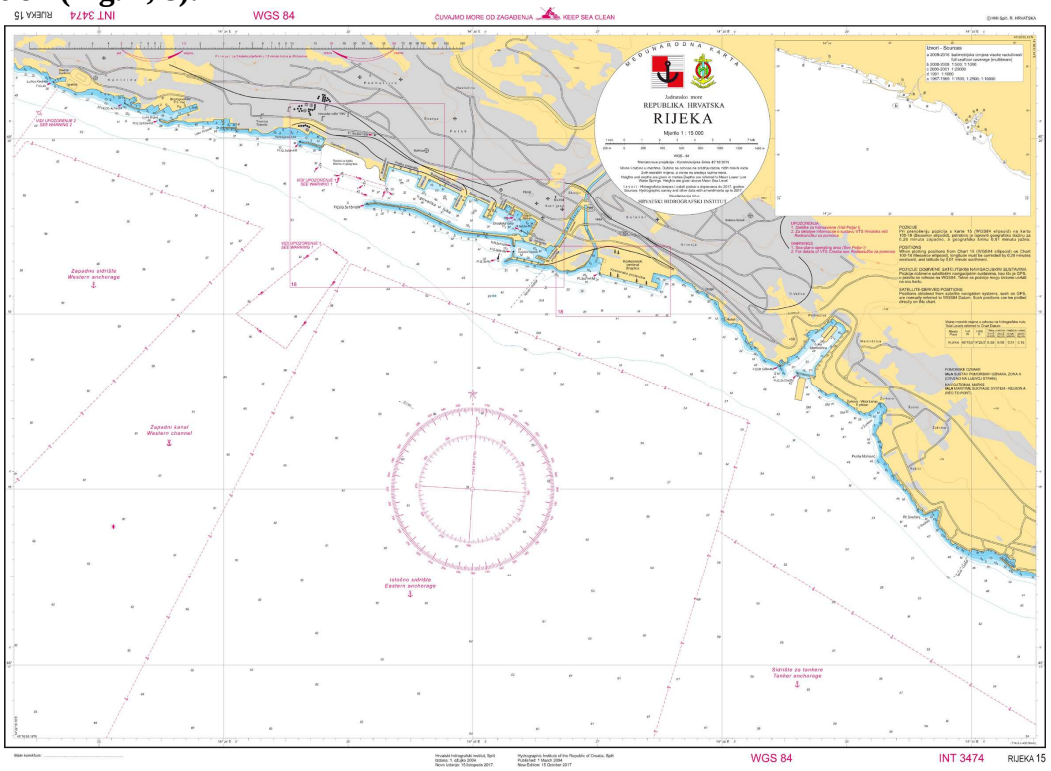


Figure 7. 15 (INT3474) Rijeka, 1:15 000

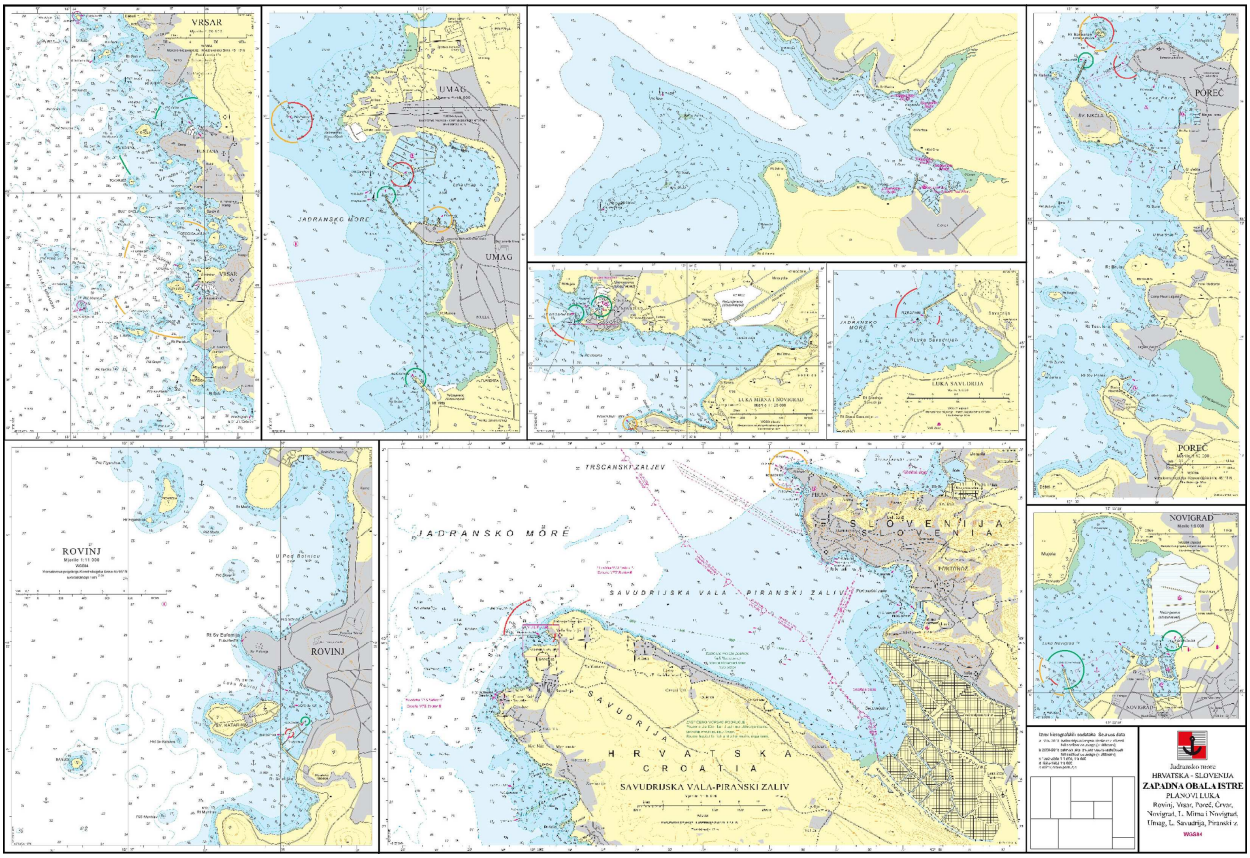


Figure 8. 11 Zapadna obala Istre – in the final stage of preparation

New printing

100-17 Lošinj – Molat	1:100 000
100-18 Rijeka – Kvarnerić	1:100 000
100-20 Dugi otok – Zadar	1:100 000
100-21 Šibenik – Split	1:100 000
100-26 Brač – Hvar	1:100 000
100-27 Pelješac – Mljet	1:100 000
100-28 Dubrovnik – Budva	1:100 000
Male karte – MK I. dio	1:100 000
Male karte – MK II. Dio	1:100 000
32 Sedmovraće – Prolaz Veli Ždrelac	1:35 000
50 Pakleni kanal	1:18 000

New technologies

Paper chart production from ENCs

Intensive work on acquisition of the production process of making paper charts from ENCs continues (Fig. 9). Several charts are in the final stage of preparation using special software.

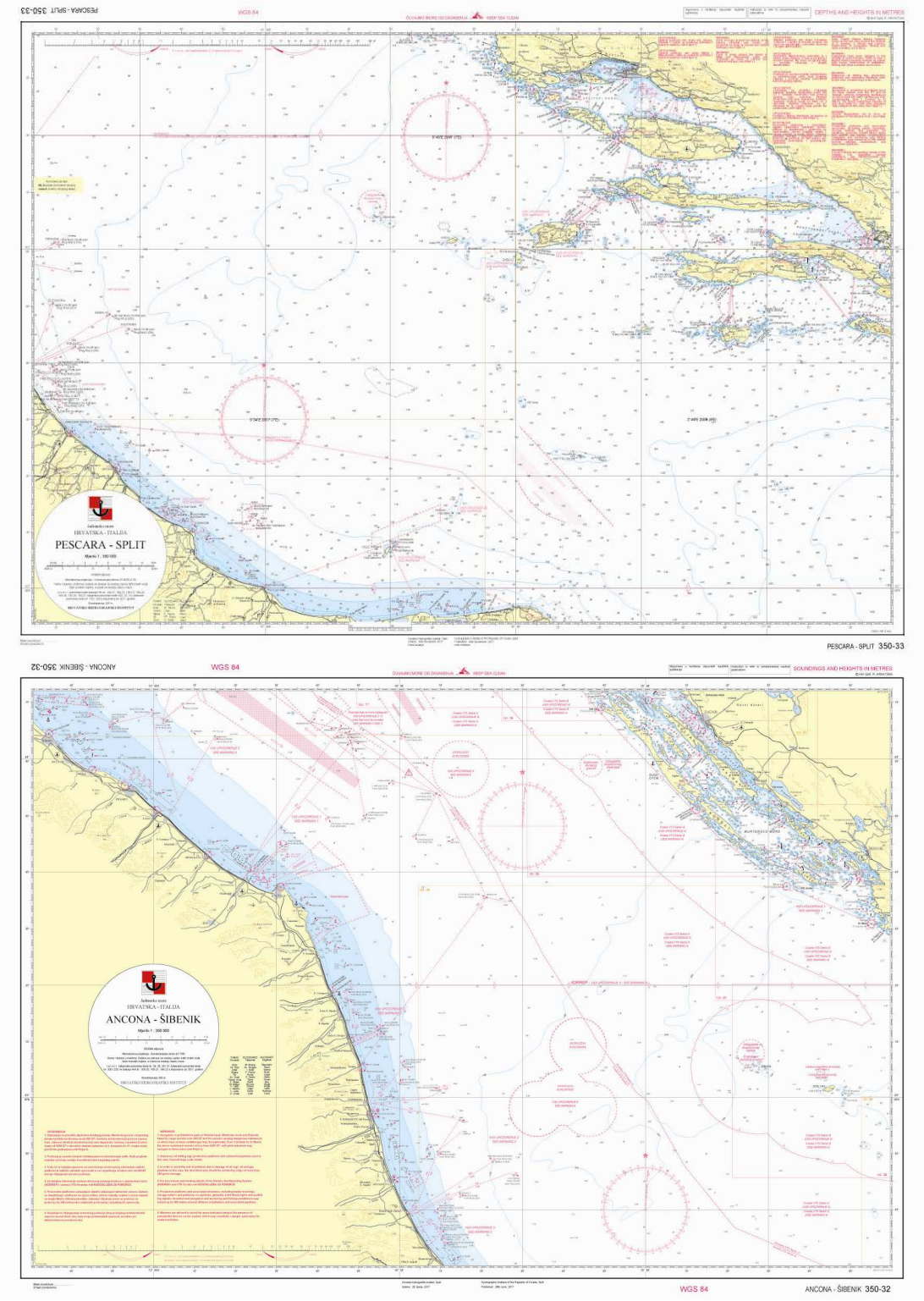


Figure 9. Charts produced from ENCs

Problems encountered

1. Some overlaps still exist between HR, IT and GR Overview and General ENCs. The process of consideration of the three current proposals is slow but still underway between IT and HR. The first version of the Technical Arrangement was drafted and exchanged.

2. A few small thin overlaps on IT/HR border are under consideration and deliberation.

3. An overlap between HR and MNE ENC in UB 3 is under urgent consideration according to Technical Arrangement.

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

5. Problems of implementation of attributes SCAMIN has been recognized as a key task to be realized in the future 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 are of particular importance and one of the objectives of the course. Regarding the current state of the cells in UB3, CHI is planning for re-scheming the cells in a square grid.

6. 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 considered to be 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.

7. As regards navigation areas of non-SOLAS ships, particularly the areas of navigation and stay of leisure boats and yachts, it can be said that there is still a need for improvement to current editions of official charts and publications. Most critical are those areas that have not been surveyed after interventions in the maritime domain, and the relevant data has not been published in the CHI official editions. However, according to the IHO specifications, even in these situations the relevant information ensuring minimum requirements for safe navigation is available to users of CHI editions (descriptive warnings of interventions in non-surveyed areas that have not been displayed on charts). In the past two-year period an improvement has been achieved even in these areas, because the systematic hydrographic survey included a considerable number of marinas and small harbours for which corresponding charts and ENCs were produced.

4. NAUTICAL PUBLICATIONS

National official nautical publications series

Figure 10. CHI official nautical publications

Nautical publications issued

Since the XX MBSHC Conference the following publications have been issued:
Radio Service 2019
Tide Tables:
- Tide Tables 2018
- Tide Tables 2019

Nautical Almanac:
- Nautical Almanac 2018
- Nautical Almanac 2019
- Nautical Almanac 2020 (in preparation)

Nautical Tables 2018
Notices to Mariners (monthly edition)

5. MARITIME SAFETY INFORMATION (MSI)

In the Republic of Croatia MSI service (Navigational Warnings) is available 7/24/365. NAVTEX broadcasts are transmitted in English and Croatian. MSI are transmitted regularly on VHF channels of coastal radio stations.
Correctness of the promulgation of information is controlled on the NAVTEX receiver and VHF station installed in the CHI Nautical Department (Fig. 11). There is no failure occurring during ordinary operation.

Figure 11. Equipment for monitoring the correctness of the promulgation of navigation warnings

Schedule of navigational warnings is shown in the following table:

NAV. WARNINGS	2017	2018	2019 (Until 31.5.2019)
NAVAREA	1	3	1
COASTAL	94	123	47
LOCAL	304	341	174
TOTAL	**399**	**467**	**222**

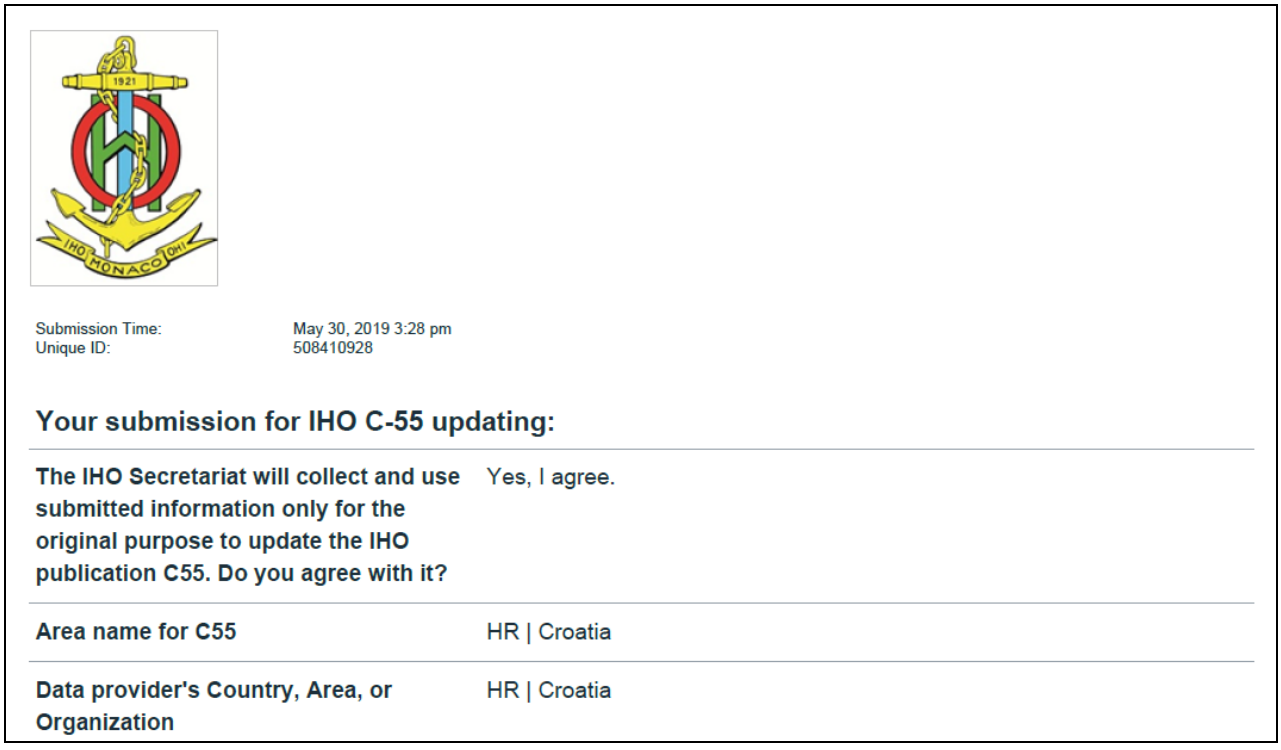
Navigational warnings are drafted according to IHO publication S-53 and there has been a high degree of unification and standardization achieved when it comes to general principles applied to message drafting. Hence, the CHI Nautical department continuously contributes to overall quality and consistency of MSI messages.

Besides, the CHI Nautical department intensively cooperates with relevant factors in the maritime domain such as: Harbour master offices, Coastal radio stations, Croatian VTS and MRCC, Croatian Navy, ship-owners, private boaters, etc. The main goal is to ensure safety of navigation by gathering the urgent safety information and issuing navigational warnings. Nevertheless, the CHI Nautical department cooperates with NAVAREA III coordinator Cadiz through Coast radio station Split, and there were no difficulties identified in overall communication.

In the past period, since the last MBSHC Conference, Croatian NAVTEX system [Q] located on the island of Hvar to cover the area of the Croatian part of the Adriatic Sea, has improved by installing additional transmitter for implementing NATIONAL NAVTEX 490 kHz SERVICE [F]. NATIONAL NAVTEX became fully operational on 24 April 2019 at 1250 UTC, when the first broadcast on 490 kHz was transmitted.
Thus, the overall safety of navigation in the Adriatic Sea has been brought up to higher standards.

6. C-55 IHO PUBLICATION

Updating information was provided on 30 May 2019. using a new IHO online submission functionality (Fig.12).



Submission Time: May 30, 2019 3:28 pm
Unique ID: 508410928

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, or Organization	HR | Croatia

Figure 12. IHO C-55 online submission updates

7. CAPACITY BUILDING

New technologies

Computer and communication infrastructure

A new wireless network (WiFi) has been implemented using four wireless access points.
Print on Demand printing technology has been introduced, using a large format plotter capable of producing high-quality paper charts printed to order (Fig. 13).

Figure 13. Print on Demand

Multibeam system

The new MBS for shallow water has been installed and operated.

Side Scan Sonar equipment

Through the CORE project the CHI acquired a two-frequency digital Side Scan Sonar CM2 (Cmaxsonar Marine Surveillance Camera), (Fig. 14).

Figure 14. Side Scan Sonar equipment

Remotely Operated Underwater Vehicle

Through the JASSPer project a remotely operated underwater vehicle (ROV) was purchased (Fig. 15). Purchase included a ROV training course for the HHI personnel.

Figure 15. Remotely operated underwater vehicle

Other equipment and instruments

A new survey boat for shallow water and Sub Bottom Profiler were procured.

WEB Services

CHI website is continuously improved (www.hhi.hr), providing a variety of new information and services, with modern design and functionality.

Online publication CATALOGUE OF NAUTICAL CHARTS AND PUBLICATIONS is updated on a regular basis (Fig. 16).

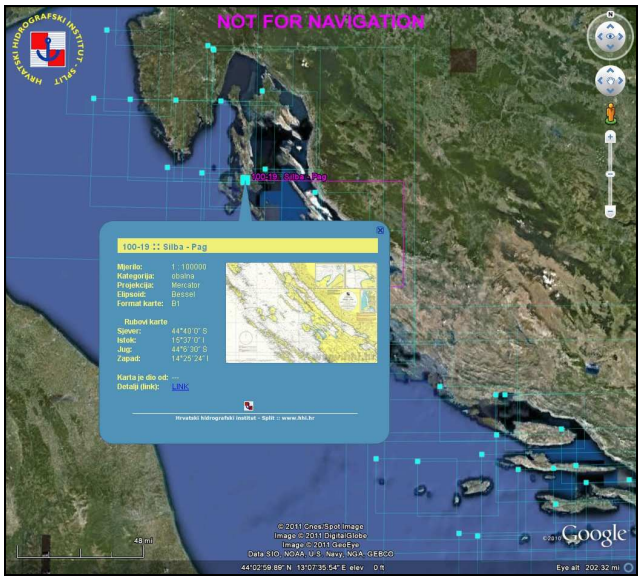


Figure 16. Online Catalogue of Nautical Charts and Publications

E-Services of Notices to Mariners and Navigational Warnings are available on the CHI website. Digital “Notices to Mariners” provide monthly updates for official editions, as well as archives of previously published digital notices (Fig. 17).

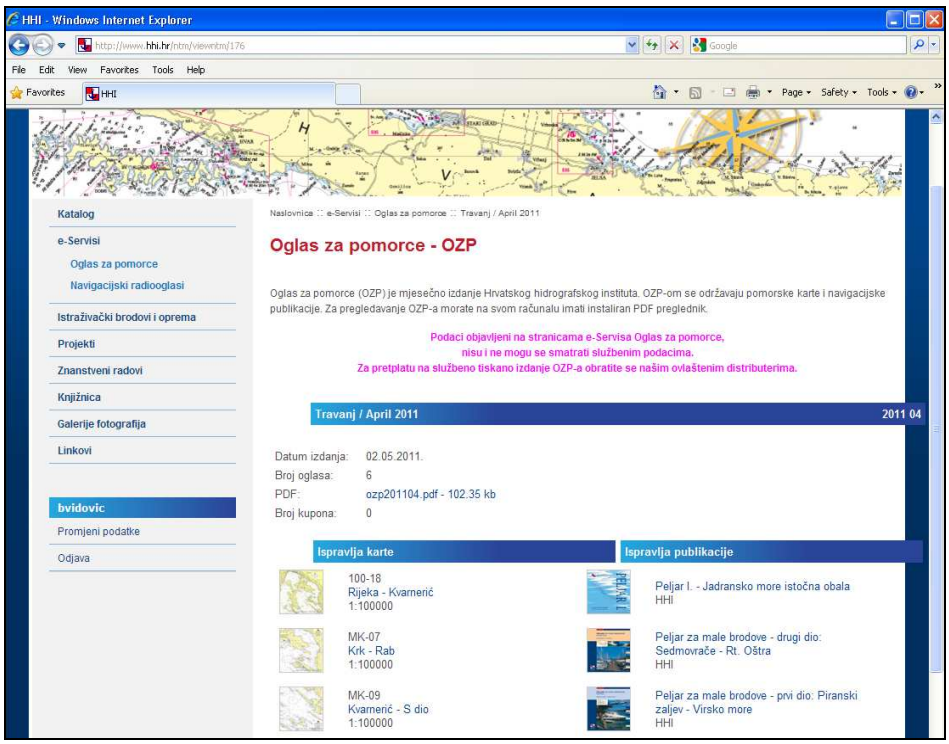


Figure 17. Notices to Mariners e-Service

Digital “Navigational Warnings” are updated promptly on the web, as soon as new information is reported and promulgated to mariners by ordinary means (NAVAREA, NAVTEX or VHF) (Fig. 18).

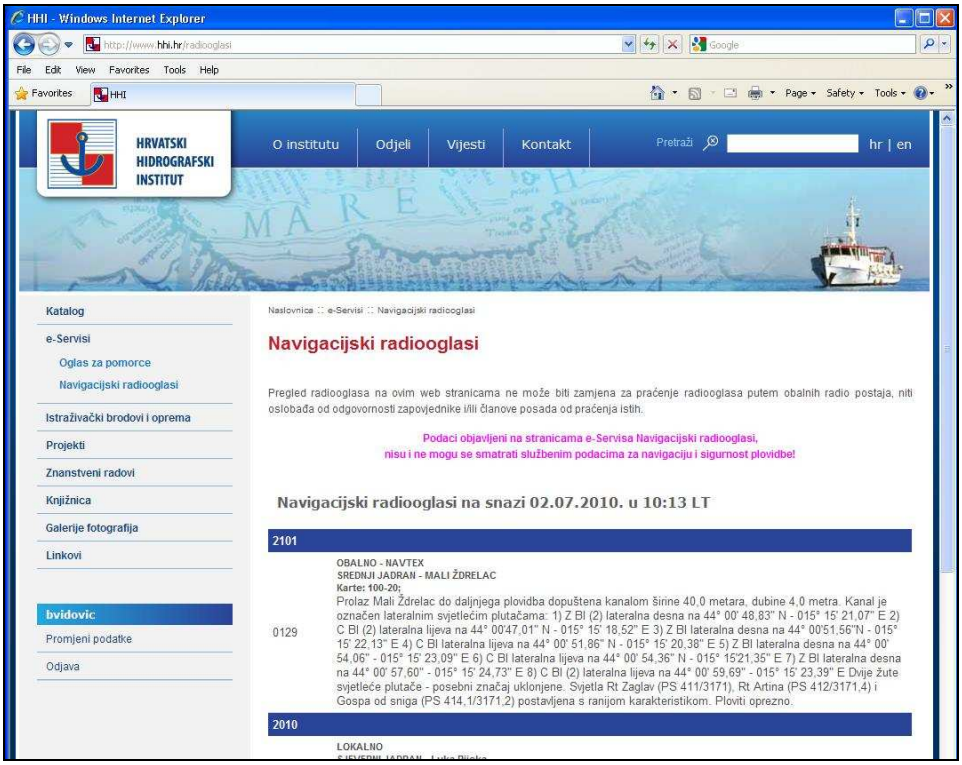


Figure 18. Navigational Warnings e-Service

Through a pilot project a web GIS service is launched presenting marine spatial data (Fig. 19)

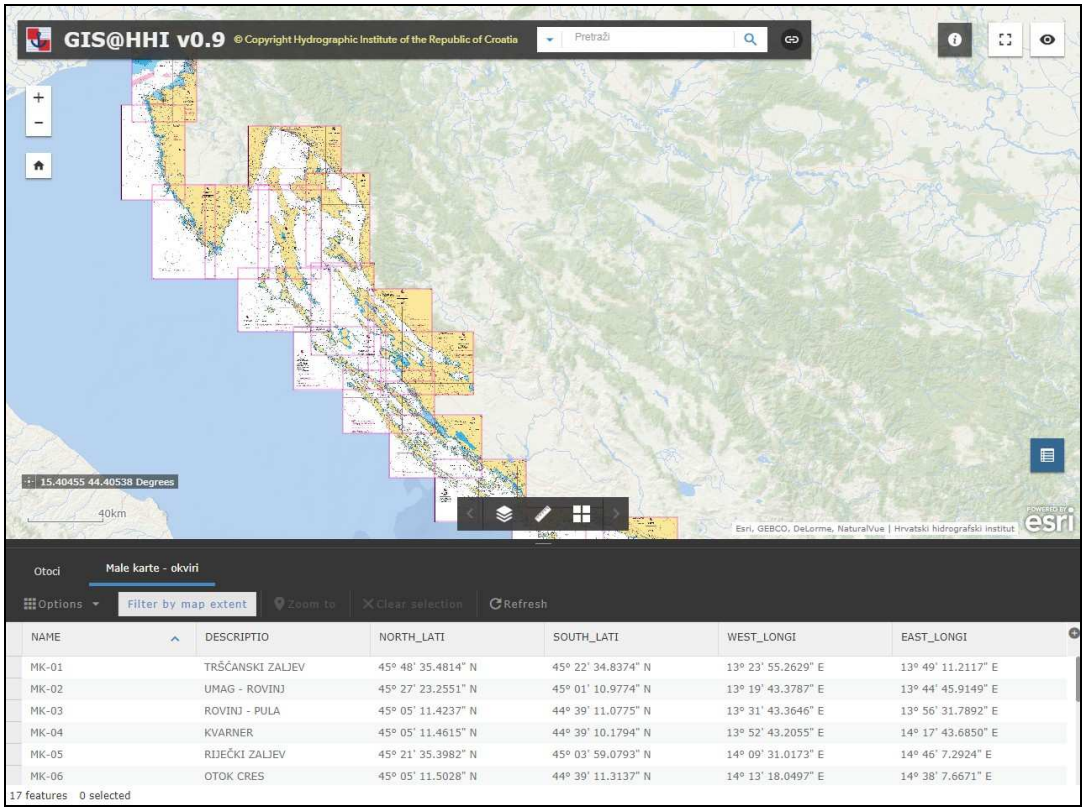


Figure 19. CHI web GIS service

Storage and overview procedures have been established for survey data provided to the CHI by authorized legal entities for hydrographic activity, as a pilot project (Fig. 20).

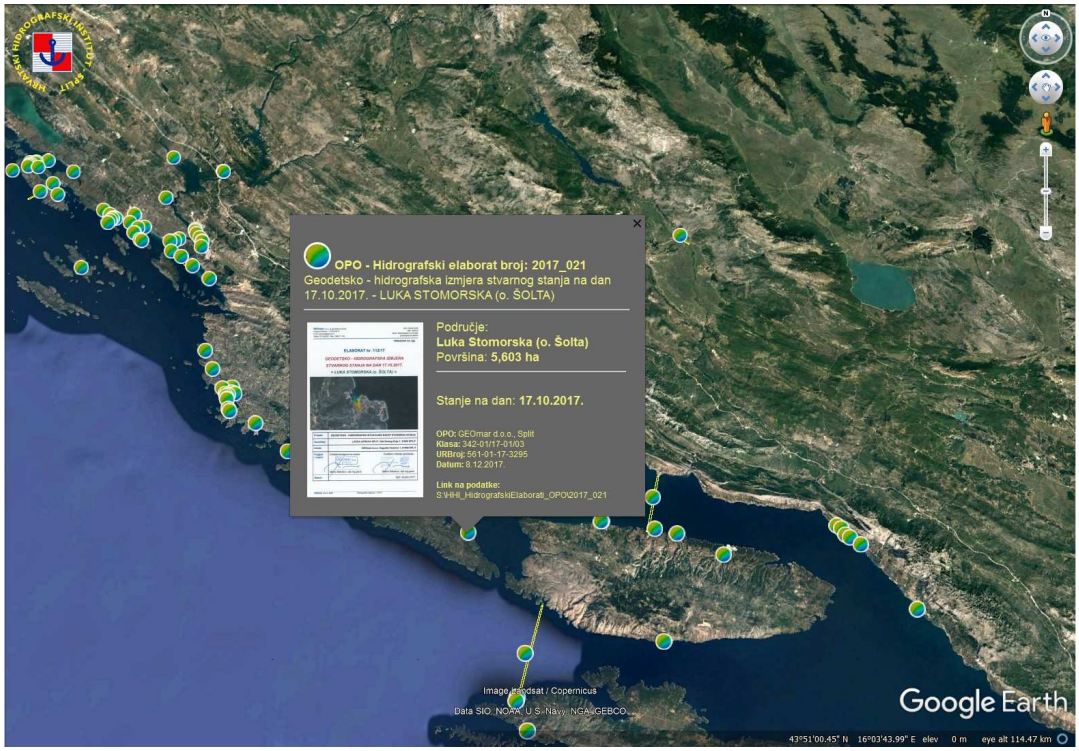


Figure 20. e-Service for authorised hydrographic surveyors

Oceanographic information system

Tidal measurements

Computer software has been provided for eight tide-gauge stations and for tidal measurements and tide-gage data (Fig. 21).

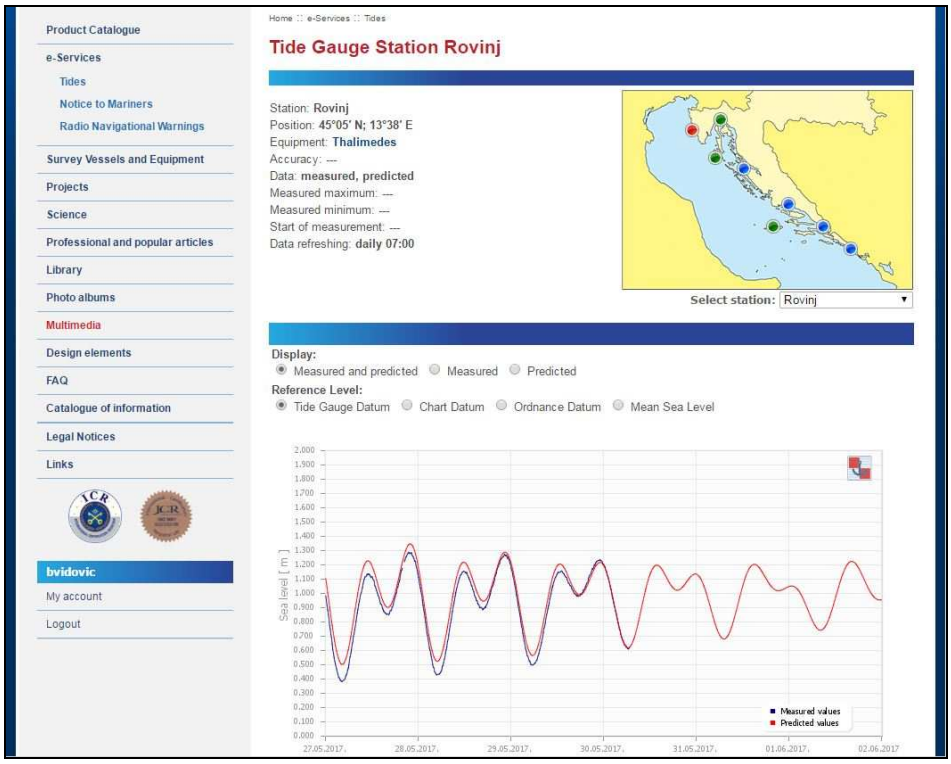


Figure 21. Tidal measurements and tide-gauge data e-Service

Wave measurements

Two Datawell DWR MkIII Waveriders have been deployed and are currently active in Ploče and near Sv. Andrija islet (Dubrovnik). They provide data in real-time and for more comprehensive analyses (Fig. 22).

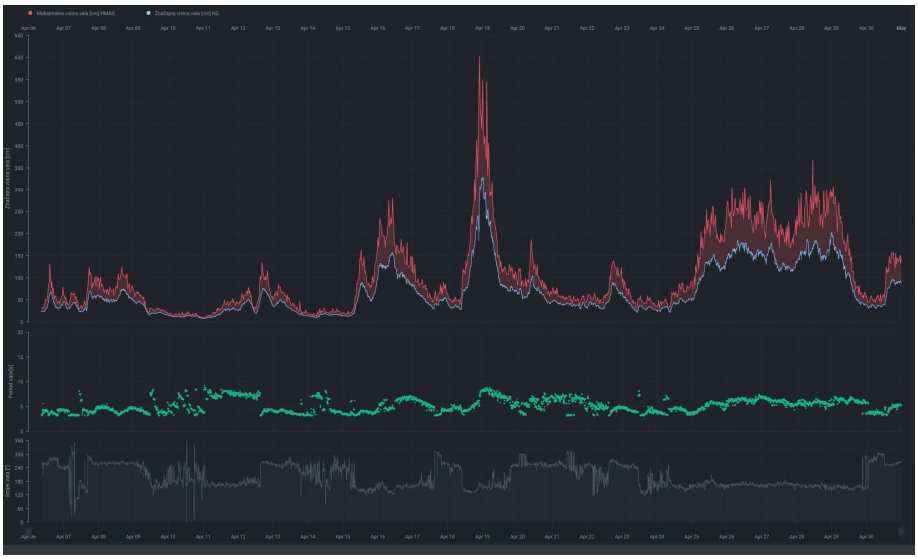


Figure 22. Wave heights, wave period and wave direction measured near Sv. Andrija islet during October 2018 (maximum wave heights exceeding 9 metres)

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. 23).

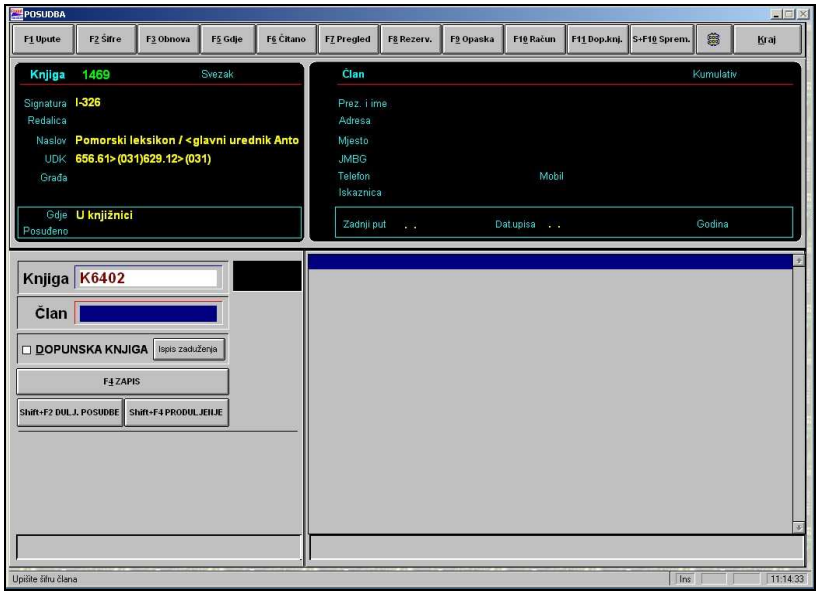


Figure 23. METELWin Application

Training

ISO Quality Management System

CHI successfully completed the process of ISO 9001:2015 certification (2018, 2019). An external audit is performed on yearly basis aiming to improve and confirm the certificate (Fig. 24).


Certificate
of Registration

Ovim se potvrđuje da je:

HRVATSKI HIDROGRAFSKI INSTITUT

Zrinsko-Frankopanska 161, Split, Croatia

prošlo procjenu od strane ICR ADRIATICA d.o.o., te da je Sustav upravljanja kvalitetom sukladan zahtjevima

ISO 9001:2015

Ovime se certifikat odobrava za registraciju pod uvjetom pridržavanja pravila i uvjeta vezanih za certifikaciju za vrijeme trajanja istog.

Certifikacijski opseg:

Pružanje usluga hidrografskih poslova, sigurnosti plovidbe, objava službenih pomorskih karata i publikacija, znanstveno-istraživačkog rada, razvojnih projekata te zaštite okoliša

Izdanje: 17.06.2016.
Valjanost: 16.06.2019.

Certifikat br.: QCN/3016

Figure 24. CHI ISO 9001:2015 certificate

Training for Ocean Policy Making and Management

The "Training for Ocean Policy Making and Management" programme was organized by the Korean Ministry of Foreign Affairs and the Korea Hydrographic and Oceanographic Agency. The course was held in the Republic of Korea from 11 to 17 November 2018. (Fig. 25). The aim of this training course was to enhance the understanding of various activities and strategic level policies on hydrography and oceanography and to strengthen future cooperation in these areas among the participating countries. This was also an opportunity to present experience and matters of common hydrographic interest.

Figure 25. Ocean Policy Making and Management training participants (KHOApremises)

New software training

Training is provided to the staff for all new versions of the existing software (Fig. 26 and 27).

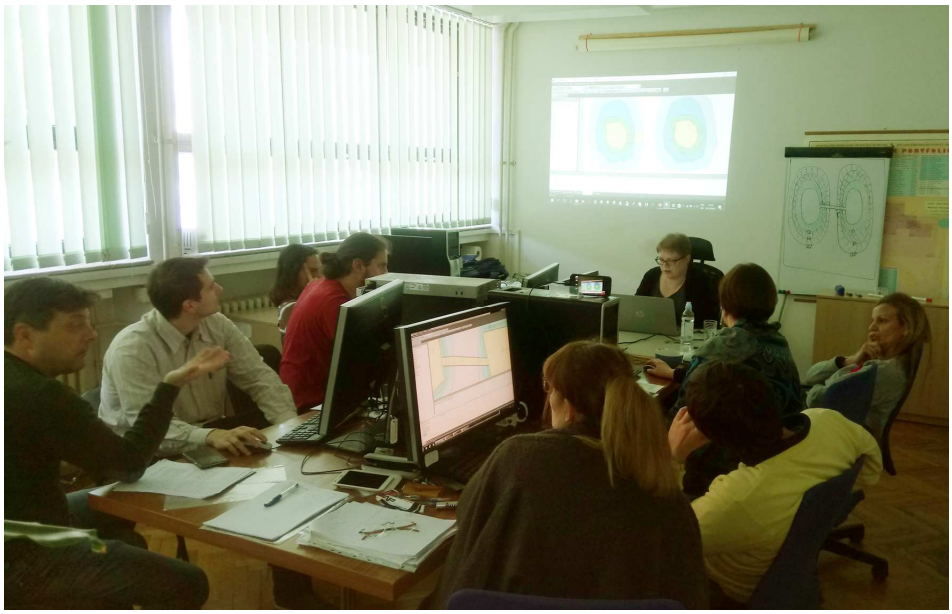


Figure 26. dKart Publisher training (CHI premises)

Figure 27. Participants in the hydrographic DBM training (CHI premises)

Cartography category B training

The training for category Cartography B was provided by the UKHO for one CHI cartographer (2018), (Fig. 28).

Figure 28. Participants Cartography Cat B training (UKHO premises)

Bilateral Cooperation

Bilateral agreements

Activities within the bilateral arrangement between Croatia and Italy are continued.
In accordance with the bilateral agreement in force between the UKHO and CHI, intensive cooperation has been established and continued with the UKHO RT2 South Geographic Manager in order to address and harmonize various data in official charts and publications of both hydrographic offices.
Very good cooperation is taking place with the UKHO (IPS) under the Custodianship Agreement, which defines the licensing process for making CHI data available to a third party, taking into account principles of the public service data and information regulations.

Bilateral and multilateral meetings

CHI - UKHO licensing meeting
Working session with representatives of the UKHO Licensing Section took place on the CHI premises in March 2019.
Main topic of the two-day session was related to numerous challenges coming from new requests for reuse of hydrographic data. Certain legal, administrative, financial, organizational and ICT aspects of the licensing issues were under comprehensive consideration.

EU projects:

1. "Cross-border joint research and awareness raising action in detecting environmental conditions. Establishing higher safety and protection measures of Maritime domain parts of Croatia and Montenegro" – CoRE

Project CoRE was a two-year EU/IPA project under component II, measure 1.1 Joint actions for environment, nature and cultural heritage protection. Location of the action was Dubrovnik-Neretva County (Croatia) and Montenegrin coastal area.
Overall objective of this project was to contribute to improving the overall protection and preservation of the eastern Adriatic coast.
Specific objectives were as follows:

- ✓ to establish safety protocols and new charts (for waterway safety / habitat preservation researches) based on research and gathered data, concerning natural changes of the coastline in the border area of Croatia and Montenegro influenced by erosion from the mainland and wave power from the open sea.
- ✓ to increase general knowledge of wide groups of stakeholders on Maritime property (maritime domain) component of coast and its sustainable littoralisation.

Croatian partners in the project were: Hydrographic Institute of the Republic of Croatia (HHI), as leading partner and Institute for Marine and Coastal Research in Dubrovnik (IMP). Montenegrin partners in the project were: Institute of Hydrometeorology and Seismology of Montenegro (IHMS) and Public Enterprise for Coastal Zone Management (JPMD). Associate in the project was PAP/RAC from Split. The project started in January 2016 and was finalised in December 2018. The total value of the project for both sides was EUR 569.876,39.
The results of the project were presented at the final conference in Dubrovnik in November 2017.

CHI had significant benefit of the project implementation. Above all, expensive and modern hydrographic and oceanographic equipment was purchased. For details see: www.projectcore.info

Side scan sonar (Fig. 29) was used for underwater hydrographic and oceanographic research in the areas of Dubrovnik and the Neretva delta. As for oceanographic equipment, Directional wave rider buoy was purchased. Directional wave rider buoy was placed near Sv. Andrija islet in Dubrovnik area (Fig. 30).

Figure 29. Side scan sonar equipment

Figure 30. Directional wave rider buoy

2. 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 a hundred 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.

A total of 41 organizations from 20 countries (18 EU Member States), located along the European seas, are participating in the project. The majority of organizations include marine research institutes (17) and national hydrographic offices (16), with the involvement of other experts from different fields (IT, INSPIRE, ISO, OGC, satellite bathymetry, mareographic modelling).

CHI has been partner in the project since May 2017. The third phase of the project is under way.

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

CHI hosted the annual meeting of the EMODnet in Split from 30 to 31 October 2018, where participants discussed the objectives, activities, methodology, technology and results achieved in the project (Fig. 31).

Figure 31. EMODnet annual meeting in Split (Oct 2018)

3. *NAVISAFE ADRIA - Risk prevention through cross-border data collection and exchange system*

New project applications under the EU Interreg IPA Cross-border Cooperation Program Croatia-Bosnia and Herzegovina-Montenegro 2014-2020 under the title NAVISAFE ADRIA - "Risk prevention through cross-border data collection and exchange system" is being prepared. The project application was developed in cooperation with its partners: Institute for Hydrometeorology and Seismology of Montenegro and Municipality of Neum. The project application was successfully submitted by 20 December 2018. Currently, it is under the evaluation process.

Status of approval of amendments to the IHO Convention

In the period between the two conferences, CHI put additional effort into communication with the competent administration aiming to speed up the bureaucratic procedure for approval of the Protocol of amendments. There is currently no information about possible prioritizing of the approval process.

8. OCEANOGRAPHIC ACTIVITIES

Oceanographic projects

CHI is involved in several oceanographic projects. The projects described below are singled out as the most interesting ones:

"Cross-border joint research and awareness raising action in detecting environmental conditions. Establishing higher safety and protection measures of maritime domain parts (emphasis on the coast) of Croatia and Montenegro – CoRE".
Geological samples were taken and analyzed during April 2017 at 17 stations near Ploče and Dubrovnik. Datawell waverider near Sv. Andrija islet and 2 Acoustic Doppler current profilers near mouth of the Neretva river were deployed during April 2017. Sea surface waves data are available in real-time and both these and sea currents data are gathered for later analysis (Fig 32).

The Port of Ploče, international cargo port having large importance for Bosnia and Herzegovina is growing. In cooperation with port authorities, CHI now provides sea level, wave height, period and direction, and wind speed and direction data in real-time, as well as a broader analysis of these (and derived) data.

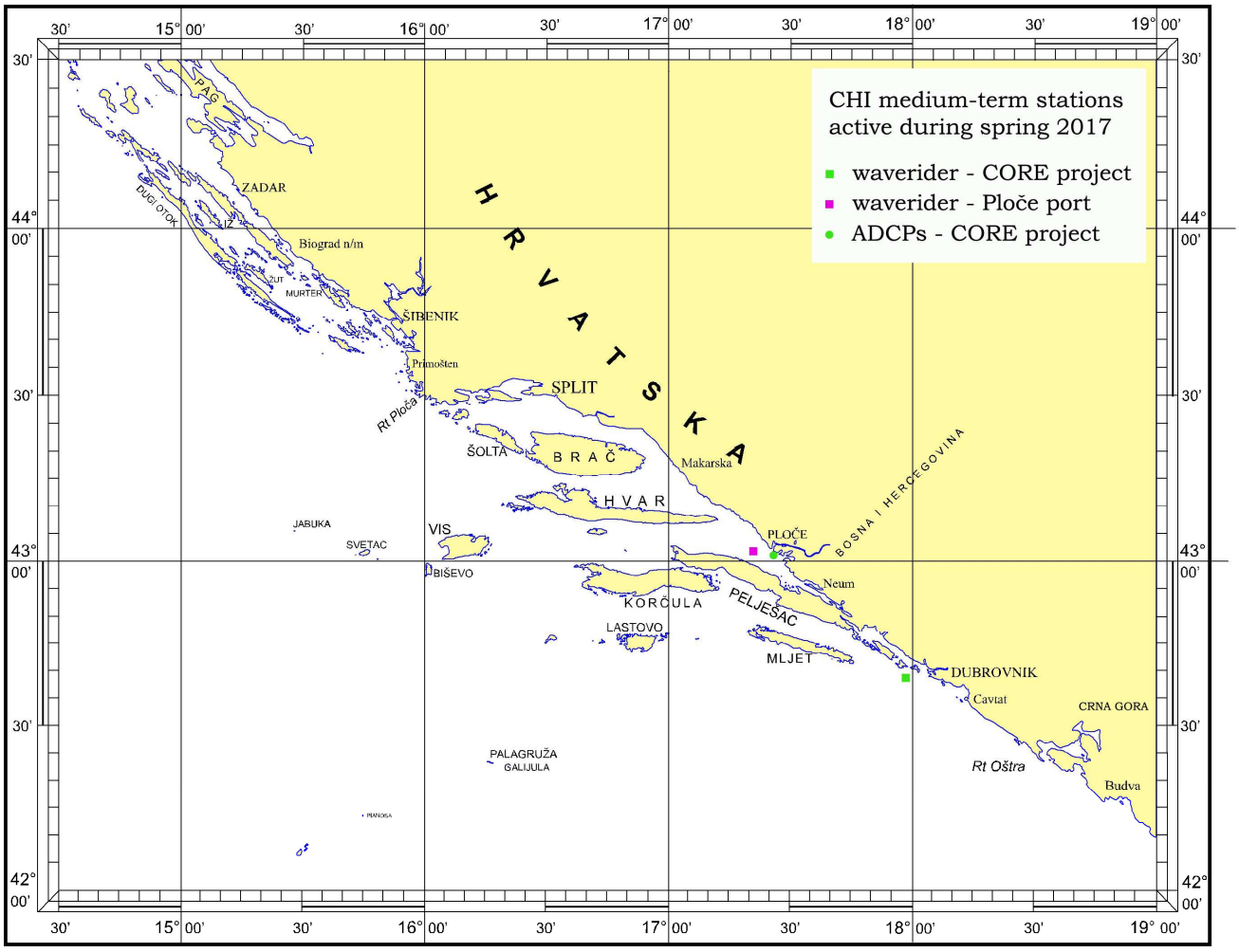


Figure 32. Geographic positions of waverider buoys and ADCP current meter stations.

There are also more than 60 smaller projects (e.g. outfall preparation studies, electric cable preparation studies...) in which oceanographic data were measured and analyzed. As an example, Fig. 33 shows the current sedimentology chart, prepared for the Peljar publications.

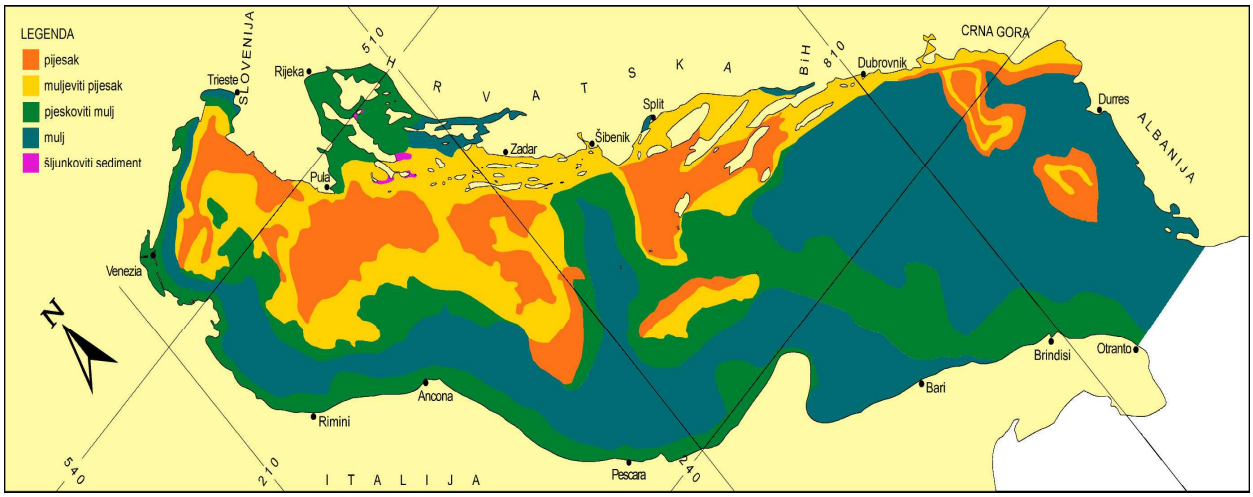


Figure 33. Sedimentology chart updated with data from a series of projects (version end 2016).

Oceanographic publications

Annual publications "Tide Tables – Adriatic Sea, East Coast" (Fig. 34) are also available in a digital format for the years 2016 and 2017.

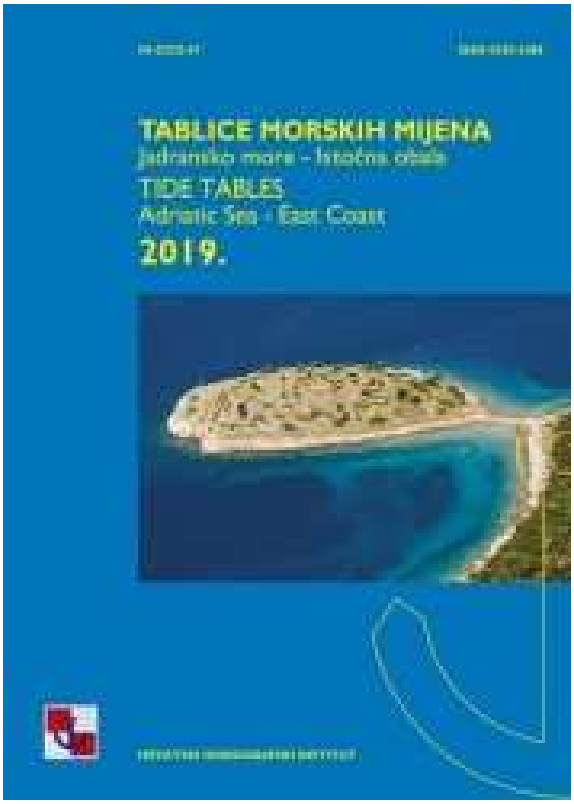


Figure 34. Tide Tables – Adriatic Sea, East Coast

9. OTHER PROJECTS AND ACTIVITIES

National Marine Spatial Data Infrastructure – MSDI

CHI actively participates in the long-term Croatian project at national level for the implementation of national legislation relating to NSDI aiming to establish the MSDI (Fig. 35).

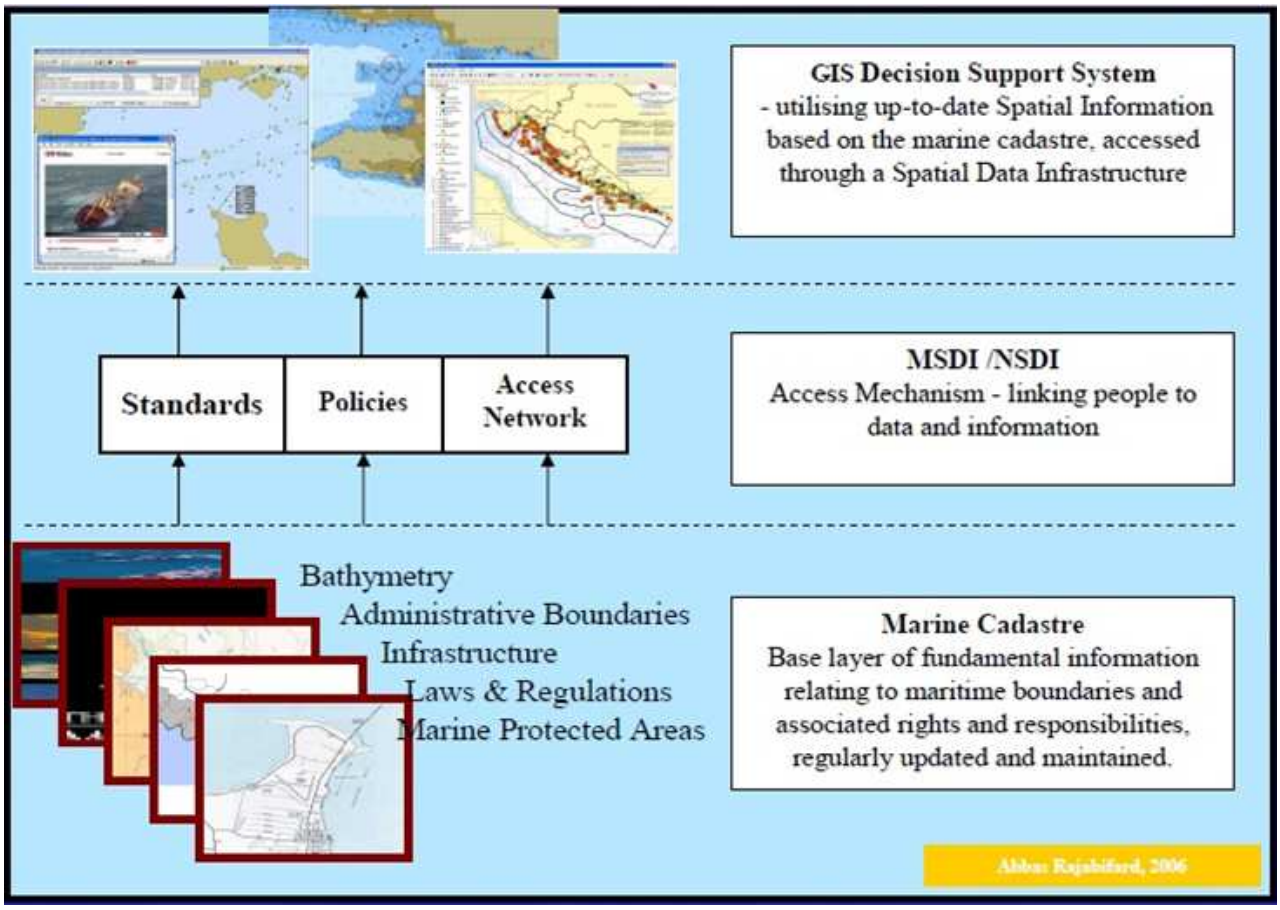


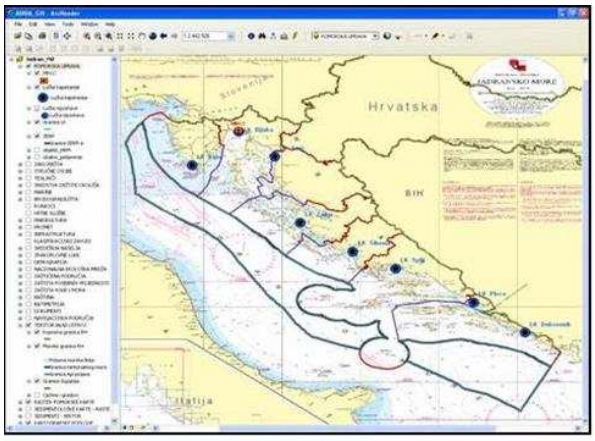
Figure 35. An overview concept of Croatian MSDI

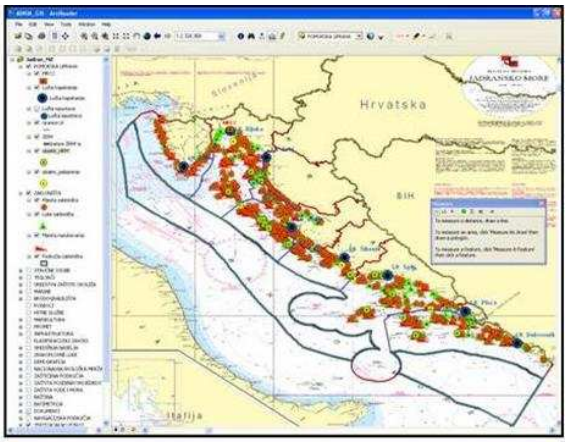
In Croatia, Marine Spatial Data Infrastructure (MSDI) is a component of National Spatial Data Infrastructure, so currently CHI provides metadata to the Croatian NSDI Geoportal that serves as a starting point for accessing spatial data sources that are, according to the NSDI Act (Official Gazette 56/2013), part of National Spatial Data Infrastructure (http://geoportal.nipp.hr/en).
CHI participates in the European Marine Observation and Data Network (EMODnet), High Resolution Seabed Mapping Phase 3 Project (2017-2020), so it is expected from CHI to provide metadata/data to the EMODnet – Bathymetry geoportal (http://www.emodnet-bathymetry.eu/)
In the future CHI plans to set up a conceptual framework for Croatian MSDI with other providers of marine data and partners. That includes building of a MSDI reference model and evaluating Metadata & Data geo-portal.

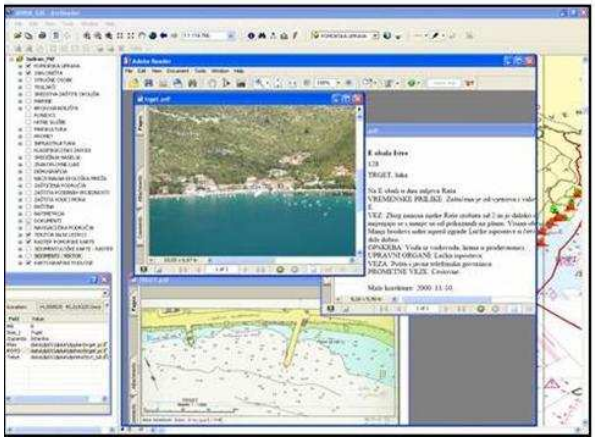
CHI personnel participated in several international scientific and technical conferences presenting hydrographic and oceanographic papers.

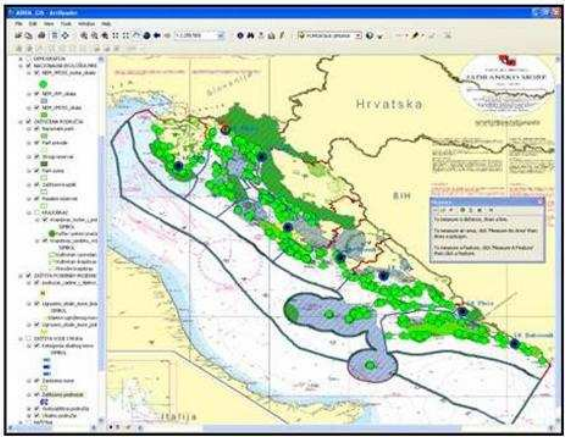
Supporting marine policies for efficient protection, use and disaster management

CHI continuously participates in multiple projects designated by the competent administrations providing high quality support. ADRIA GIS application (Figure 36), as SW decision support tools in emergency situations, is developed for HR MRCC and the decision-making body. It is recognized through European countries, IMO and EMSA.









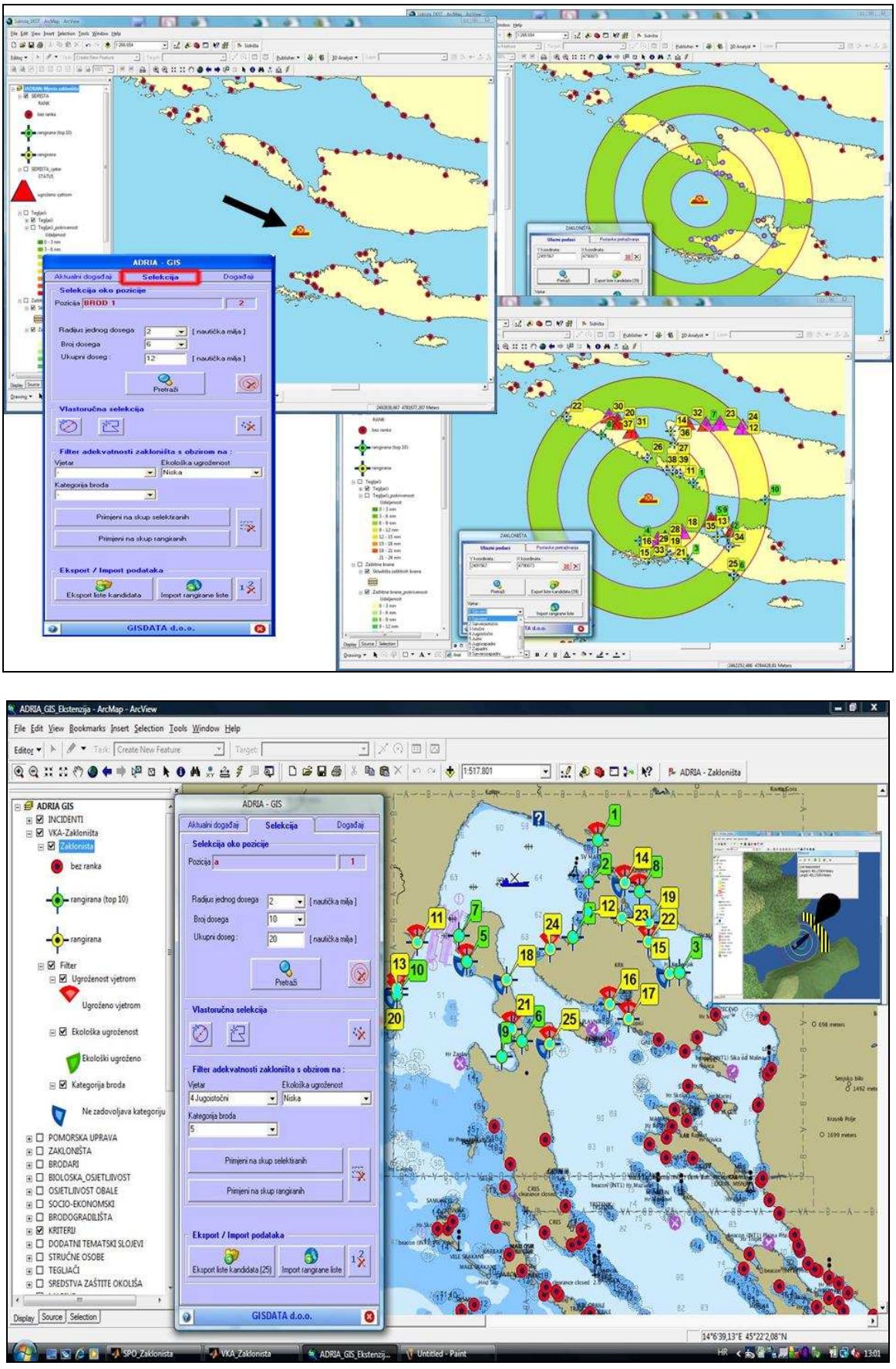


Figure 36. ADRIA GIS Application in operative use in HR MRCC Rijeka

10. CONCLUSIONS

Operational Level - status

In the past two-year period the status of hydrographic-navigational element of the navigational safety was at a satisfactory level.

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.

Realization of hydrographic surveying and charting was conducted according to defined priorities and the planned schedule.

A significant contribution towards improving the hydrographic-navigational element of navigational safety was made through publishing of a number of new Croatian electronic navigational charts (ENC) 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.

Since the end of 2016 Croatian ENCs have been made available on the Croatian Navy vessels through the Navy Agreement. Agreements have also been 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).

Operational Level – challenges

There are some problems and challenges regarding HR ENCs. Some overlaps exist between HR, IT and GR Overview and General ENCs. Currently, there is a commonly harmonized proposal, most likely to be the final solution.

Problems of implementation of attributes SCAMIN CHI recognized as a key task planned to be realized in the future periods. Regarding the current state of the cells in the UB3, CHI is planning for re-scheming the cells in a square grid.

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

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 considered to be 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.

As regards navigation areas of non-SOLAS ships, particularly the areas of navigation and stay of leisure boats and yachts, it could be said that there is still a need for improvement to current editions of official charts and publications. In the past two-year period an improvement has been achieved even in these areas, because the systematic hydrographic survey included a considerable number of marinas and small harbours for which corresponding charts and ENCs were produced.

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.

CHI has maintained a high level of technical and technological equipment by acquisition of several important systems, devices and equipment through EU funded projects. Existing software of the basic production line is regularly updated.

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.

Through participation in several bodies and working groups of the IHO and PRIMAR RENC, the CHI continues its proactive role and contributes to realisation of objectives established by these organizations.

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

Achievement of main strategic and programme objectives in the current and next planned periods will be challenging in every respect, because it is expected to proceed in very restrictive conditions with additional requirements and tasks.

Management Level – challenges

A general assessment of overall CHI capacity determines an approach to achievement of objectives which will be based on prioritization, well organized business processes and cooperation between employees, as well as good cooperation with the Management Board and competent ministry.

The main challenges in the forthcoming period will be in connection of introducing a new digital production line and internal organizational restructuring in order to establish a new business model in accordance with ISO QMS, which will ensure a modern and high quality hydrographic service.

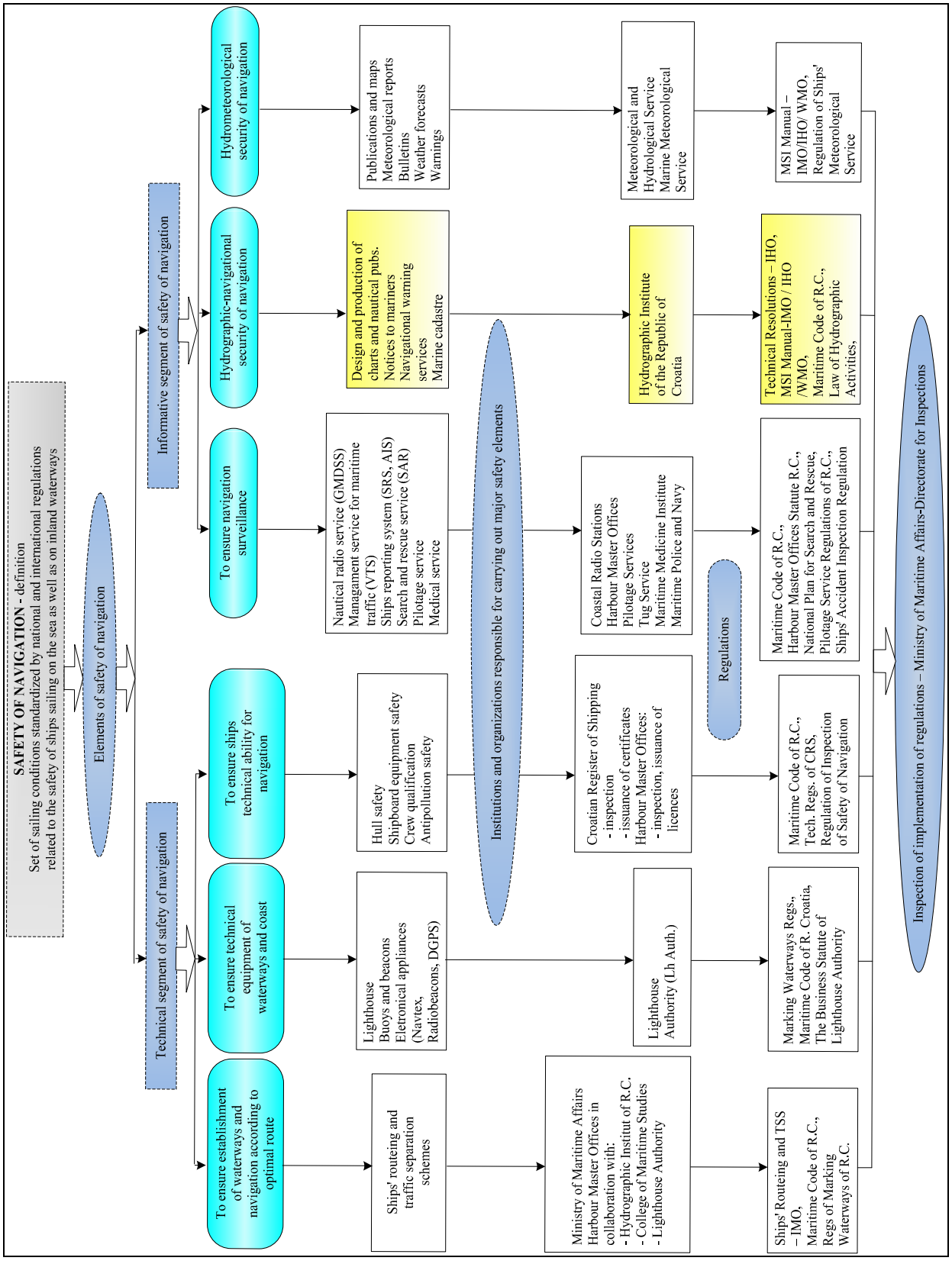
It is well known that the key point and premise of a quality hydrographic service is to achieve and maintain a high level of motivated and educated staff. Overwhelming fact is that new technologies pose high demands on the required qualifications of employees. This will be a major challenge, as well as the introduction of new technologies.

Expectations – topics for discussion and exchange of views and experiences

Finally, it is expected that this report will contribute to the XXI MBSHC Conference for better understanding of the overall situation in the Croatian hydrographic service, focusing on operational, management and policy aspects. It is also expected to facilitate the achievements of the conference through presentations, discussions and exchanges of views and experience, especially on the following topics:

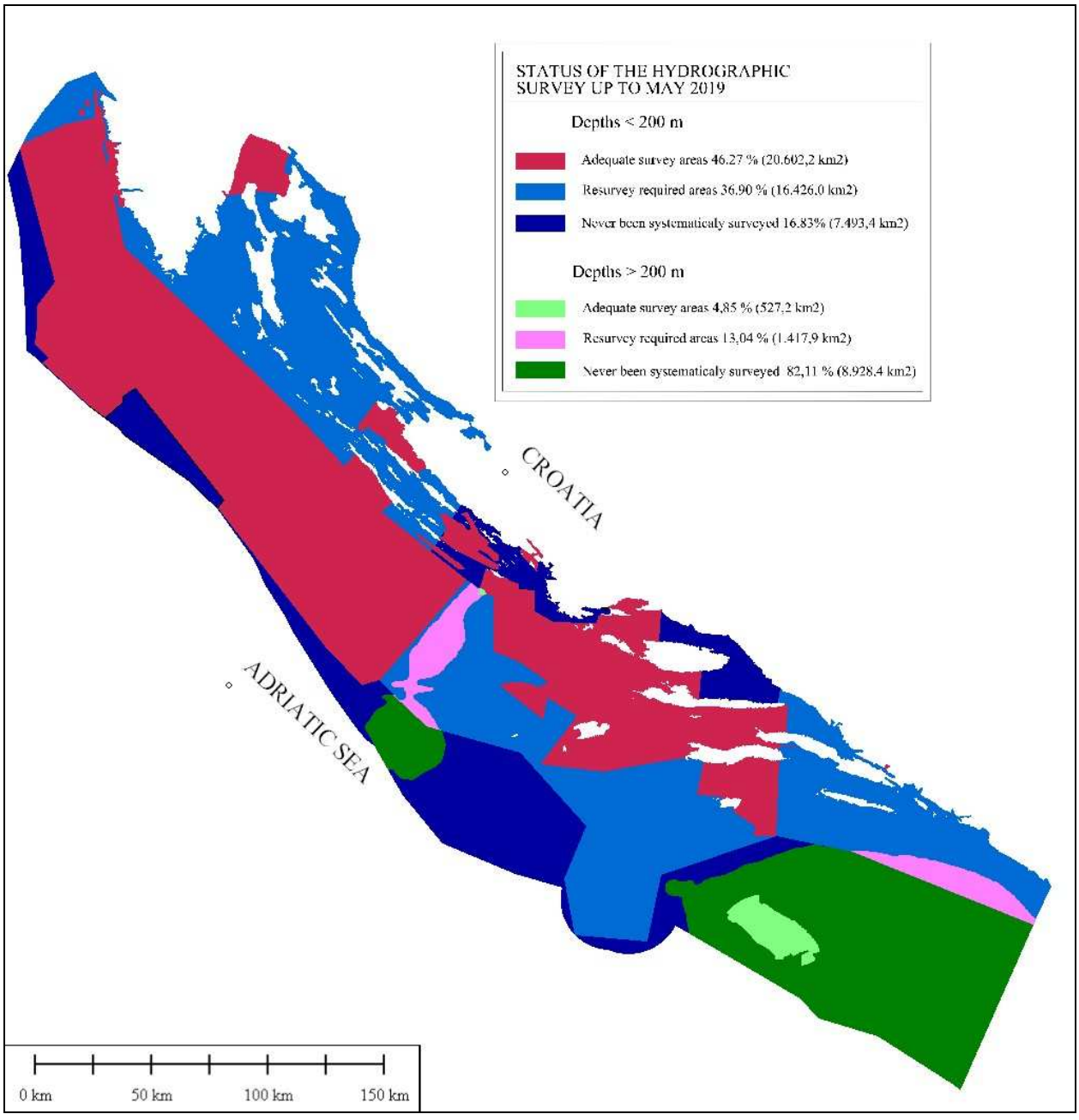
1. **Smooth technological transition – HO organizational structure**
2. **Legal framework for hydrographic service – national prospective, strategic and planning docs**
3. **Data centric approach – challenges of introducing and implementations**
4. **ISO QMS design, implementation and improving**
5. **Dual fuel ENC service operating – S-57 and S-101, …**
6. **National ENC distribution options and challenges**
7. **ENC S-101 test data development - expectations**
8. **ENCs overlap in region – applications of the WEND principles (Technical Agreement)**
9. **Data licensing policy**
10. **Commercial hydrographic survey – legal aspect and implications**
11. **LIDAR experience and praxis (coast line and shallow waters)**
12. **Satellite bathymetric data (accessibility and applications)**
13. **Crowdsourced bathymetry – position and national regulation (restrictions)**
14. **Science approach for HO**
15. **Non-SOLAS ENCs and market options for leisure community/users – National regulations**
16. **Regional cooperation with neighbouring countries**
17. **Regional Hydrographic Commission operation (capacity building)**
18. **e-Office – administrative arrangement and daily management**

ANNEX 1 - CHI position in the structure of Croatian administration

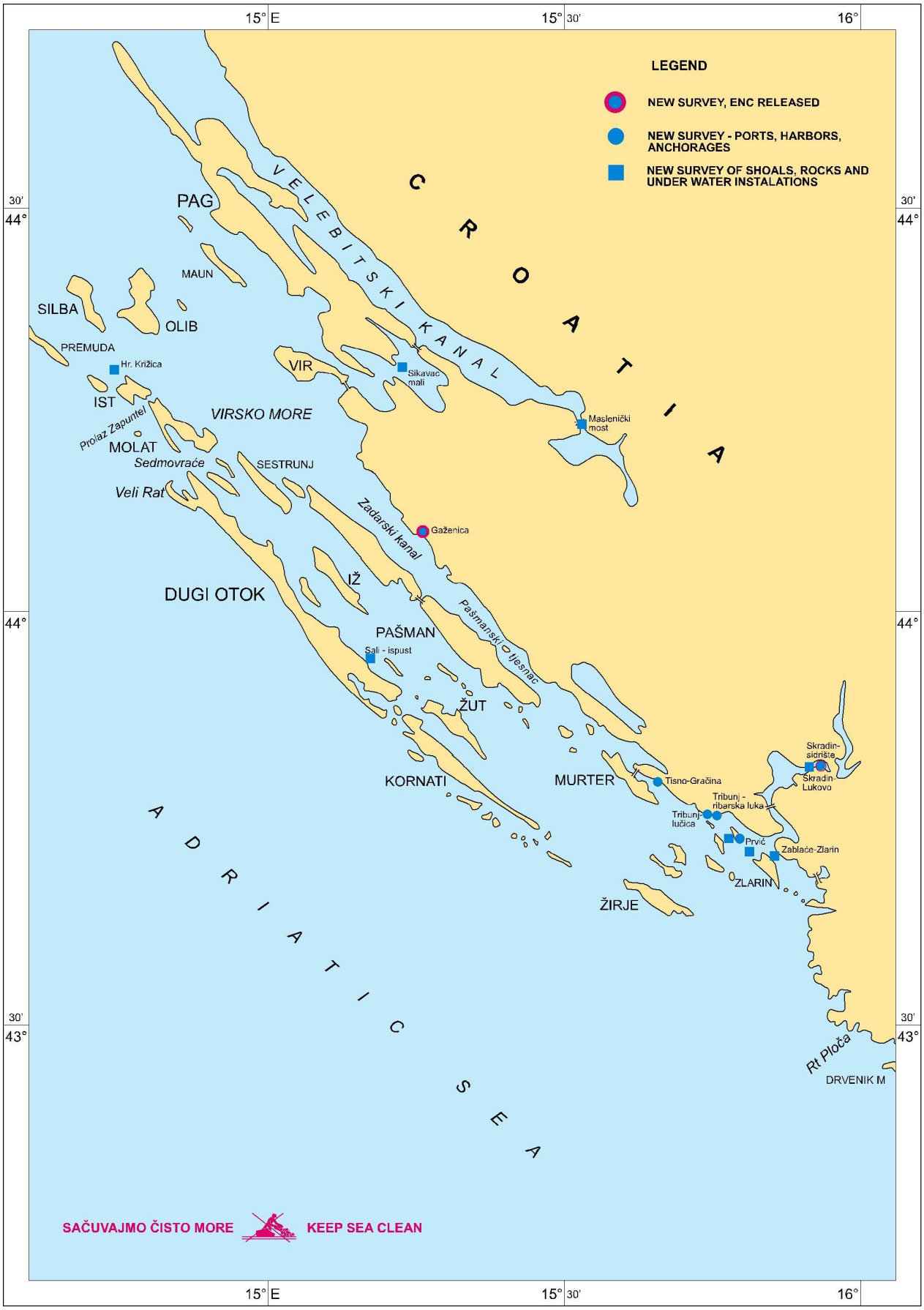


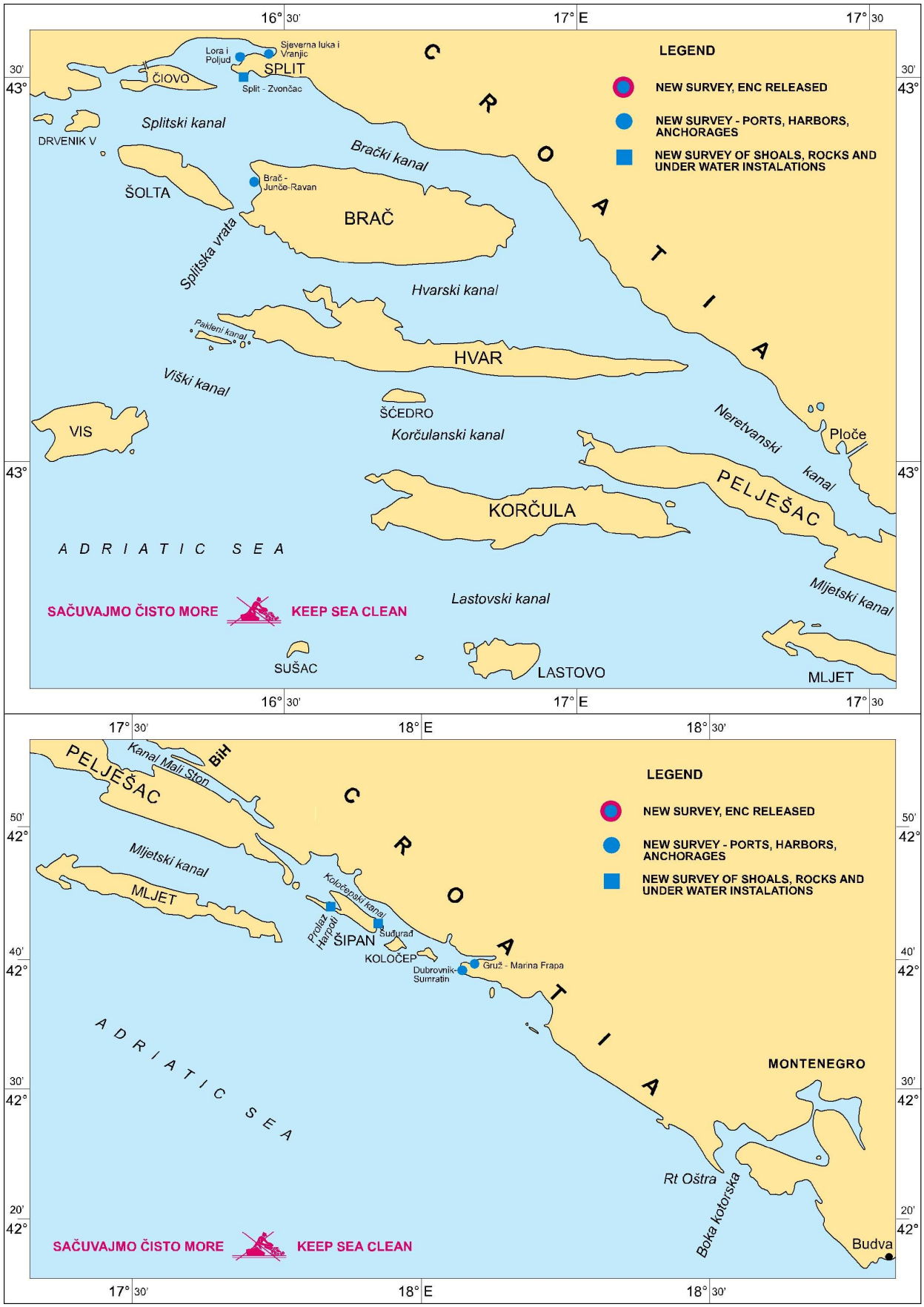
ANNEX 2 - Status of hydrographic survey in accordance with the IHO C-55 criteria

	Adequate survey		Resurvey required		Never been systematically surveyed	
Depth	**A1** (<200m)	**A2** (>200m)	**B1** (<200m)	**B2** (>200m)	**C1** (<200m)	**C2** (>200m)
Percentage (%)	**46,27**	**4,85**	**36,90**	**13,04**	**16,83**	**82,11**
Area (sq. km)	20.602,2	527,2	16.426,0	1.417,9	7.493,4	8.928,4

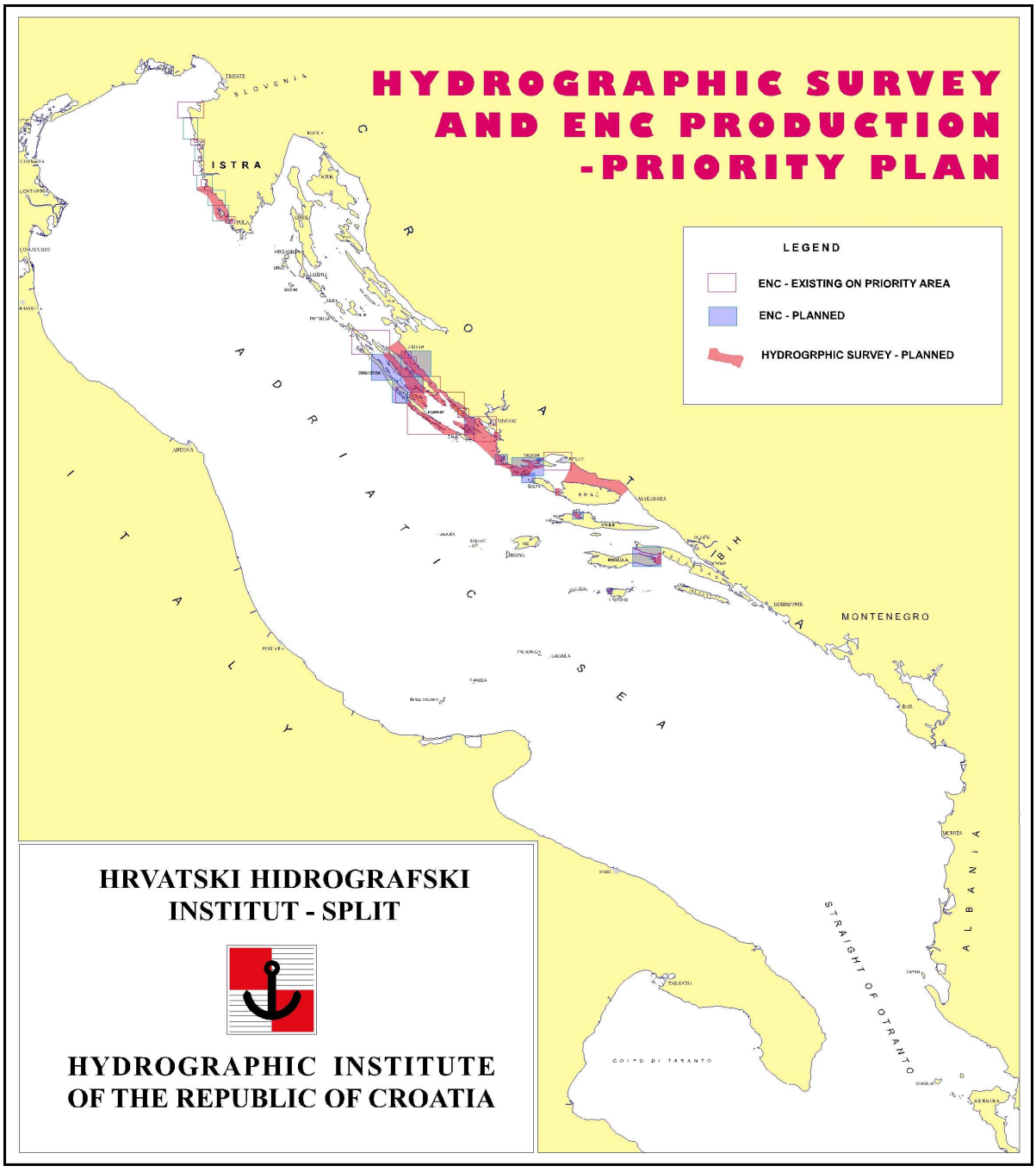


ANNEX 3 - New hydrographic survey and ENC of marinas, small ports, shoals, underwater rocks and installations

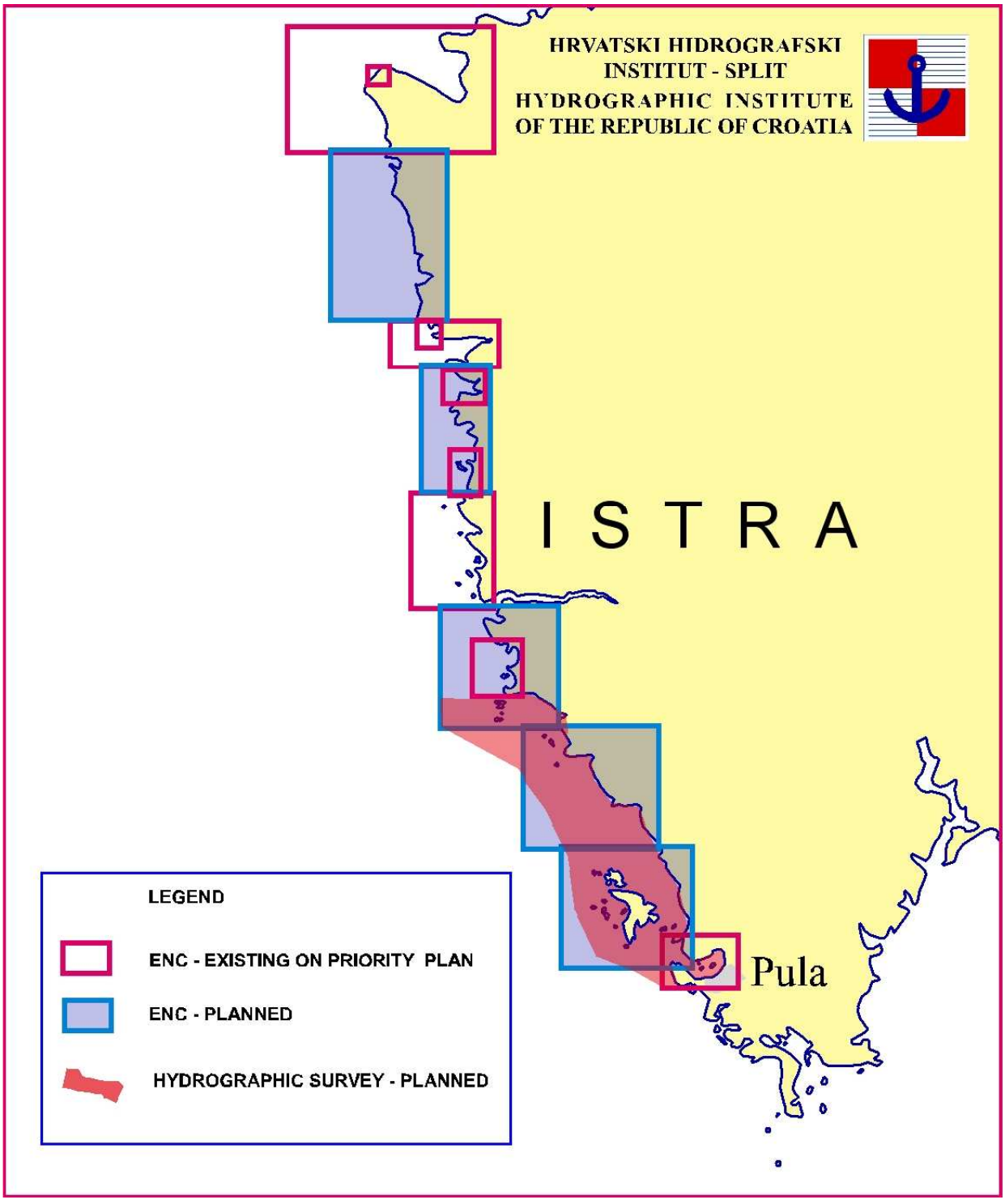

15° E
15° 30'
16°
30'
44°
43°
LEGEND
NEW SURVEY, ENC RELEASED
NEW SURVEY - PORTS, HARBORS, ANCHORAGES
NEW SURVEY OF SHOALS, ROCKS AND UNDER WATER INSTALATIONS
C R O A T I A
VELEBITSKI KANAL
PAG
MAUN
SILBA
OLIB
PREMUDA
Hr. Križica
VIR
Sikavac mali
IST
VIRSKO MORE
Prolaz Zapuntel
MOLAT
Sedmovraće
SESTRUNJ
Veli Rat
Maslenički most
Zadarski kanal
Gaženica
IŽ
DUGI OTOK
PAŠMAN
Sali - ispust
Pašmanski Ijesnac
ŽUT
KORNATI
MURTER
Tisno-Gračina
Skradin-sidrište
Skradin-Lukovo
Tribunj - ribarska luka
Tribunj-lučica
Prvić
Zablaće-Zlarin
ZLARIN
ŽIRJE
A D R I A T I C S E A
Rt Ploča
DRVENIK M
SAČUVAJMO ČISTO MORE
KEEP SEA CLEAN

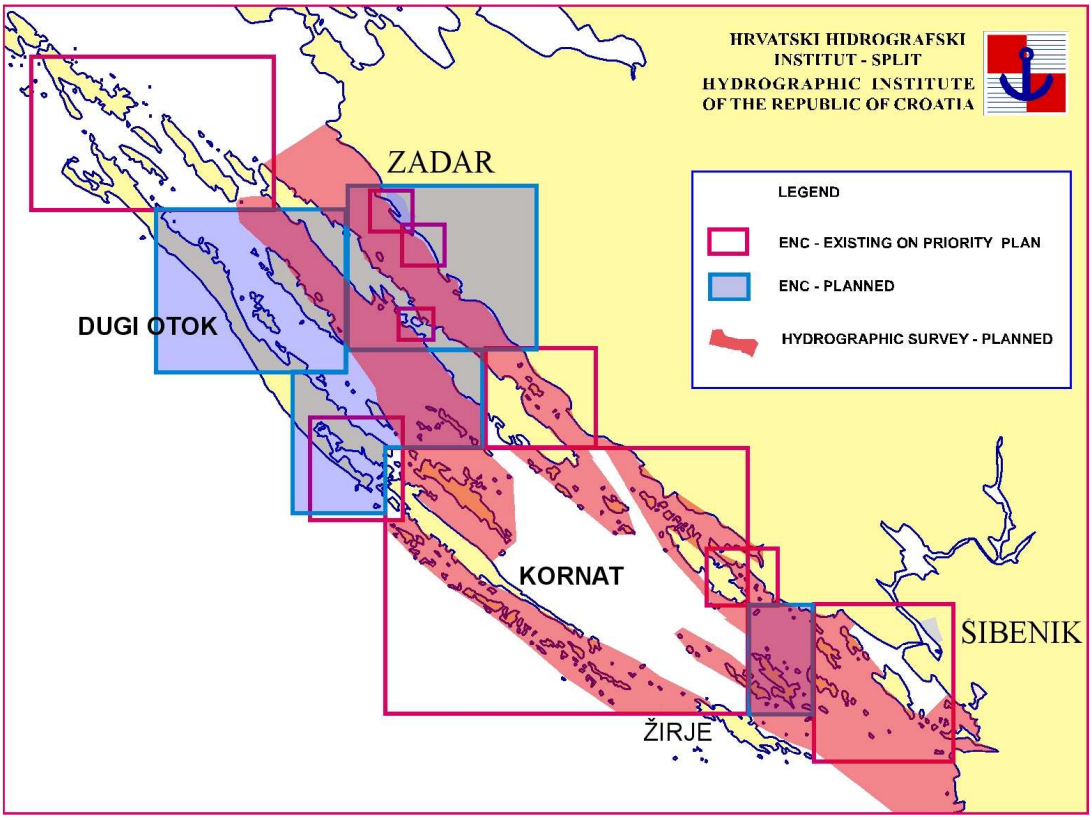

LEGEND
NEW SURVEY, ENC RELEASED
NEW SURVEY - PORTS, HARBORS, ANCHORAGES
NEW SURVEY OF SHOALS, ROCKS AND UNDER WATER INSTALATIONS
CROATIA
ADRIATIC SEA
SAČUVAJMO ČISTO MORE
KEEP SEA CLEAN
Lora i Poljud
Sjeverna luka i Vranjic
SPLIT
Split - Zvončac
ČIOVO
Splitski kanal
DRVENIK V
Bračka kanal
Brač - Junče-Ravan
ŠOLTA
BRAČ
Splitska vrata
Hvarski kanal
Pakleni kanal
HVAR
Viški kanal
VIS
ŠĆEDRO
Korčulanski kanal
Neretvanski kanal
Ploče
PELJEŠAC
KORČULA
Mljetski kanal
Lastovski kanal
SUŠAC
LASTOVO
MLJET
16° 30'
17° E
17° 30
43°
30'
Kanal Mali Ston
BiH
Mljetski kanal
Kološepski kanal
Prolaz Hrpoti
ŠIPAN
Šuđurađ
KOLOČEP
Dubrovnik-Sumratin
Gruž - Marina Frapa
Rt Oštra
Boka kotorska
Budva
MONTENEGRO
17° 30'
18° E
18° 30'
50'
42°
40'
20'

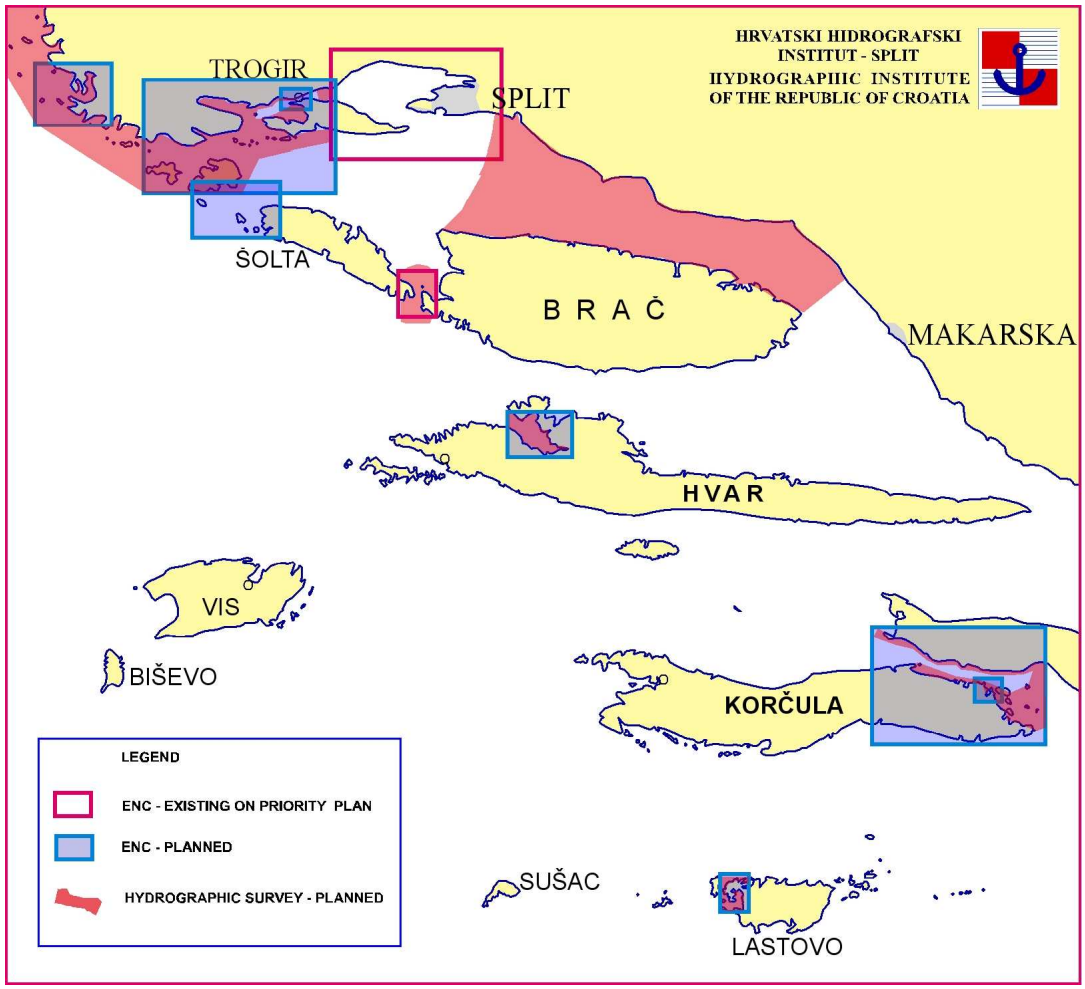
ANNEX 4 - ENC 5-year priority plan based on new hydrographic survey - Overall



ANNEX 5 - ENC 5-year priority plan based on new hydrographic survey - Regional




HRVATSKI HIDROGRAFSKI
INSTITUT - SPLIT
HYDROGRAPHIC INSTITUTE
OF THE REPUBLIC OF CROATIA
ZADAR
DUGI OTOK
KORNAT
ŠIBENIK
ŽIRJE
LEGEND
ENC - EXISTING ON PRIORITY PLAN
ENC - PLANNED
HYDROGRAPHIC SURVEY - PLANNED


HRVATSKI HIDROGRAFSKI
INSTITUT - SPLIT
HYDROGRAPHIC INSTITUTE
OF THE REPUBLIC OF CROATIA
TROGIR
SPLIT
ŠOLTA
B R A Č
MAKARSKA
HVAR
VIS
BIŠEVO
KORČULA
SUŠAC
LASTOVO
LEGEND
ENC - EXISTING ON PRIORITY PLAN
ENC - PLANNED
HYDROGRAPHIC SURVEY - PLANNED

ANNEX 6 - Current ENC release status

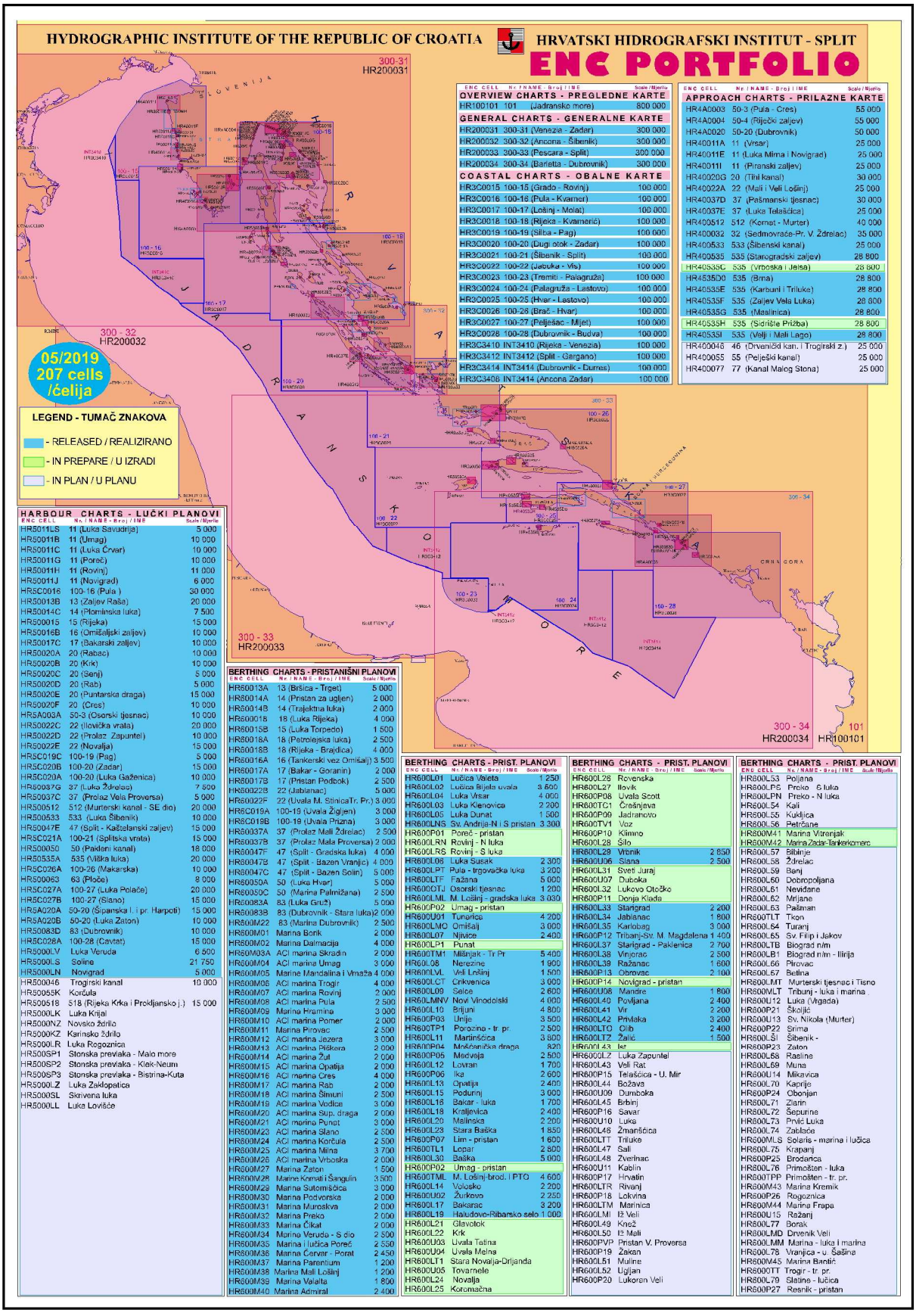


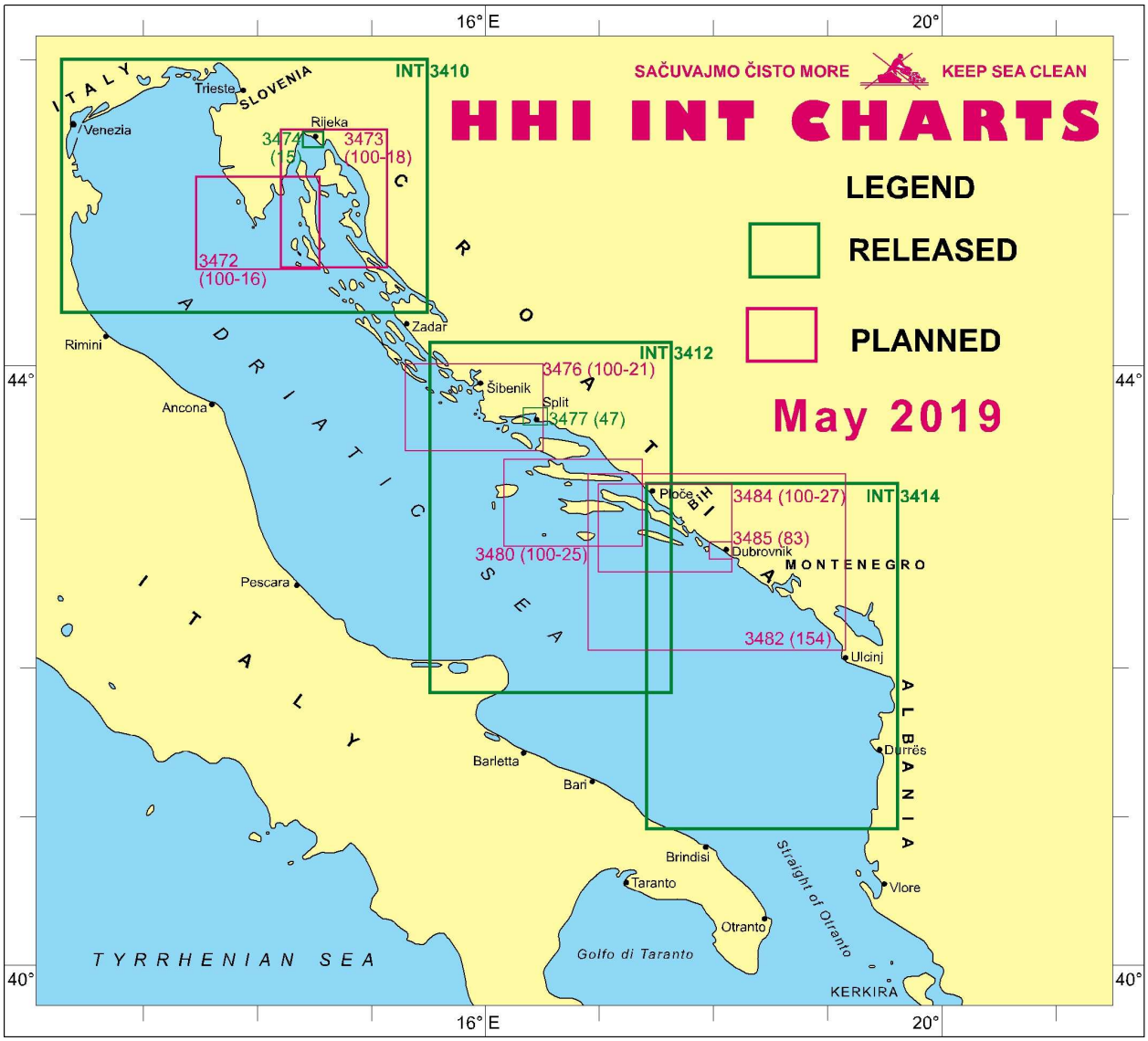
Table 1. INT charts - Croatia Printer Nation

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'	Preparation
3474	HR	15 18	2004 2017	2017	15 000	45°18.50'	A1		Rijeka	45°16.59'	45°20.59'	14°22.32'	14°30.52'	Available
					4 000	45°19.67'	A1		A-Luka Rijeka	45°19.15'	45°20.20'	14°24.53'	14°26.73'	
					4 000	45°19.20'			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'	Preparation
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