INSTITUTO HIDROGRÁFICO

http://www.hidrografico.pt/

2021

PORTUGAL

National Report

This report describes the main technical activities and developments at the Instituto Hidrográfico (IHPT), the Portuguese Hydrographic Office, during the period from October 2018 to September 2021. It is to be presented at the 16th EAtHC Meeting in accordance with IHO Resolution 2/1997 as amended.

IHO International Hydrographic Organization

16th MEETING OF THE EASTERN ATLANTIC HYDROGRAPHIC COMMISSION (EatHC)

Plenary meeting 29th September – 01st October 2021

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- IHO Resolution 2/1997 as amended.
- IHO ACL 27/2020 dated 25 June 2020 – approval of the second tranche of proposals originally for consideration by the 2nd session of the assembly.
- Decision No.9 of A-2, 2020.

1- HYDROGRAPHIC OFFICE

Established in 1960, Instituto Hidrográfico (IHPT) is both an organization within the Portuguese Navy and a national marine research laboratory. It is the national hydrographic service, provides environmental support to naval operations and does research and development activities in physical and chemical oceanography, marine geology, hydrography, safety of navigation and marine data management.

IHPT is focused on the ocean observation, mapping its several scientific dimensions and predicting its behavior in the short, medium and long term. It is committed to open data policies and sharing its capabilities with the society to faster research, development and knowledge of the ocean.

The main objectives of IHPT activities are the safety of navigation, the environmental monitoring and the protection of the marine environment. It is permanently involved in several R&D projects, which ultimately contribute to the climate change analysis and the development of the blue economy. It has established a Quality Management System recognized by an independent, credible and competent external entity, according to the normative reference (NP EN ISO 9001). The Quality Policy includes a commitment to meeting regulatory requirements and continually improving to meet customer needs.

Among these activities, the training provided by the Hydrography and Oceanography School stands out, with FIG/IHO/ICA category A and B courses. Its students are Navy officers and civilian technicians, from Portugal and Portuguese-speaking African countries, as well as from other friendly nations.

Detailed information to update IHO Publication P-5 has been submitted using the online system, by Commander João Paulo Delgado Vicente, Head of the Hydrographic Division (dt.hi.chf@hidrografico.pt).

In EAtHC region, IHPT is the Primary Cartographic Authority (PCA) in Cape Verde, Guinea-Bissau and S. Tomé and Príncipe.

2- SURVEYS

a) Coverage of new surveys

The main hydrographic program of IHPT, "SEAMAP 2030: Mapping of the Portuguese Sea" (http://www.hidrografico.pt/iprojeto/16) is in progress. This program, which is focused on high-resolution mapping of Portuguese waters of interest, will contribute to the conservation and sustainable use of the sea, supporting research, and promoting development. It is aligned with SEABED 2030 and the United Nations Decade of Ocean Science for Sustainable Development.

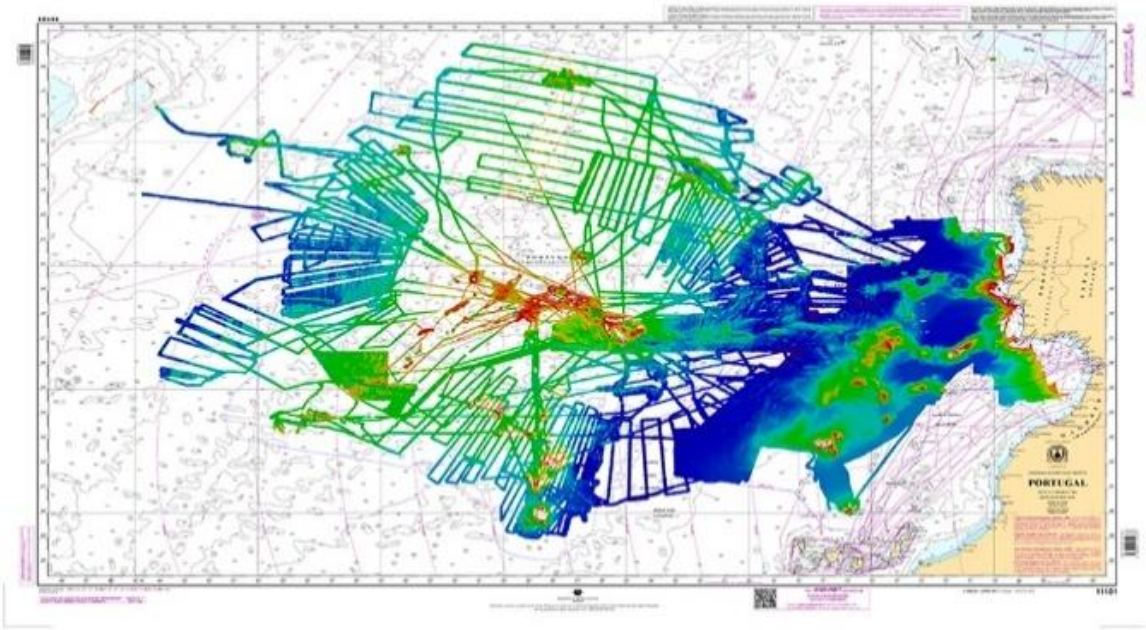

Figure 1 – SEAMAP 2030 actual coverage with multibeam surveys.

Considering this report's period, Portugal has focused its surveys on the Portuguese maritime areas, updating existing charts and contributing to the goal of the long-term project SEAMAP 2030 (it is Portugal's intention to have all Portuguese maritime areas under its sovereignty and jurisdiction surveyed with high resolution by 2030). Over this cycle Portugal has executed 49 hydrographic surveys, including 33 harbors and port entrances (Figure 2), some inland, coastal and deep sea area surveys (Figure 3) and specific projects surveys (Figure 4). On the course of the period of this report, surveys were accomplished in continental Portugal, and Madeira and Azores archipelago areas. Despite the focus on Portuguese waters, several Hydrographic surveys were also made in Portuguese speaking African country Cape Verde (Figure 5) where Portugal has cartographic responsibilities, and specific agreements for cooperation.

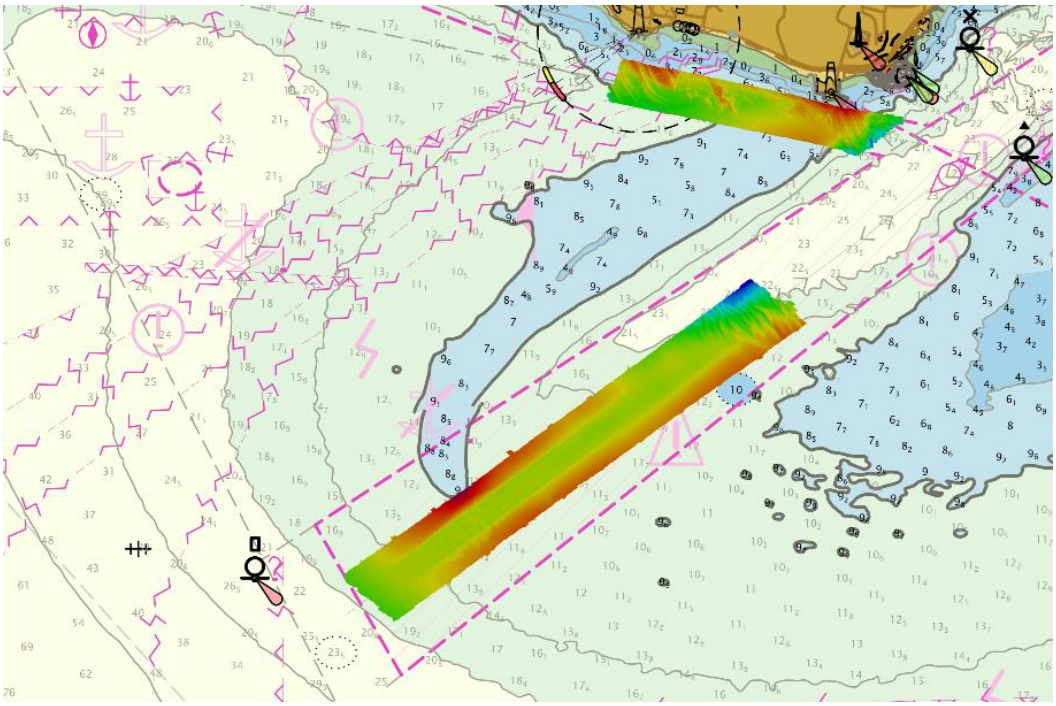

Figure 2 – Example of a surveys for harbor maintenance (Lisbon area).

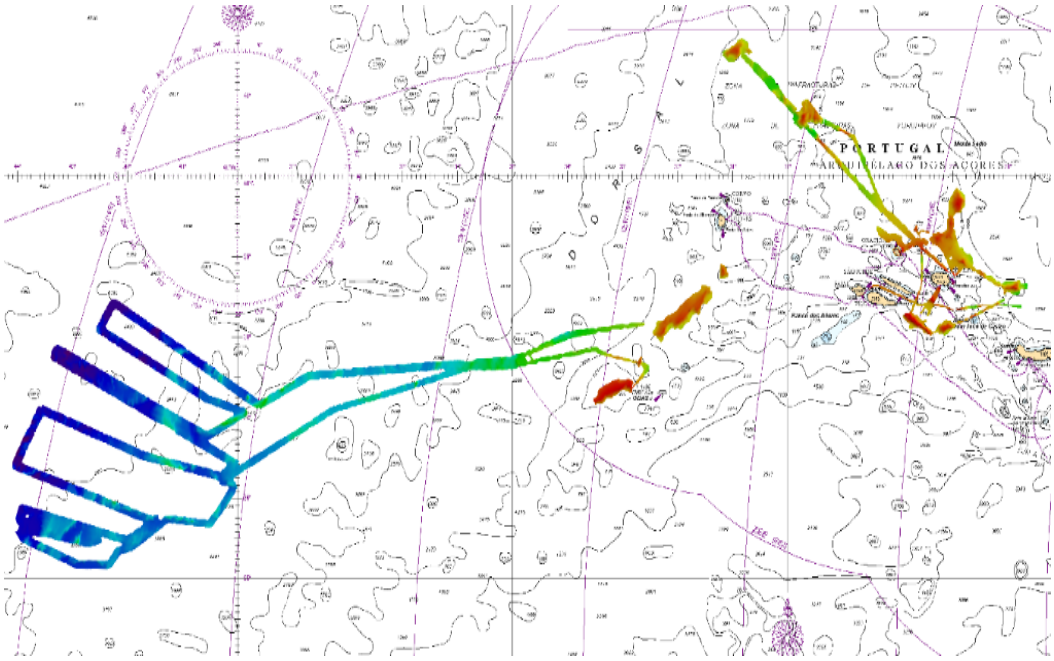

Figure 3 – Azores surveyed areas.

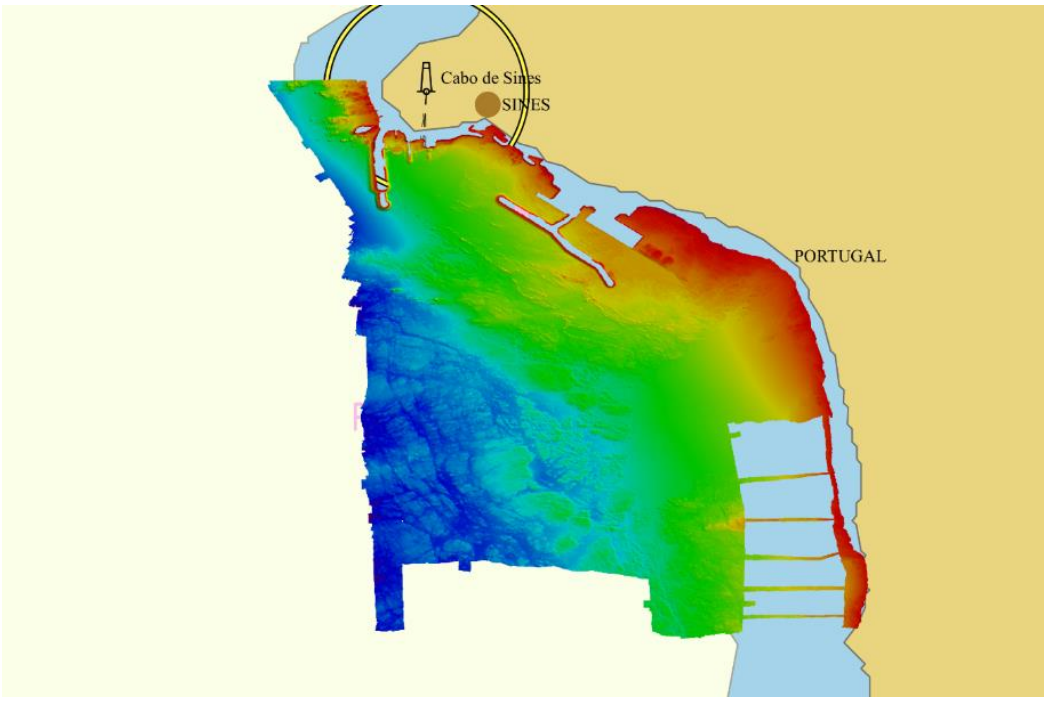

Figure 4 – Sines Survey for seafloor monitoring.

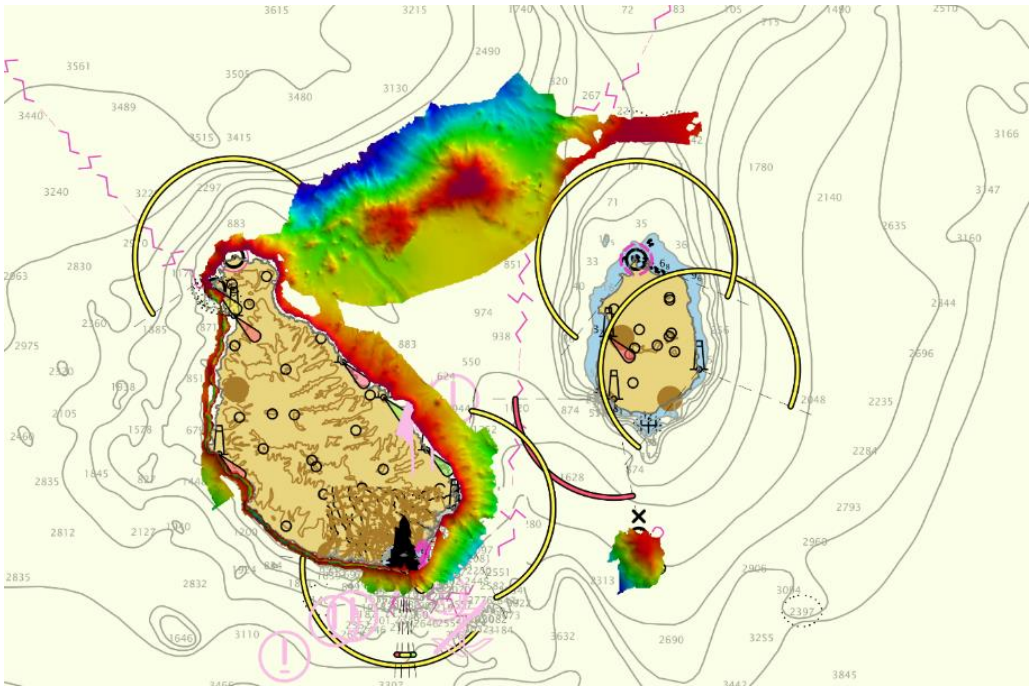

Figure 5 – Cape Verde survey near Santiago Island

With reference to harbors surveys, Portugal has spread its attention throughout the Portuguese coast as shown in Figure 6, with Lisbon entrance, Barreiro docks and channel, Alfeite docks, Portimão harbor and bar, Faro channel and bar, Setúbal harbor and entrance, Sines harbor, Peniche harbor, Lajes harbor in Flores - Azores, Poças harbor in Flores – Azores, Casa harbor in Corvo – Azores, Vila da Praia harbor in Graciosa – Azores.

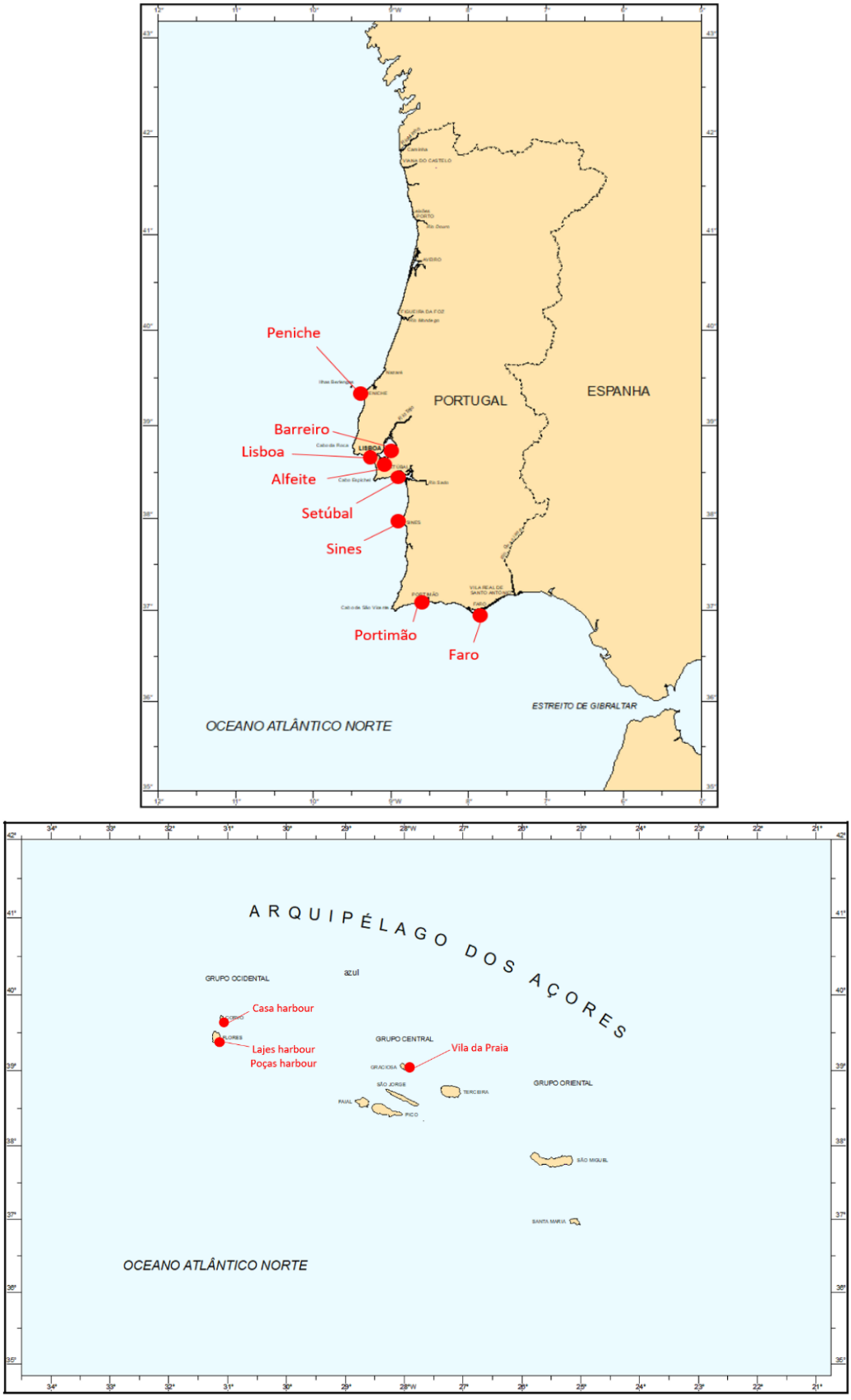

Figure 6 – Portuguese Map showing Harbor surveys (red text).

Regarding other survey areas, including inland and deep sea wide area surveys, one should mention Mondego River, Guadiana River and Douro River surveys (Figure 7) for inland areas. As for coastal and deep sea surveys (Figure 8) it is important to mention São Torpes area monitoring, Corvo island (Azores) coastal survey, São Jorge (Azores) channel, Graciosa island (Azores) coastal survey, Faial island (Azores) coastal survey, Pico island (Azores) coastal survey, Porto Santo island (Madeira) survey, Azores seamounts surveys, with some areas having shared importance both to the SEAMAP 2030 and specific surveying projects for biological, sovereignty and geological purposes.

Figure 7 – Inland Surveys (Green text).

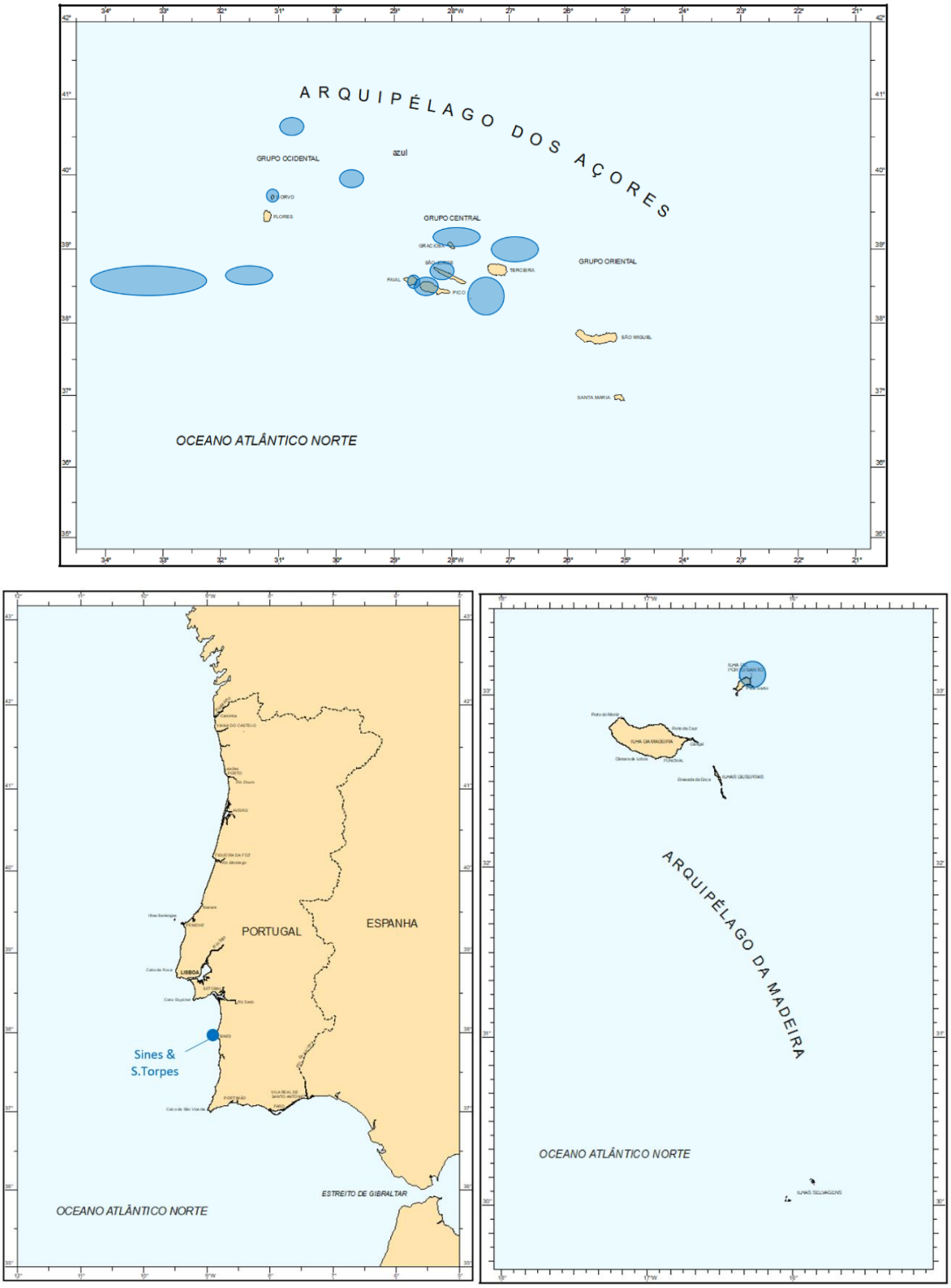

Figure 8 – Coastal and deep water surveys (Blue text and blue areas)

Concerning specific projects, several areas are of broad importance as Sines harbor environmental monitoring, Guadiana River surveying for infrastructural development, Douro River survey for river navigation channel maintenance, Azores seamounts for scientific purposes.

These surveys are shown in Figures 9 to 11.

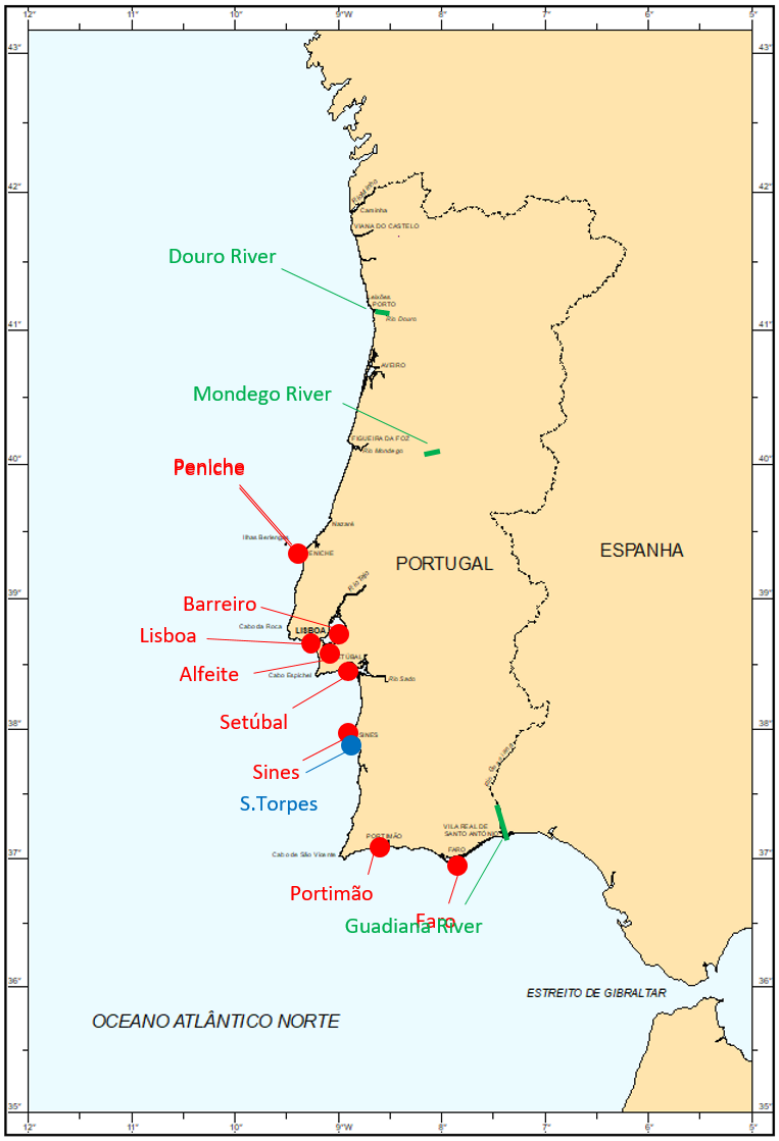

Figure 9 – Continental Portugal surveys

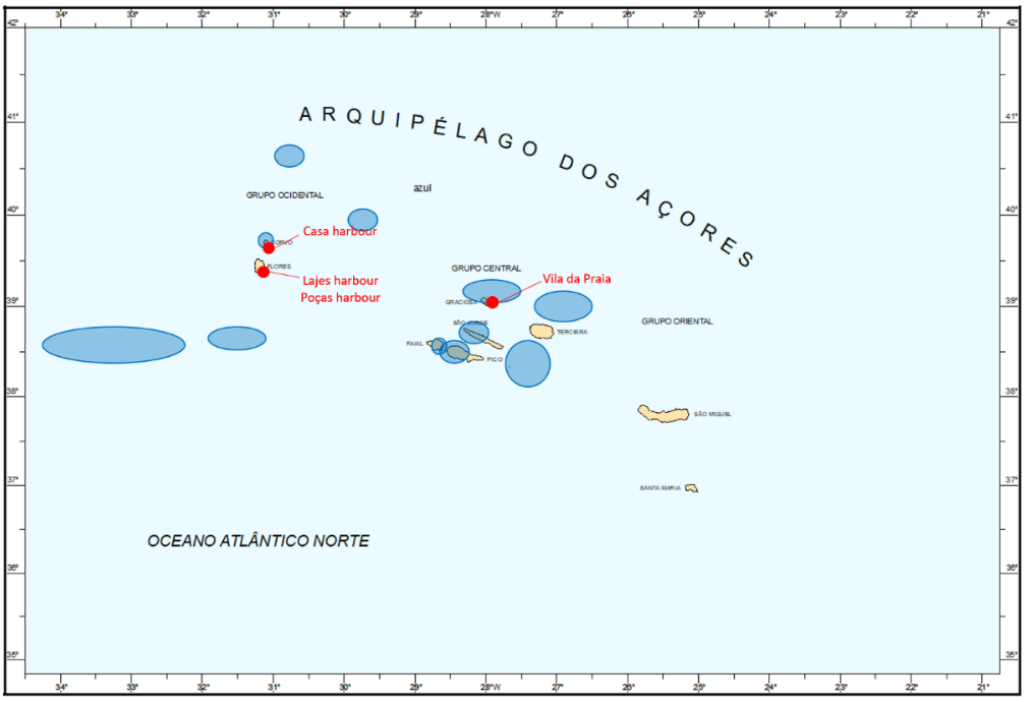

Figure 10 –Azores surveys.

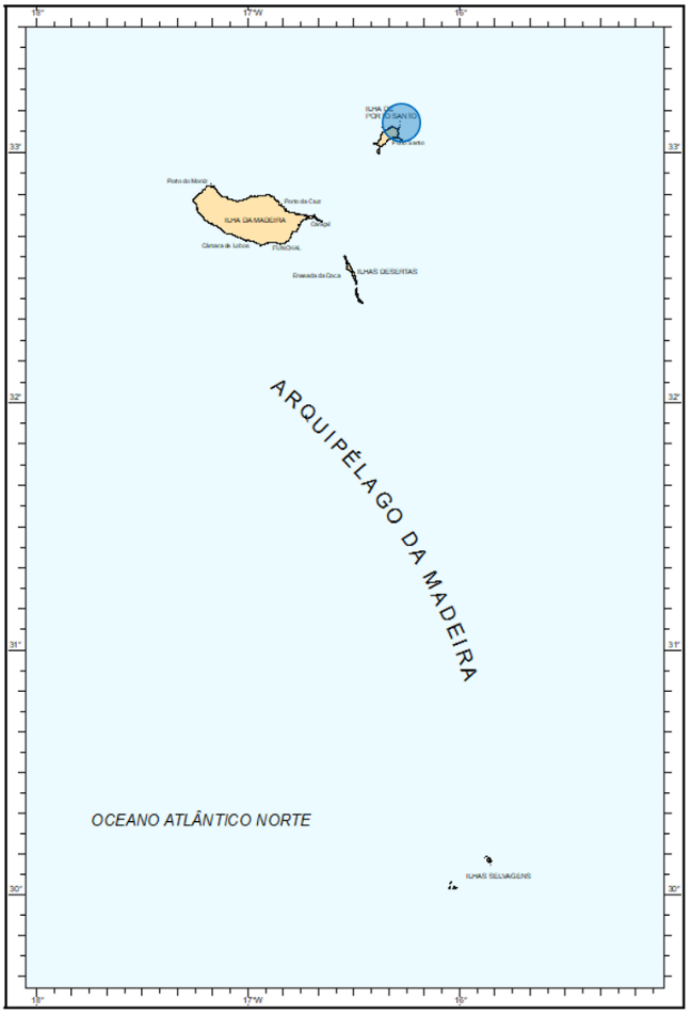

Figure 11 –Madeira surveys

The use of Portuguese Navy survey ships “D. Carlos I” and “Almirante Gago Coutinho” out of area, also allowed for hydrographic surveys in Africa in cooperation with Cape Verde (Figure 12). Three harbor areas were surveyed: Porto Grande in São Vicente Island, S. Martinho bay and São Tomé bay in Santiago Island, and the coastal areas of Santiago Island was also surveyed.

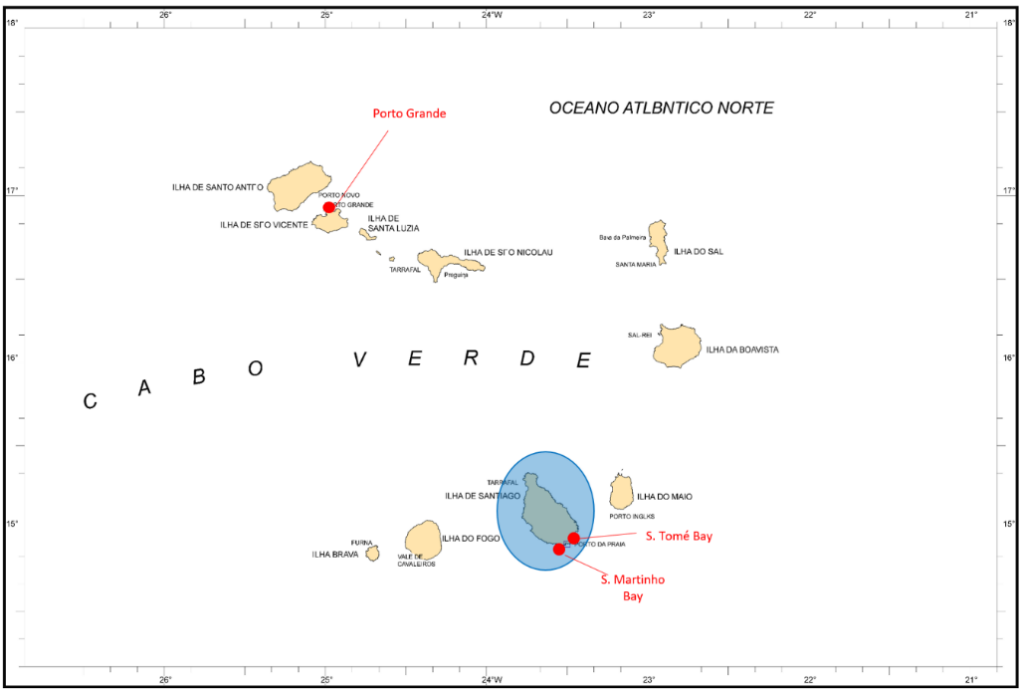

FIG 12 – Cape Verde surveys

All considered, Portugal has put all efforts on conducting hydrographic surveys, both for cartographic purposes and for science purposes, endeavoring distinct objectives, such as adding new and updated cartography, either in Portugal or in Africa’s Portuguese responsibility areas, or maintaining an updated hydrographic scenario on most dynamic harbors or coastal areas, and also augmenting the hydrographic awareness in the Portuguese waters, expanding the already significant surveyed area of the Portuguese sea.

b) New technologies and /or equipment

On the technological line, Portugal is using top of the shelf acoustic systems for hydrographic surveys. New methodologies based on satellite imagery and low flying vehicles imagery is also being used and currently developed. Portugal is also using third party surveys data, which is being appropriately checked for quality control.

For the future, Portugal has the challenge of SEAMAP 2030 to fulfill and also several demands such as focusing on more regular use of crowdsourced data, and the usage of bathymetry derived from remote imaging data for cartographic usage. A regular updated service of coastal bathymetry is also one objective for the coming years.

c) New ships

Specifications are being made for the acquisition of a new multipurpose research ship.

d) Crowdsourced and satellite-derived bathymetry - national policy

IHPT has no knowledge of crowd-sourced bathymetry sources for the areas of interest.

e) Challenges and achievements

Obtaining funding for new surveys off Cape Verde, Guinea-Bissau, S. Tomé and Príncipe and Angola, in conjunction with those countries, is considered the greatest challenge.

IHPT received new bathymetric data from the Angolan government authorities. This new data was used to update several charts.

Portugal is also using bathymetric data acquired and shared from international Scientific Cruises. Figure 13 shows the actual contribution on bathymetric information from this source, namely NOOA, BSH and NIOZ.

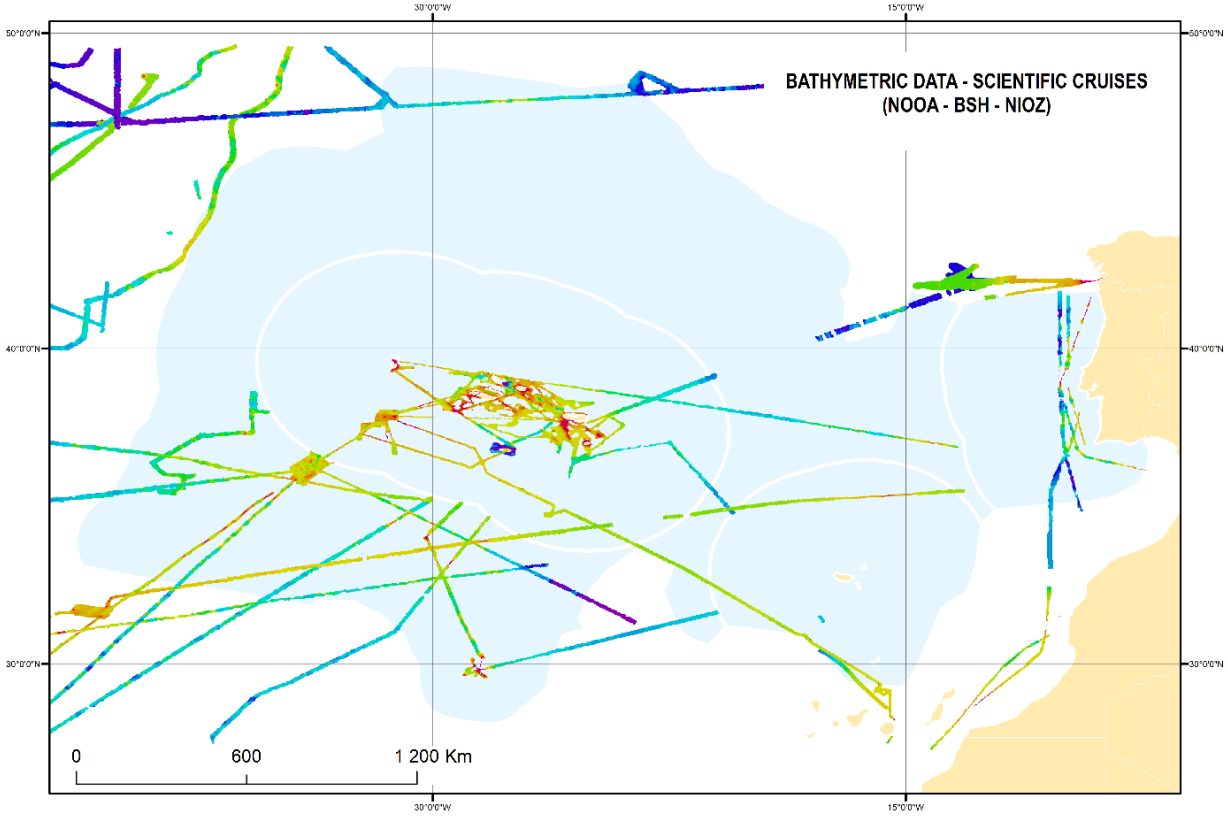

Figure 13 – Scientific cruises multibeam coverage.

3- NEW CHARTS & UPDATES

All IHPT Electronic Navigational Charts (ENC) and updates are produced according to the S-57 standard. All new Nautical Charts (NC) and new editions are bilingual (Portuguese and English) and follow INT specifications, whether or not they belong to INT series. Presently, IHPT provides its Nautical Charts using a Print-on-Demand system. All charts are continuously updated according to the published "Notices to Mariners".

a) ENC coverage, gaps and overlaps

The current PT ENC coverage for EAtHC region is shown in Figures 14 and 15. Each ENC is broadly equivalent to a paper chart, both in terms of its coverage area and its content.

The complete PT ENCs folio in G area comprises 97 cells, according to the navigational purposes shown in the following table:

	UB1	UB2	UB3	UB4	UB5		UB7	
	Overview	General	Coastal	Approach	Harbour		River	
Portugal	1	3	11	18	44	**77**	54	
Cabo Verde	0	2	1	2	12	**17**	0	
Guiné-Bissau	0	0	0	0	1	**1**	0	
São Tomé e Príncipe	0	0	0	1	1	**2**	0	
TOTAL	**1**	**5**	**12**	**21**	**58**	**97**	**54***	**151**

*Free download https://www.hidrografico.pt/vn.douro

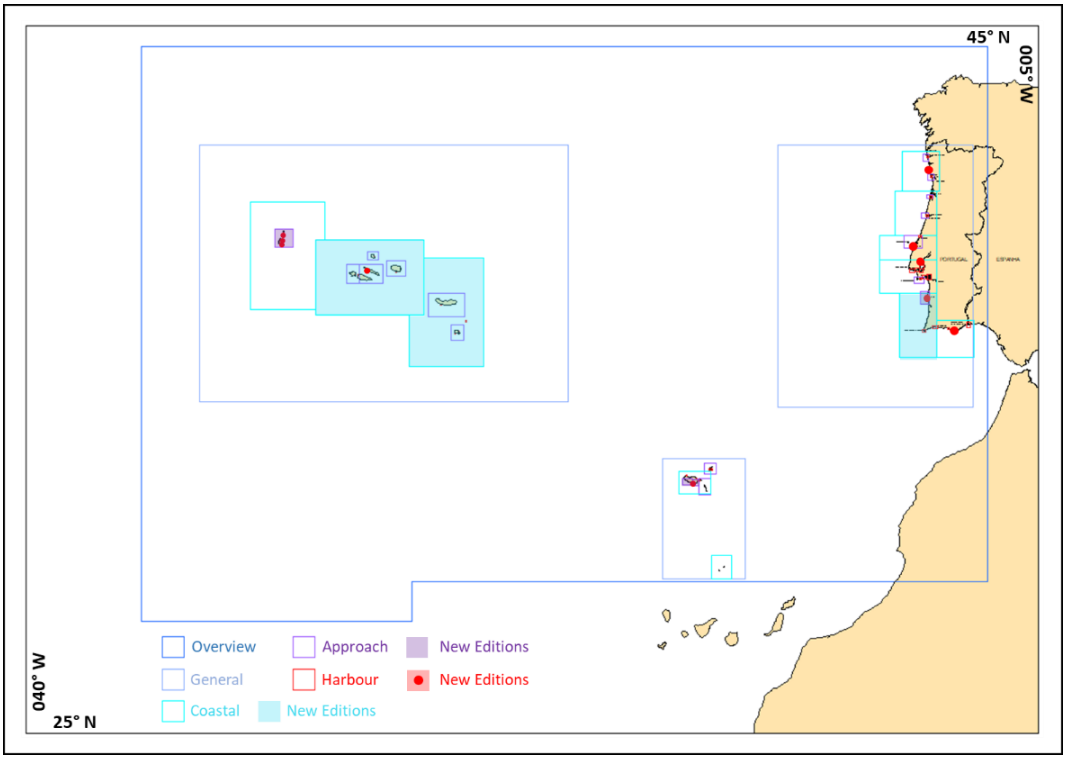

Figure 14 - PT ENC coverage for EAtHC region (Portugal)

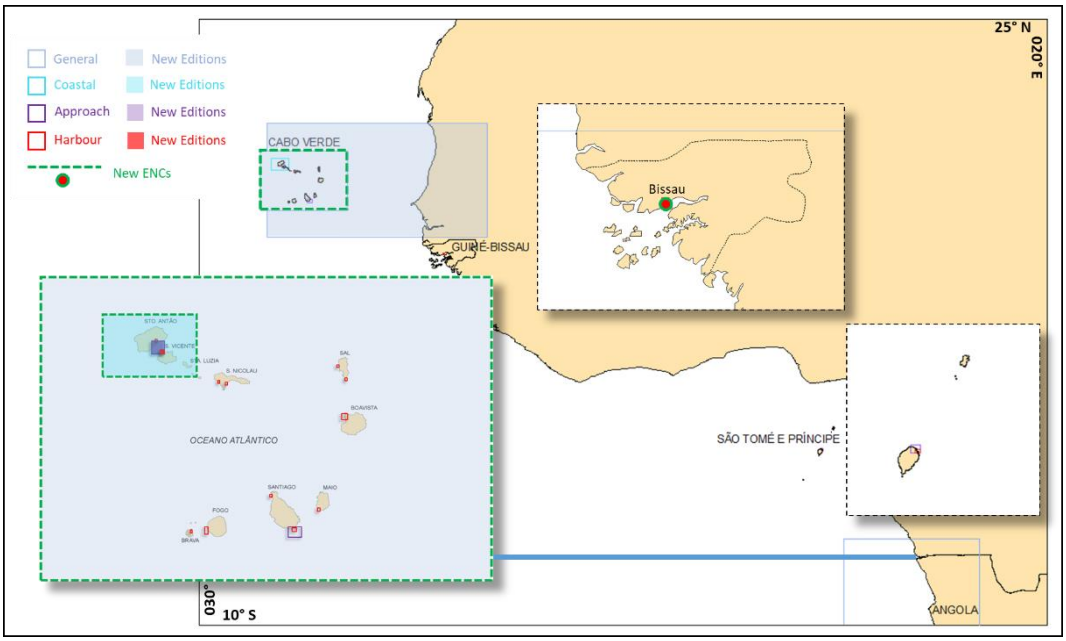

Figure 15 - PT ENC coverage for EAtHC region (North African Portuguese Speaking Countries)

Since the last meeting, were produced three (3) new ENC cells and twenty (20) new editions, depicted in the Figures 1 and 2 and in the following table:

	UB1	UB2	UB3	UB4	UB5		UB7	
	Overview	General	Coastal	Approach	Harbour		River	
Oct2018-Dec2019	0	0	1	1	0	**2**	0	
2019	0	0	0	0	4	**4**	54	
2020	0	0	0	2	5	**7**	0	
Jan2021-Sep2021	0	2	2	2	4	**10**	0	
Sep2021-Dec2021	0	1**	0	0	1**	**2****	0	
TOTAL	**0**	**2+1**	**3**	**5**	**13+1**	**23+2**	**54***	**77+2**

***Free download** https://www.hidrografico.pt/vn.douro

** Planed to be published until the end of 2021

A list of the twenty-three (23) ENC cells (new cells in light blue on the table below) produced by IHPT during the report's period is presented in the following table, as well the fifty-four (54) new cells for Douro River.

New Editions and New ENCs from OcT2018 to SEP2021			
Edition/Year	**Number**	**Scale**	**Title**
6/2018	PT**3**24205	90 000	Cabo de Sines à Ponta da Piedade
4/2018	PT**4**46401	45 000	Arquipélago dos Açores - Ilha das Flores e Ilha do Corvo
3/2019	PT**5**48501	4 000	Ilha do Corvo - Porto da Casa
3/2019	PT**5**48502	8 000	Ilha das Flores - Porto de Santa Cruz das Flores
3/2019	PT**5**48503	4 000	Ilha das Flores - Porto das Lajes das Flores
1/2019	PT**5**66310	12 000	Porto de Bissau
3/2020	PT**5**28510	8 000	Porto de Peniche
2/2020	PT**4**66402	22 000	Ilha de São Vicente – Aproximações ao Mindelo
2/2020	PT**5**68502	8 000	Ilha de São Vicente – Porto Grande
6/2020	PT**5**28514	12 000	Porto de Sines
5/2020	PT**4**36402	22 000	Ilha da Madeira - Ponta Gorda ao Caniçal
3/2020	PT**5**38506	8 000	Ilha da Madeira - Porto do Funchal
4/2020	PT**5**26311	12 000	Barra e Portos de Faro e Olhão
7/2021	PT**5**28514	12 000	Porto de Sines
2/2021	PT**2**62101	699 999	Cabo Verde ao Senegal
1/2021	PT**2**62102	500 000	Arquipélago de Cabo Verde
1/2021	PT**3**64201	90 000	Ilhas de Santo Antão, São Vicente e Santa Luzia
6/2021	PT**4**26408	45 000	Aproximações ao Porto de Sines
2/2021	PT**4**36403	22 000	Ilha da Madeira - Paúl do Mar à Praia Formosa
4/2021	PT**5**26307	12 000	Rio Tejo (Sacavém a Vila Franca de Xira)

3/2021	PT**3**43103	180 000	Arquipélago dos Açores - Grupo Oriental
2/2021	PT**5**28503	8 000	Portos de Póvoa de Varzim e Vila do Conde
3/2021	PT**5**48509	4 000	Ilha de São Jorge - Porto das Velas

Under constrution:

4/2021**	PT**3**43102	180 000	Arquipélago dos Açores - Grupo Central
5/2021**	PT**5**26311	12 000	Barra e Portos de Faro e Olhão

** Planed to be published until the end of 2021

	New cells for Douro River from OUT2018 to SET2021	
Year Pub	**Number**	**Title**
2018	PT76611A	Rio Douro – Estuário - Da Ponte D. Luís a Avintes
2018	PT76611B	Rio Douro – Estuário – Avintes a Crestuma
2019	PT76612 A to M	Rio Douro – Albufeira de Crestuma
2019	PT76613 A to M	Rio Douro – Albufeira do Carrapatelo
2019	PT76614 A to L	Rio Douro – Albufeira da Régua
2019	PT76615 A to I	Rio Douro – Albufeira da Valeira
2019	PT76616 A to H	Rio Douro – Albufeira do Pocinho

Gaps and Overlaps:

Overlaps with GB cells in the geographic zone of Cabo Verde were solved.

It is the intention of the IHPT to prepare/redefine a new coverage scheme in the Cape Verde area, as new data becomes available. For the time being it is planned as shown in Figure 16.

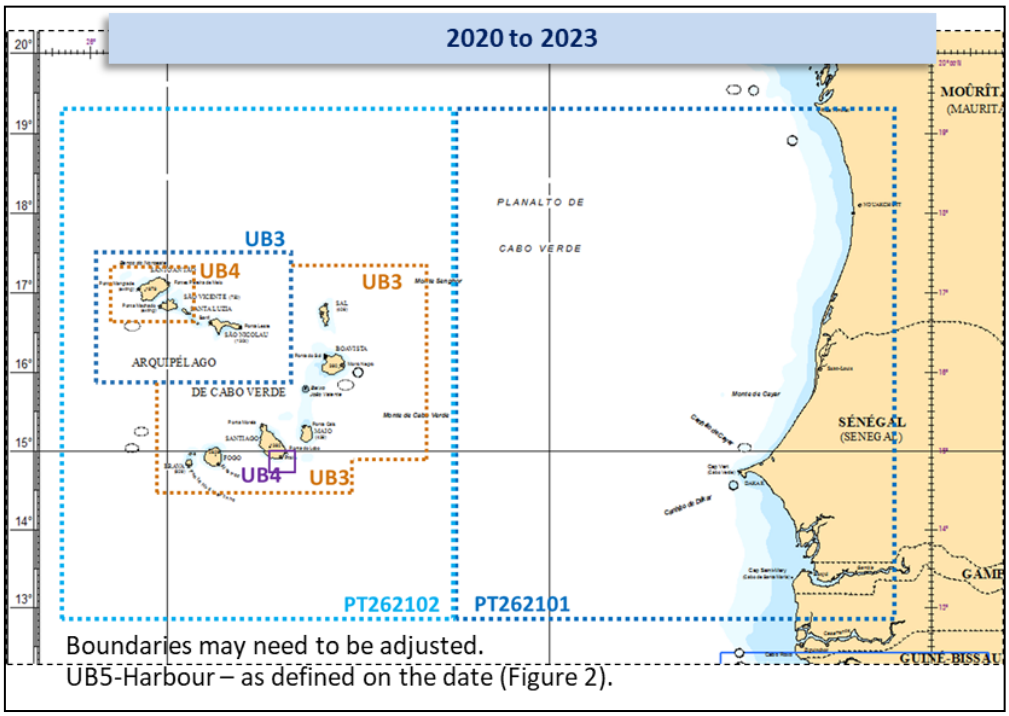

Figure 16 – The new coverage scheme in the Cape Verde area.

b) ENC Distribution method

Portuguese ENCs are distributed through a RENC, the IC-ENC, of which IHPT is a member and participates in the respective work together with other Hydrographic Services, including in its Technical Experts Working Groups.

Presently, for EAtHC region, ninety-seven (97) PT ENC cells are available for distribution through the IC-ENC as shown in the tables and diagrams above.

Douro River cells are available for free download on the IHPT portal: https://www.hidrografico.pt/vn.douro.

c) RNC

NTR.

d) INT Charts

Since the last meeting, two (2) new charts (light blue on table below) and five (5) new editions were produced, depicted in the following table and diagrams:

New Editions and New INT charts from OCT2018 to SEP2021				
Edition/Year	**Number**		**Scale**	**Title**
	INT	**National**		
2/2019	1965	66402	40 000	Aproximações ao Mindelo
		66402-A	10 000	Porto Grande
1/2021/2019	2852	66310	15 000	Porto de Bissau – Do porto de Bissau à Ponta Chugué
1/2020	1960	62102	500 000	Arquipélago de Cabo Verde
4/2021	1882	26408	50 000	Aproximações a Sines
		26408-A	15 000	Porto de Sines
2/2021	2089	72101	1 000 000	Gamba to Luanda
2/2021	2814	73201	350 000	Ponta Tchitembo à Cabeça da Cobra

New edition under construtions

3/2021**	1885	26311	15 000	Barra e Potos de Faro e Olhão

New charts under construtions

1/####	1963	63203	250 000	Ilhas Brava, Fogo, Santiago, Maio e Ilhéus Rombos
1/####	1955	63210	350 000	Cabo Roxo ao Cabo Verga
1/####	1084	62101	1 100 000	De Trimiris à Guiné-Bissau e Cabo Verde

** Planed to be published until the end of 2021

Gaps:

INT charts not yet published are the ones presented in brown and orange in the following diagram (Figure 17).

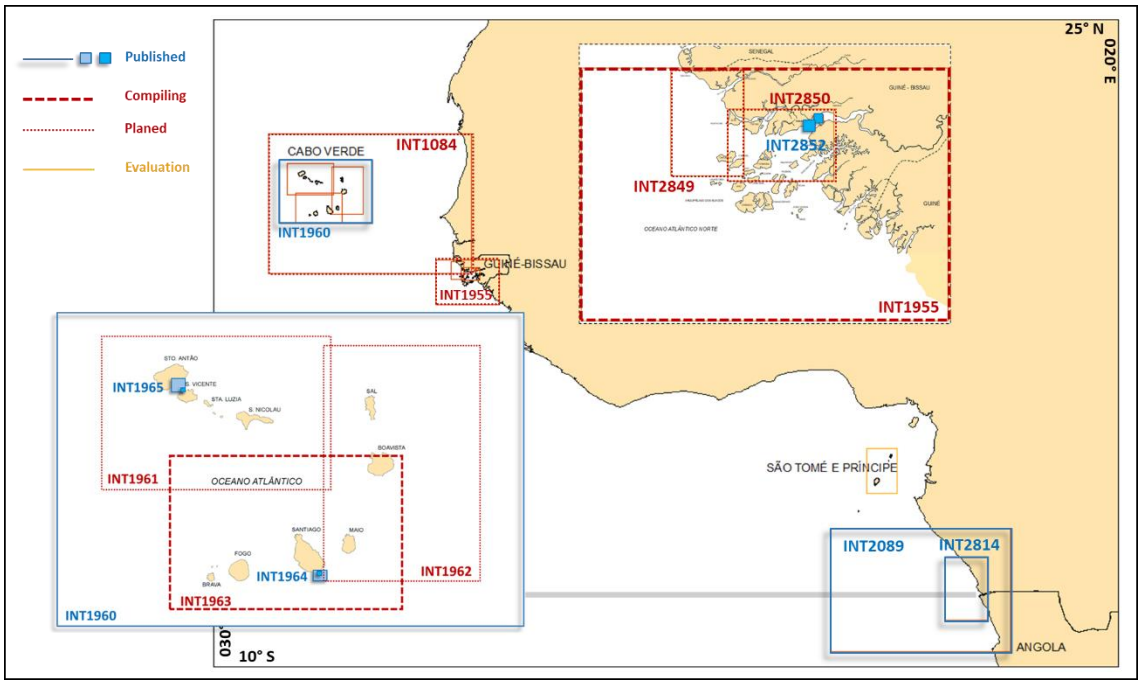

Figure 17 – INT charts gaps.

e) National paper charts

Since the last meeting, one (1) new chart for Cabo Verde, and one (1) new edition were produced by IHPT during the report's period, as well five (5) new charts (52 sheets) for Douro River and two (2) new charts (12 sheets) for Guadiana River (light blue on table below) depicted in the following tables and Figure 18.

New Editions and New INT charts from OUT2018 to SET2021				
Edition/Year	**National Number**		**Scale**	**Title**
4/2018	26312	-	15 000	Barra e Porto de Vila Real de Santo António
1/2018	26F12	FL01 to 12	5 000	Rio Douro – Albufeira de Crestuma
1/2018	26F13	FL01 to 12	5 000	Rio Douro – Albufeira do Carrapatelo
1/2018	26F16	FL01 to 08	5 000	Rio Douro – Albufeira do Pocinho
1/2018	26F14	FL01 to 11	5 000	Rio Douro – Albufeira da Régua
1/2019	26F15	FL01 to 09	5 000	Rio Douro – Albufeira da Valeira
1/2019	64201	-	100 000	Ilhas de Santo Antão, São Vicente e Santa Luzia

1/2021	26F21	FL01 to 08	5 000	Rio Guadiana – Da Ponte Internacional a Alcoutim
1/2021	26F22	FL01 to 04	5 000	Rio Guadiana – De Alcoutim ao Pomarão

Under construction

2/####	46401	Main	75 000	Ilhas das Flores e Corvo
		Plan A	5 000	Porto das Lajes das Flores
		Plan B	10 000	Porto de Santa Cruz das Flores
		PlanC	10 000	Porto da Casa

Under construction – Data acquisition, compilation and production in cooperation with **IHM** (Spain)

2/####	26409	Main	40 000	Aproximações à Barra do Rio Minho
		Plan A	10 000	Barra do Rio Minho, Caminha
		Plan B	10 000	Porto de Vila Praia de Âncora

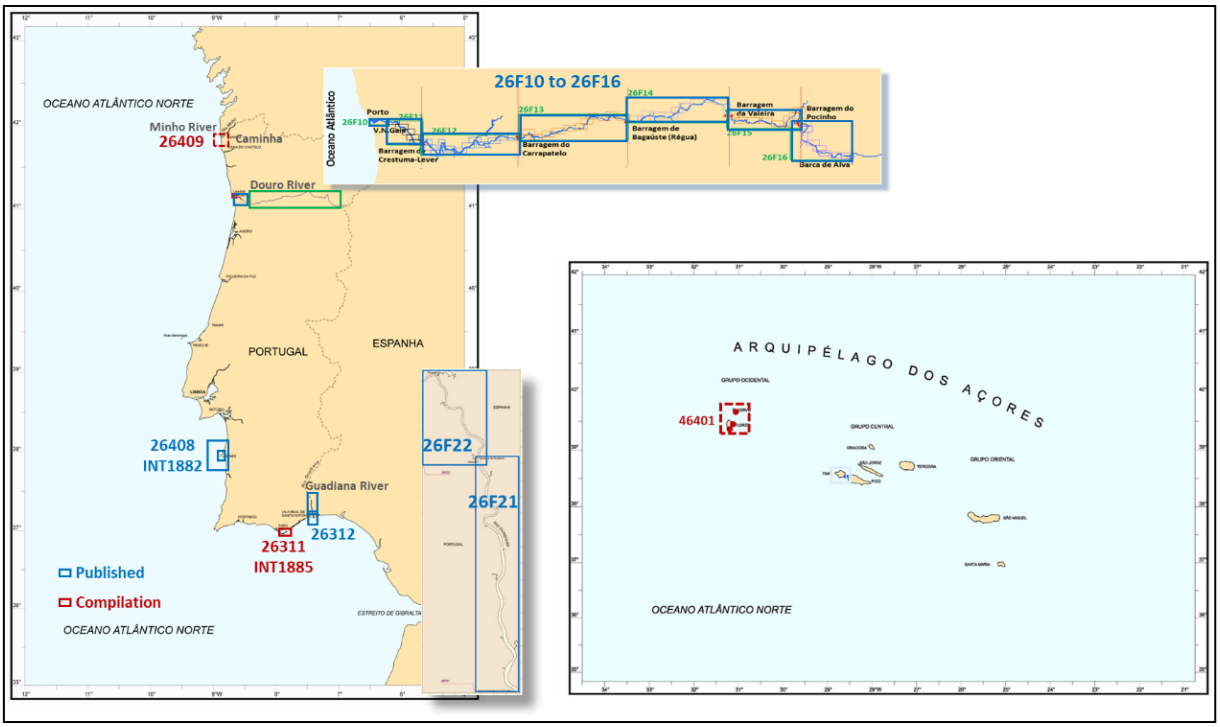

Figure 18 – New charts and new editions.

f) Other charts, e.g. for pleasure craft

IHPT produces some other charts namely the ones belonging to the series listed in the flowing table. All those charts are also in accordance with IHO specifications and were very well accepted by the users.

Series	Scale	Purposes
Fishery (Pescas)	Medium	Charts to support fishing activity
Recreational (Recreio)	Medium	Charts for pleasure crafts
Sedimentological (surface sediments)	Medium	Representation of the geographic distribution of the surface sediments of the submarine seafloor.
Training (Instrução)	Medium	For training in navigation exercises
Special (Especial)	Small/Medium	For scientific, administrative/jurisdiction or decision support purposes

g) Challenges and achievements

Some errors were identified in the cartographic coverage schemes related to the geographical areas of the Cabo Verde, Guinea-Bissau and São Tomé e Príncipe territories, namely the indication of old folio chart numbers and coordinate values referenced to Local Data, for which an analysis was carried out and a rectification proposal elaborated.

Folio review for Cabo Verde (ENC, INT and National charts) and for Guinea-Bissau (INT and National Charts) is completed.

São Tomé and Príncipe folio review – planned to be completed by the end of 2021.

As soon as possible (2-3 years) IHPT intends to complete the INT charts coverage in order to eliminate the gaps that still exist. The gaps reported are directly linked to the difficulty of obtaining data that allows the elaboration of the nautical cartography.

IHPT sees the implementation of the S-100 as a major challenge, particularly with what regards to the production of S-101 ENCs (Specifications/Prodution Software/QC/Validation/National Procedures) as well as the establishment of S-101 ENCs schemes and the way during the transition period.

4- NEW PUBLICATIONS AND UPDATES

a) New Publications

Since the last meeting IHPT published the Annual Group of Notices to Mariners (2019, 2020 and 2021), as well as, every month, the Monthly Group of Notices to Mariners.

Annually, IHPT publishes the Tide Tables for the main harbors of Portugal, including the Azores and Madeira Archipelagos. IHPT also publishes, annually, the Tide Tables for the African Portuguese Speaking Countries which, in the EAtHC region, includes the main harbors of Cape Verde, Guinea Bissau and São Tomé and Príncipe.

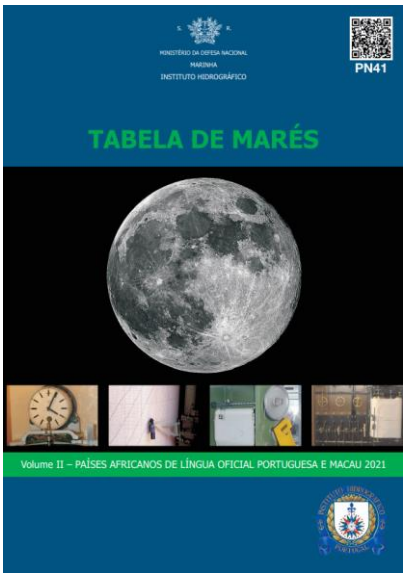

Figure 19 - Tide table for the African Portuguese Speaking Countries.

b) Updated publications

IHPT has updated the "Portuguese Sailing Direction Mainland Coast Pilot – Marinas and Yachting Harbors" (2019 – 4th edition) and the Portuguese List of Lights and Fog Signals – AIDS to Navigation (2020 – 12th Edition).

Since February 2021, the "Charts and Nautical Publications Catalogue" is freely available online in PDF format to be consulted or downloaded. It is kept up to date. The link to this publication is as follows: https://loja.hidrografico.pt/?product=catalogo-de-cartas-e-publicacoes-nauticas-digital. In the future it will also be available on the new ANAVNET platform.

c) Means of delivery, e.g. paper, digital

Digital or paper, as requested.

d) Challenges and achievements

IHO has released an English /Portuguese version of the guidelines for the Standardisation of Undersea Feature Names (IHO publication B-6). These guidelines explain the process to submit proposals for undersea features names and provide necessary information for them to be adopted by the GEBCO Sub-Committee on Undersea Feature Names (SCUFN). This English /Portuguese version is the result of a productive cooperation and input from Brazil (DHN) and Portugal (IHPT). Available on: https://iho.int/uploads/user/pubs/bathy/B-6_e4%202%200_Eng_Por_versao-final_17Dec2020.pdf.

Portugal and Brazil are now working on the translation to Portuguese of the recent 6th Edition of the special publication S-44 'IHO Standards for Hydrographic Surveys'.

5- MARITIME SAFETY INFORMATION

a) Existing infrastructure for transmission

IHPT is the national coordinator for the Maritime Safety Information and the navigational warnings are transmitted by COMAR (the Portuguese centre for maritime operations) that provides a 24h service, in cooperation with the NAVAREA II coordinator.

NAVTEX broadcast is made both in English and Portuguese and it is transmitted from Penalva Station (near Lisbon), São Miguel Island (in the Azores Archipelago) and from Porto Santo Island (in the Madeira Archipelago).

Monthly, IHPT publishes the Group of Notices to Mariners (NtM), containing all permanent, preliminary, and temporary warnings in force for the corresponding period. This information, covers all navigation charts and publications of Portugal, Angola, Cape Verde, Guinea-Bissau and São Tomé e Príncipe, and is also available on the web site (http://www.hidrografico.pt).

IHPT on-line application ANAVNET (http://www.anavnet.hidrografico.pt), provides either entire NtM publications, or single NtM affecting individual documents; allowing in any case consultation and printing, including entire correction pages of nautical publications and graphical annexes to paste on charts. Regarding Navigational Warnings, ANAVNET allows consultation of warnings broadcasted by any of the Portuguese NAVTEX stations (coastal and local warnings), both in Portuguese and English languages.

Portugal has also three AIS coastal stations in Continental Portugal and in Azores and Madeira Archipelagos.

b) Statistics on work of the National Coordinator

NTR.

c) New infrastructure in accordance with GMDSS Master Plan

NTR.

d) Challenges and achievements

IHPT is currently developing a new ANAVNET system, which will allow better user-friendly access to information, as well as access to georeferenced safety information. It is intended to be up and running by november 2021.

6- C-55

An update of C-55 was sent to IHO using the online system.

The following tables shows the updates.

Survey Status Updated August 2021	Depth < 200m			Depth > 200m		
	A	B	C	A	B	C
Portugal	100	0	0	99	0	1
Portugal Azores	75	25	0	64	0	36
Portugal Madeira	81	0	19	72	0	28
Cape Verde	91	0	9	25	0	75
Guinea-Bissau	Not updated.					
São Tomé and Príncipe	99	1	0	31	0	69
Observations: A: Adequately surveyed / B: Re-survey required / C: Never systematically surveyed						

Main achievements since last updates:

- Cape Verde:
  - depths below 200 m: increase from 65% to 91% in the area adequately surveyed.
  - depths greater than 200 m: increase from 3% to 25% in the area adequately surveyed.

  Note: These new values are mainly due to Portugal's efforts in carrying out of area hydrographic surveys and to the IHPT's access to data from international scientific cruises/surveys.
- São Tomé and Principe:
  - depths below 200 m: decrease from 99% to 6% in the area adequately surveyed and increase from 1% to 94% in the area that needs new surveys.
  - depths greater than 200 m: decrease from 25% to 1% in the area adequately surveyed and increase from 0% to 30% in the area that needs new surveys.
  - Note: Despite some surveys carried out in the area by Portugal, the current values can be considered as negative due to the analysis carried out taking into account the age of most of the bathymetric data available.

Charting Status Updated Ago2021	< 1 M			1 M to 75 000			> 75 000			Paper charts - depths in meters	WGS84
	A	**B**	**C**	**A**	**B**	**C**	**A**	**B**	**C**		
Portugal Continental	100	0	100	100	0	100	100	0	100	100	86
Arquipélago dos Açores	100	0	100	100	0	100	100	0	100	100	77
Arquipélago da Madeira	100	0	100	100	0	100	100	0	100	100	71
Cabo Verde	100	0	100	75	0	26	100	0	100	100	75
São Tomé e Príncipe	100	0	0	80	0	80	100	0	100	100	12
Guiné-Bissau	100	0	100	75	0	0	100	0	100	100	5
A: INT and others S-4 / B: RNC / C: ENC S-57 Note: Values relating only to charts produced by IHPT.											

7- CAPACITY BUILDING

a) Offer of and/or demand for Capacity Building

The School of Hydrography and Oceanography (https://www.hidrografico.pt/op/23) is a Navy Specialization School, and the department of the Hydrographic Institute dedicated to the training of Navy officers and sergeants and civilian technicians necessary for the Hydrographic and Oceanographic activities, or to these with that interest to the Navy and the Country. The training provided by the Hydrography and Oceanography School stands out, with FIG/IHO/ICA category A and B courses.

The next courses available start:

- September 2021: CAT A
- September 2022: CAT B
- September 2023: CAT A

b) Training received, needed, offered

IHPT recommends a strong commitment to the training of EAtHC members in the development and production of the new generation of S-100 products and services. These activities should be coordinated in the next years by the Regions in order to include as many participants as possible, as well as to influence the standardization of training.

IHPT is also part of a Trans-National Access (TNA) initiative, among some international partners, to develop knowledge and capability to operate gliders and AUVs. IH operational teams have been enrolled in some deployments where all the deployment procedures are tested and trained. The goal

is to implement a “Glider Lab” in IH facilities to maintain and calibrate not only our futures vehicles, but also the ones from our partners.

c) Status of national, bilateral, multilateral or regional development projects with a hydrographic component.

NTR.

d) Definition of proposals and requests to the IHO CBSC

IHPT proposed this year a Technical Visit to Guinea-Bisau with following generic objectives:

- Advice on a way forward for Guinea-Bissau to develop its hydrographic services (MSI first & other national hydrographic services), in accordance with IHO standards, to fulfill SOLAS obligations. Particular attention should be paid to the establishment of an efficient MSI organization as very little nautical information is relayed by the maritime authorities of Guinea-Bissau (very little warnings transmitted to the NAVAREA II coordinator in the last 3 years for example).
- Definition of a plan to update Guinea-Bissau's nautical cartography.

8- OCEANOGRAPHIC ACTIVITIES

a) General

IHPT has regular and robust activity in respect to physical, geological and chemical oceanography, participating in national and European Union research projects in those fields. For the last two years, IHPT was involved in 12 different projects, which allowed to play an increasingly important role in the European scenario.

Besides that, IHPT acts as an oceanographic data provider among several organizations, such as COPERNICUS, IBI-ROOS, EMODNet, GEOHFRADAR and others. IHPT has also an important role on the discussion of the European strategy for the ocean, due to an active enrolment on initiatives such as JERICO-DS and JERICO-S3 or EOOS.

More locally, managing and co-managing some coastal observatories, such as RAIA, MONICAN and OCASO gives to IHPT the expertise that a national observatory, like MONIZEE, demands.

b) GEBCO/IBC's activities

IHPT provides bathymetric data to IHO DCDB and GEBCO through EMODNet, the European Marine Observation and Data Network. With this participation in European level multidisciplinary projects IHPT learns and keeps its alignment with the best procedures in the MSDI research developments.

Part of the work involves linking to national, regional or thematic data repositories in which lies the basic information and the creation of outreach products. Thematic groups have been set up to organize the data available from various sources, assess their quality, ensure that they are accompanied by metadata and provide such data through thematic portals in the areas of bathymetry, geology, habitats, biology, chemistry, physical oceanography, and human activities.

The High Resolution Seabed Mapping (HRSM) project aims to create and maintain an operational service that provides free and open access to the seabed and coastal sea basin bathymetric models at the best resolution possible.

A harmonized EMODnet Digital Terrain Model (DTM) has been generated for European sea regions from selected bathymetric survey data sets, composite DTMs, Satellite Derive Bathymetry (SDB) data products, while gaps with no data coverage are completed by integrating the GEBCO Digital Bathymetry (see GEBCO Grid and IHO DCDB website).

IHPT has been collaborating with this project for almost a decade, providing bathymetric data in the Atlantic, Azores and Madeira regions.

c) Tide gauge and other monitoring equipment network

Four different networks compose the Portuguese Monitoring Network, named MONIZEE. Chronologically, the first one was the Tide Gauge network, distributed along the mainland coastline and both archipelagos, Madeira and Azores, comprehend more than 22 tide gauges, gathering data, some for over 100 years. The present system configuration consists of acoustic or laser sensors to measure the water level and air pressure sensors with all of them having online communications. Some of them contribute to the National Tsunami Warning System, providing data every 30 seconds.

In the early 80's, the coastal wave buoy network, was implemented. Initially only in the mainland and a few years later expanded to Madeira and Azores, with the purpose of monitoring the wave pattern in the middle/inner shelf.

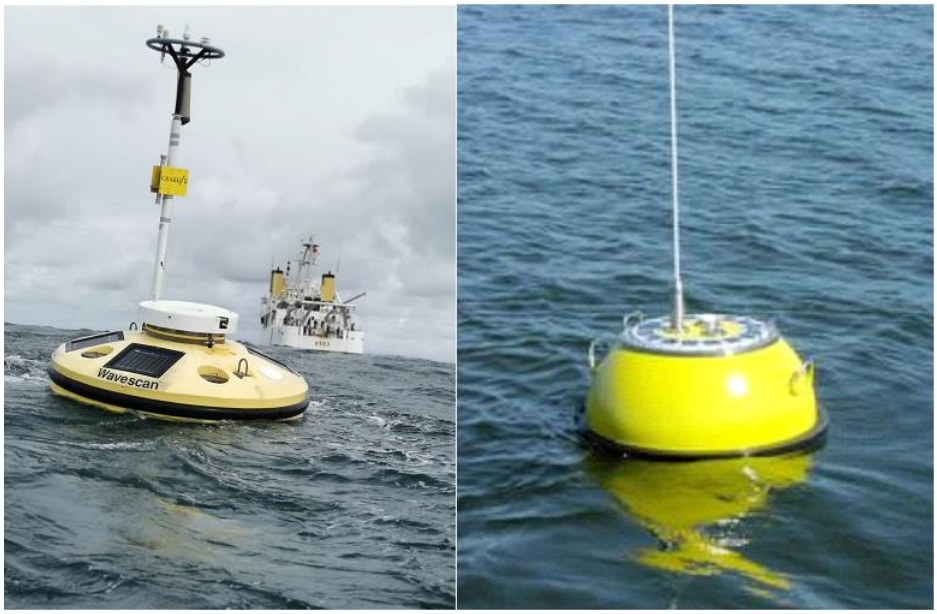

Figure 20 – Multiparametric Buoy (left) – Coastal Wave Buoy (right).

Twenty years later, in the beginning of the XXI century, IHPT started a new wave buoy network. This new network, with the purpose of monitoring waves, currents, meteorological conditions and water quality outside the continental shelf, makes use of OCEANOR WAVESCAN buoys with a very comprehensive payload. Beyond the basic wave monitoring sensors, the buoys are equipped with wind, air pressure, air temperature and air humidity sensors for the meteorological part, acoustic current profilers for currents, thermistors along the mooring line and several water quality sensors such as oxygen, chlorophyll and hydrocarbons.

Lately, a brand new HF Radar network started to be designed and implemented. For the 20 HF Radar stations, six are already operational. For this net, IHPT decided to go for the CODAR SEASONDE systems.

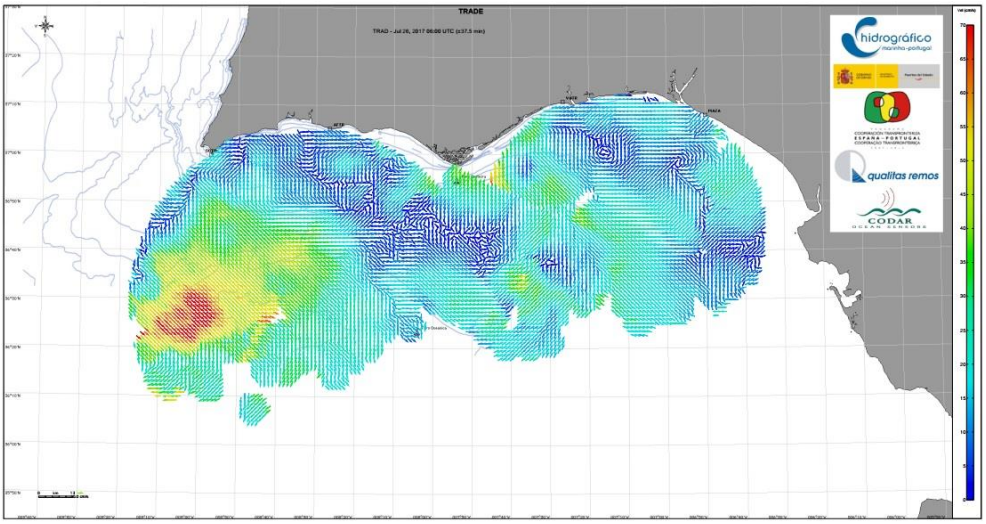

Figure 21 – Hourly Surface Current Map, from three HF Radar station combined- Algarve.

From this network, one can obtain an hourly surface current map, a 10min wave information, and at one particularly station, at Alfanzina, a 2min tsunami probability index is also calculated.

Figure 22 – MONIZEE – Portuguese Monitoring Network.

d) New equipment

Along the period covered by this report, some new equipment was updated and, in some areas, the network was reinforced by adding more instruments.

Regarding the coastal buoy, brand new receivers and new motion sensors replaced the outdated ones.

The oceanic buoy network, the one with the multiparametric buoys, grown by adding one more buoy outside Sines. Now they are five.

By the international project JONAS - Joint Framework for Ocean Noise in the Atlantic Seas - INTERREG-ATLANTIC AREA program, three of them got brand new passive hydrophones arrays to measure the environmental noise. A fourth one (Faro), integrated in the OCASO Coastal Observatory, a project funded by POCTEP, got a NORTEK Long Range ADCP (1000m range) able to identify both Mediterranean veins.

IHPT added one more HF Radar station, at Leça da Palmeira, Porto, to the network. This upgrade was possible by the project RADAR-ON-RAIA, funded also by POCTEP program. Along this 2021 year, IHPT expects to add two more stations, at Nazaré and Peniche, through an EEA Grants funding program, thus bringing the total number to eight.

e) Challenges and achievements:

Regarding to the monitoring network, the IHPT main challenge is sustainability.

Concerning the scientific challenges, IHPT is very focused on acidity, micro plastics and noise. We have some projects submitted to European financing, waiting the results, to allow us to develop tools and means to achieve those capabilities.

The harmonic constants included on Volume II of Tide Table are not updated since the 70's for Cape Verde, Guinea-Bissau and São Tomé and Principe. Only a few harbors in Mozambique were updated in the 80's. This lack of update is due to the absence on data published by the concerned national authorities.

IHPT is collaborating with MALMON DeSira project (https://www.malmon-desira.com/). One of the tasks to support this project is the installation of several tide gauges in Guinea-Bissau. IHPT hopes that the data obtained by this tide gauge network can be used to update tidal information in the area.

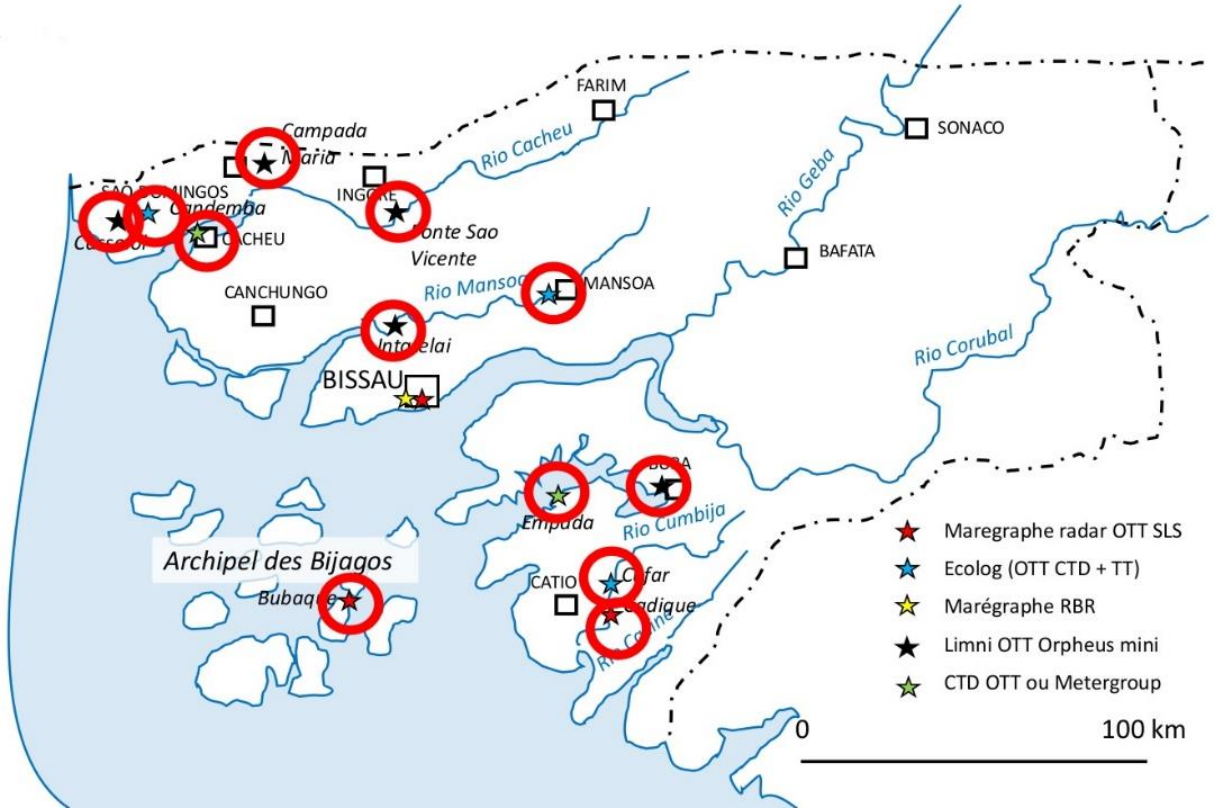

Figure 23 – MALMON DeSira project tide gauges network

9- Spatial data infrastructures

The Portuguese Hydrographic Institute is an organization with several roles: national hydrographic office, marine observation and marine technology national laboratory and a Portuguese Navy unity. As marine data and knowledge producer its internal data management processes are kept in line with national, European and international data policies and information sharing legal requirements.

The Hydrographic Institute is in all aspects a data driven organization. To address the geospatial data needs for improvement the Portuguese Hydrographic Institute starts to build a new Marine Spatial Data Infrastructure through the Hidrográfico + project having granted funding from SAMA2020 program (POCI-02-0550-FEDER-035422). This Marine Spatial Data Infrastructure (MSDI) is aligned with the OHI, UN-GGIM, INSPIRE, IODE best procedures to improve the data management, metadata creation, data search services and optimized data access services. The MSDI frontend is a centralized webGIS – Hidrográfico + (https://geomar.hidrografico.pt). In the portal users will find several marine and hydrographic datasets: environment observations at sea, forecast, nautical charts and hydrographic information.

a) Status of MSDI

Hidrografico + MSDI integrates the software components presented in the Figure . This service oriented architecture implements the MSDI functionalities, principles and pillars. Human and machines actors could access marine data through OGC services and custom APIs. The infrastructure presents a full integration between the portal and the metadata catalogue, this integration optimizes data access by National Spatial Data Infrastructure (SDI) – SNIG Portal - and INSPIRE Geoportal.

The MSDI has been designed to support blue economy sector clients like maritime users, fisheries, aquaculture, green energy operators, etc. At this point, the users recognize the potential of this new tool as an organizational asset capable of support diverse scientific projects and clients – Human and machines.

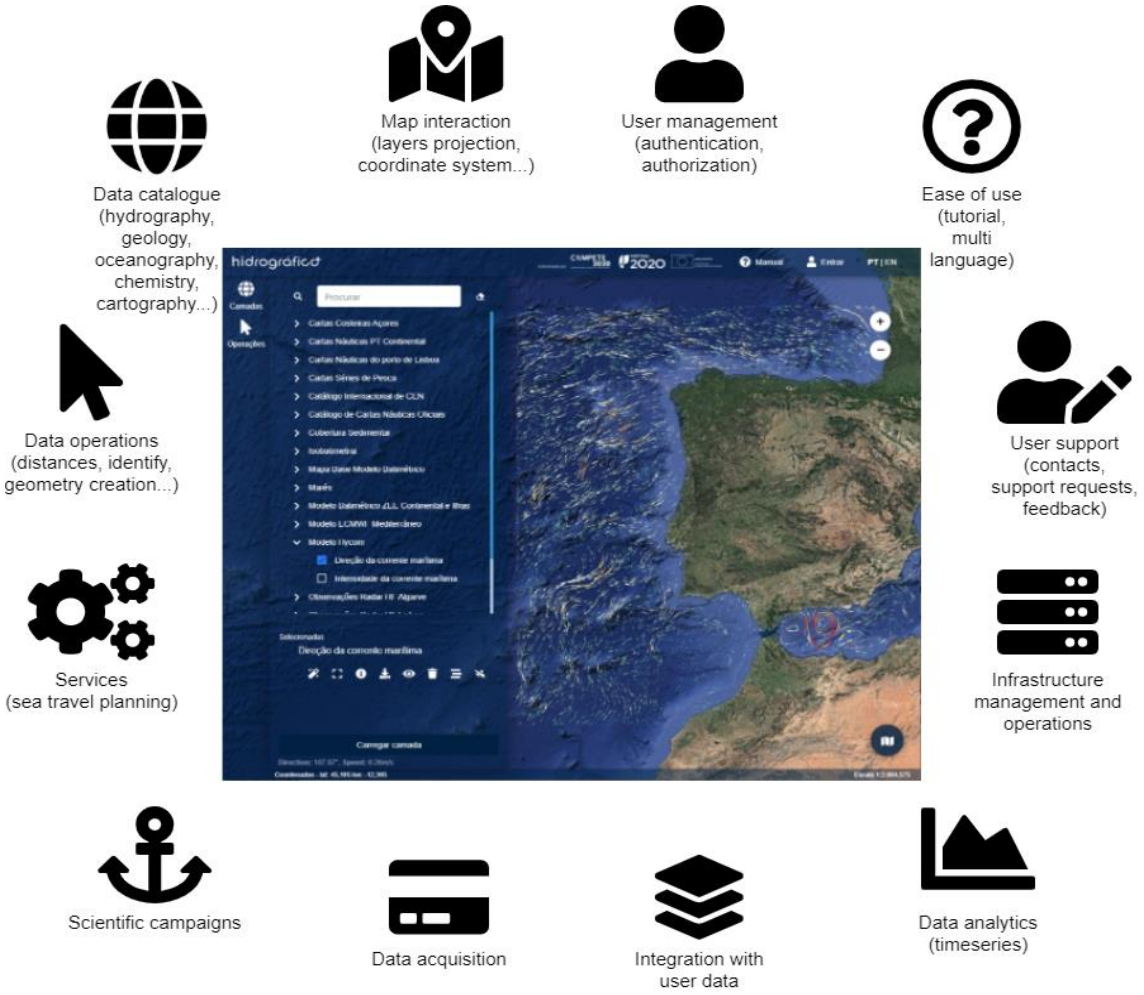

Figure 24 - Hidrográfico+ MSDI functionalities and components

From the systems architecture (Figure) point of view the PT MSDI implements several open source technologies. This allows IH to be compliant with INSPIRE and IHO MSDI requirements and to publish diverse data sources and formats through web services.

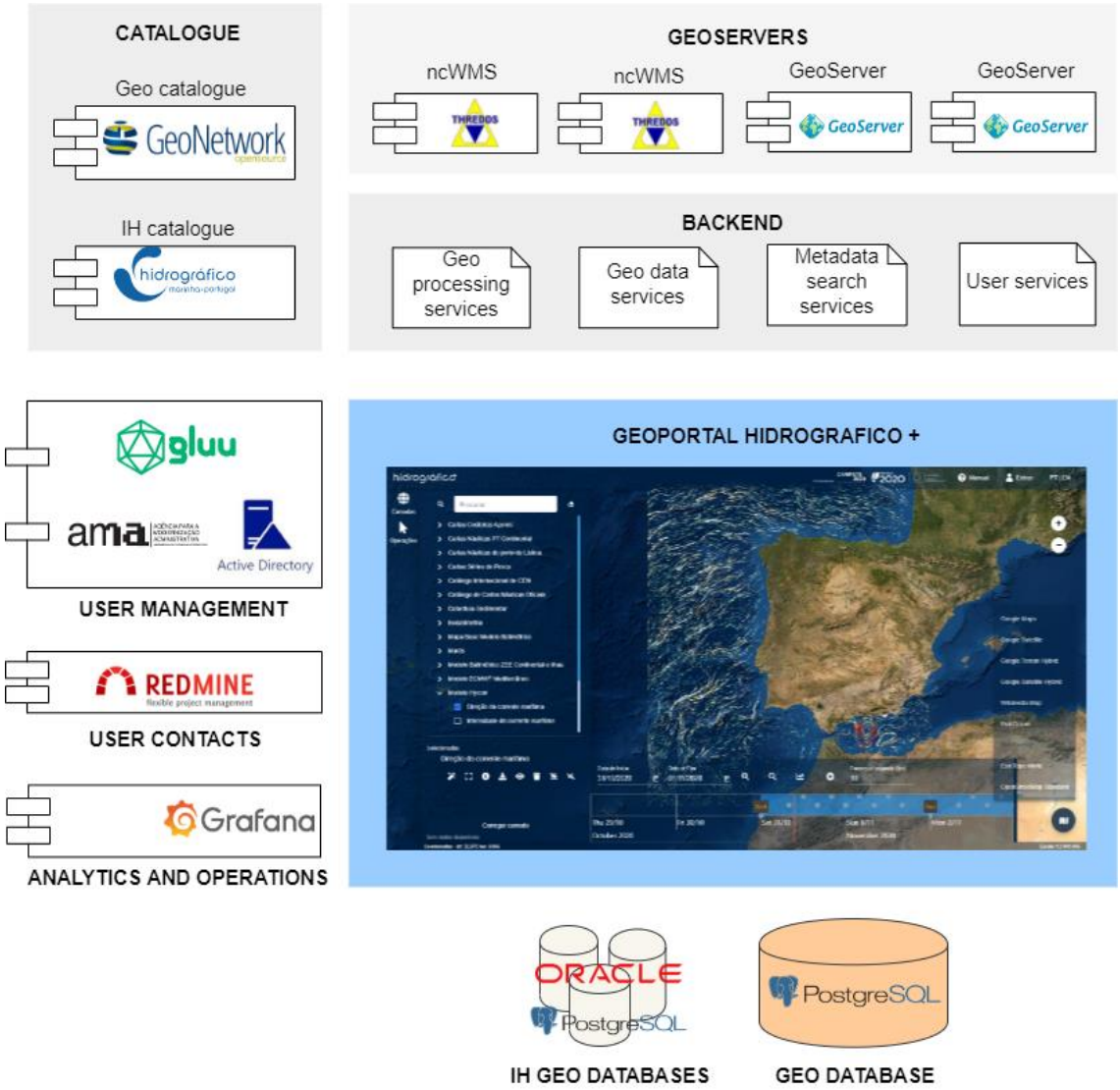

Figure 25 - Hidrográfico Plus MSDI archicteture

The Portuguese Hydrographic Institute MSDI will support goals 2 and 3 identified in the OHI strategic plan (Figure).

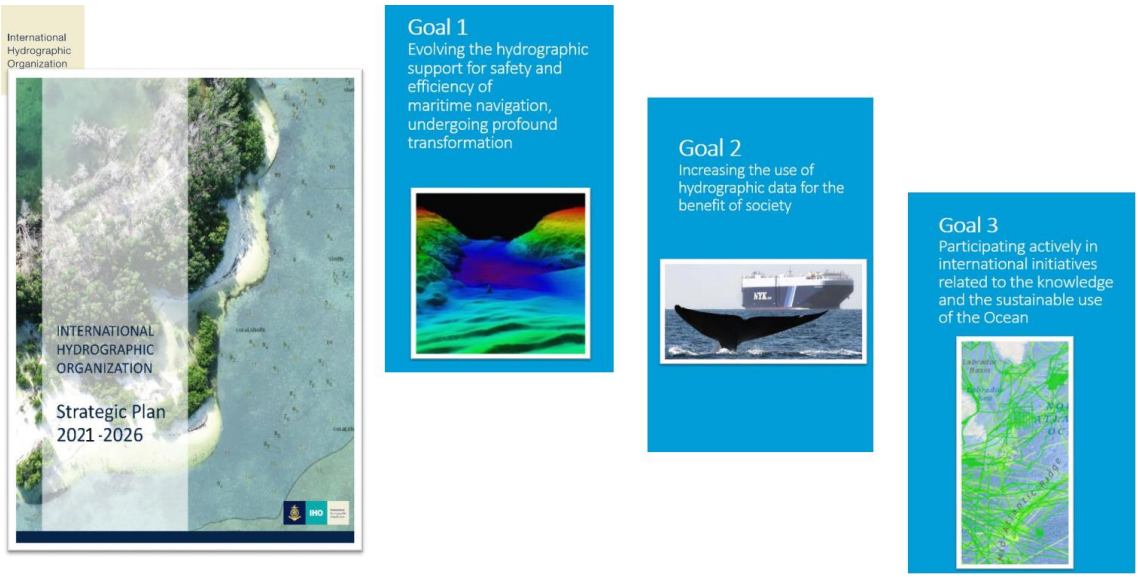

Figure 26 - OHI Strategic Plan (2021 – 2026)

Notices to Mariners and Navigational Warnings are also available at IHPT Internet portal ANAVNET, as well as general information on the Portuguese Nautical Charts and Nautical Publications.

IHPT also supports IC-ENC by providing a world ENC availability catalogue (independent of maker or distributor) to support the mariners: (https://gisportal.hidrografico.pt/arcgis/apps/webappviewer/index.html?id=0c592915e0884049b7c197bf7cbe2d91).

b) Relationship with the NSDI

IH data is available through Open Geospatial Consortium (OGC) web services in the Portuguese National Spatial Data Infrastructure (NSDI) – Sistema Nacional de Informação Geográfica (SNIG): https://snig.dgterritorio.gov.pt/. SNIG maintains a centralized metadata catalogue with all national data providers and is linked to the EU INSPIRE Portal. The metadata is shared between the different infrastructures through automatic harvesting process. This approach assures data access for different clients.

c) Involvement in regional or global MSDI efforts

IHPT works in the SNIG Working Groups for a common effort in the INSPIRE implementation principles and provides geospatial data services to other portals like the Marine Spatial Data Portal – Geoportal do Mar Português

(https://webgis.dgrm.mm.gov.pt/portal/apps/webappviewer/index.html?id=df8accb510bc4f33963d9b03bf3674b8).

d) National implementation of the Shared Data Principles – including any national data policy and impact on marine data.

Several Portuguese organizations have been implementing the common European directives and orientations such as INSPIRE, Marine Directive Framework, the European Strategy for Data Policy and the Directive on open data and the re-use of public sector information, also known as the 'Open Data Directive' (Directive (EU) 2019/1024).

The main driver in the SDI and MSDI has been the European community and the regional initiatives. SNIG follows the INSPIRE directive and the Implementation Working Groups. IH combined the needs to implement the INSPIRE directive with the IHO and IMO principles and requirements to build up the Hidrográfico + MSDI capable of serving multiple users, needs and uses. Portugal does not have a national common marine data policy. However, data producers and providers have their own organizational data policies aligned with national and European legislation compliant with international data management best practices.

The Hidrografico + platform currently delivers free data, for visualization, and download. Some of the data is not available for download, as in the future a paid access will be required for downloading that data.

e) MSDI national portal

Currently it is not identified one simple portal as the MSDI national portal and maybe the best approach for the implementation of MSDI federate principles is to implement a network of geospatial services and aggregated metadata access points like SNIG and INSPIRE portals.

f) Best practices and lessons learned

The Hidrográfico + MSDI follows the best practices and requirements identified from several recognized institutions/organizations: INSPIRE (https://inspire.ec.europa.eu/), OHI MSDIWG (https://iho.int/en/body-of-knowledge), OGC (https://www.ogc.org/) and IOC OceanBestPractices (https://repository.oceanbestpractices.org/handle/11329/139), among others. The main lessons learned are the need to maintain a good human resources capacity building program and to maintain the internal competences and technical skills aligned with the MSDI principles and implementation

models.

g) Challenges and achievements.

Hidrográfico + MSDI components are used to support internal technical and scientific geospatial data management processes and to feed external clients with near real time data. This MSDI supports the organization mission as marine national laboratory and hydrographic chart authority. As navy unit it supports maritime operations that are extremely dependent of geospatial data.

Hidrográfico +, since its internet deployment has proved its value. The IH developed this project taking into account marine user needs. This MSDI should be mature at the Ocean Decade Beginning and Portugal has great expectations about its role for decreasing the ocean knowledge gap at National, European and Global level. This MSDI implements all identified requirements needed for interoperability. For sure it will potentiate the access to IH blue geospatial data and has potential for private sector applications development. In this way, IH will manage one infrastructure ready to be used in the Open Data Directive umbrella and aligned with INSPIRE requirements. This is one of the IH contributions for Ocean Decade sustainable development goals and for national blue economy development.

Currently, there are plans to incorporate the IH open data into the European Commission (EC) funded NextGEOSS catalogue (https://nextgeoss.eu/), a European contribution to GEOSS (Global Earth Observation System of Systems), which consists of a next generation European data hub and cloud platform, for EO data, where the users can connect to access data and deploy EO-based applications. The concept revolves around bringing the data and resources to the user communities, together with cloud resources, seamlessly connected to provide an integrated ecosystem for supporting applications.

Another platform to use the Hidrografico + data services, starting by free data, will be the European Space Agency (ESA) funded ECOMI (E–COMmerce platform for MIcro geoservices) platform, based on the store4EO platform (https://www.store4eo.com/), which aims to become a marketplace connecting EO service providers and users of such services. The platform aims to facilitate the delivery of innovative geo-services to various industries, the public sector, and the general public, while reinforcing the use of EO services.

Putting all this together, the Hidrografico + is rapidly becoming a consolidated platform of geographic ocean data, by making easily available, the value of the data produced by IH, to a number of different community of users, and also by integrating into a network of other geospatial European initiatives, where all those stakeholders can work together for the benefit of all.

The MSDI development is a never endless process. Digital era is still rising multiple challenges for hydrographic offices. For sure new requirements for digital data should show up soon. Yet, at this

moment our main goals have been achieved.

The main challenges will keep the MSDI aligned with digital data strategies at different levels. This is a digital environment with a continuous evolution which requires a rapid adaptation to new clients and stakeholders. Data harmonization and development of S-100 based web services will be for sure a challenge in the future.

10- INNOVATION

a) Use of new technologies

Considering the use of new technologies for hydrographic surveys, Portugal has put new work power to developing and using current satellite technology for the acquisition of bathymetric information. In house software development allowed the use of satellite images to bring in new survey techniques. Multispectral remote detection images are now used for bathymetry where this approach is considered viable and needed. Following this implementation, new tasks have been set up, to develop a similar technique using remotely acquired imaging from low flying vehicles such as unmanned aerial vehicles.

Portugal is currently working on Horizon2020 European Project “4S - Satellite Seafloor Survey Suite” focused on using techniques for having Bathymetry and Seafloor Classification from remotely acquired multispectral images.

Furthermore, other methods are being developed, such as using the wave field inversion for calculating depth and thus achieving another bathymetric survey technique. Considering the development of this methods using newer technology, Portugal is currently working on several European projects focused specifically on these purposes.

As a statement of those capabilities is the fact that IHPT is now a “beta-tester” for the brand new ESA produtcs.

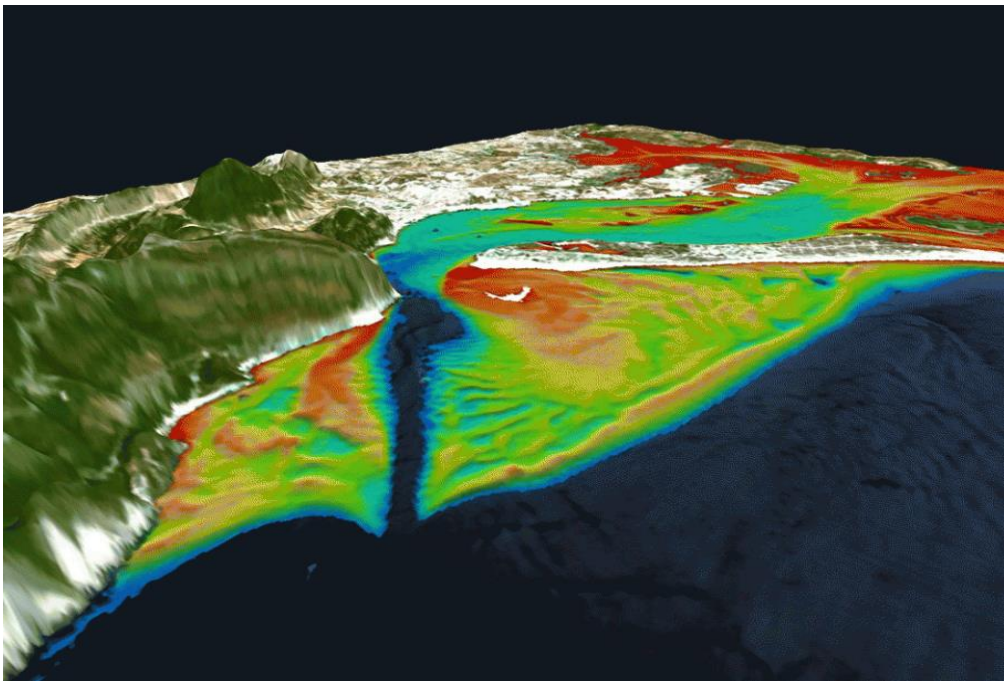

FIG 27 - SDB image from Setubal harbor

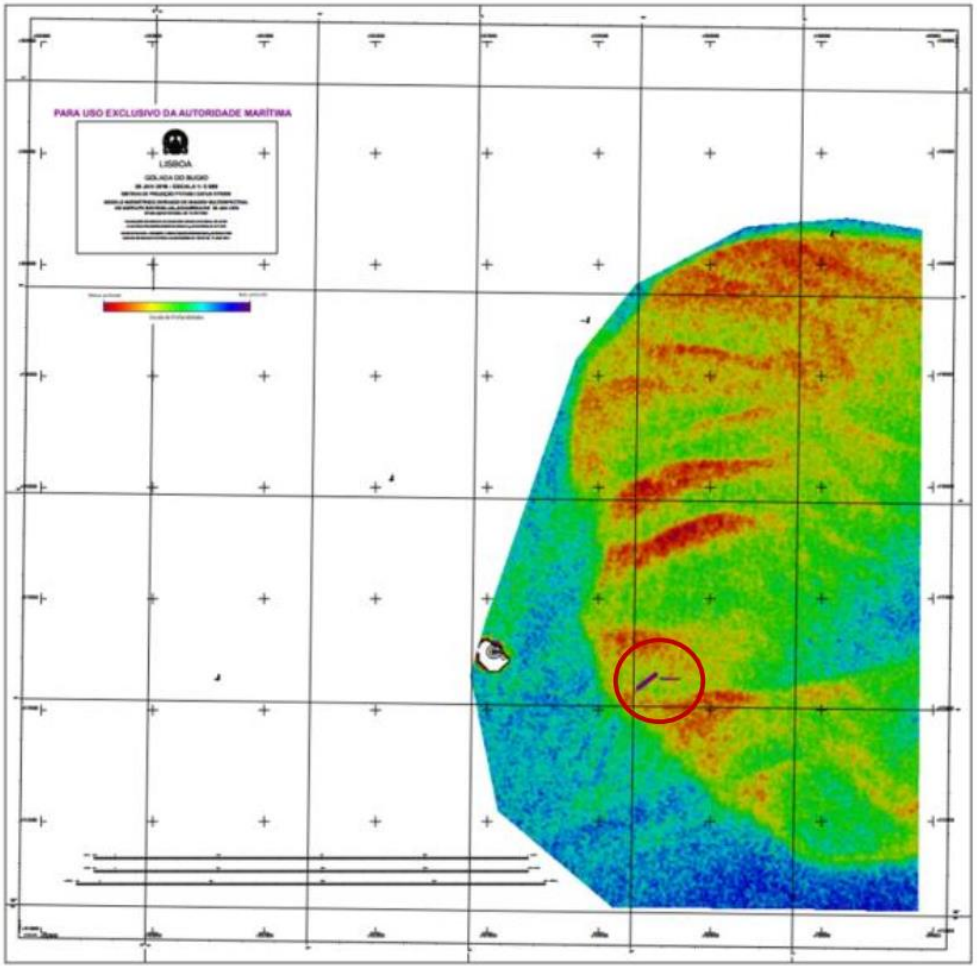

FIG 28 - Lisbon Bar SDB survey for the recovery of Betanzos ship

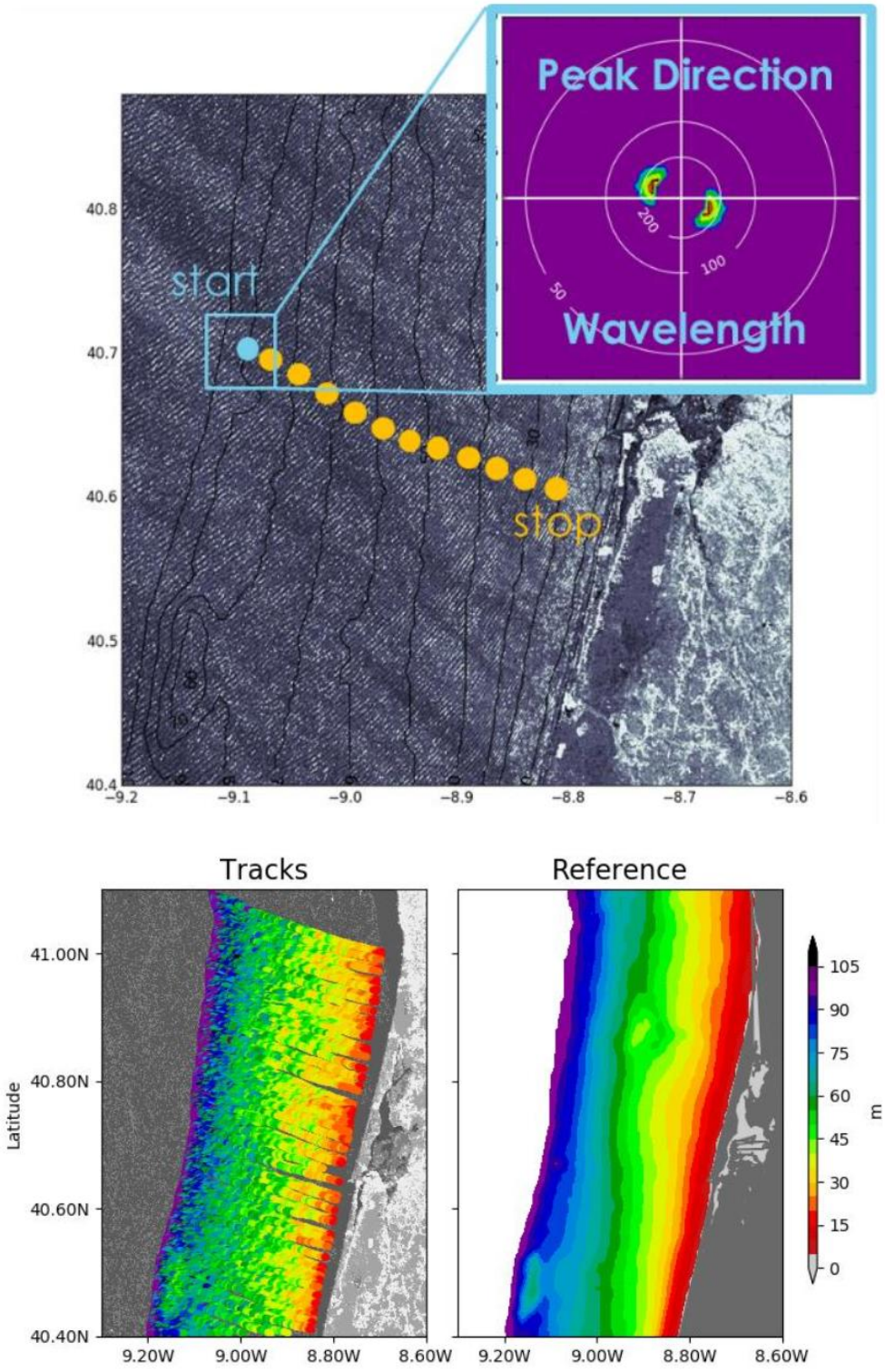

FIG 29 - Coastal bathymetry from wave parameters retrieved from SAR data

For oceanographic surveys, IHPT also used new technologies. The one that stands out is the low cost ocean drifters developed under the scope of the MELOA project. Those drifters, that were baptized with the name WAVY, have three different generations, the basic, the littoral and the ocean. Some are ready for deployment, allowing the use of massive drifters with a low investment.

Figure 30 – Wavys ready for deployment

b) Risk assessment

IHPT is conducting Risk Assessment of some of the waterways in order to identify areas of improvement for the safety of navigation. These assessments are performed in accordance with the recommendations and guidelines of IALA.

c) Policy matters.

NTR.

11- OTHER ACTIVITIES

a) Participation in IHO Meetings

Portugal participated in the IHO Assembly (A2) and in the celebrations of the 100 years of the IHO. IHPT shared several photos and images, which were used in the commemorative video published by the IHO.

At the IHPT, the Director-General Rear-admiral Carlos Ventura Soares gave a brief address alluding to this day, followed by a presentation on the ocean data infrastructure "Hidrográfico +", by Lieutenant-commander Paulo Antunes Nunes.

Portugal also contributed to THE INTERNATIONAL HYDROGRAPHIC REVIEW No. 25 (May 2021), available on https://iho.int/uploads/user/pubs/ihreview_P1/IHR_May_2021.pdf, with two articles:

- Portuguese Hydrographic Institute: 60 years of ocean knowledge projected into the future by RAdm C. V. Soares;

- Program SEAMAP 2030 - 100% of the Portuguese maritime spaces mapped by 2030 by Lieutenant-commander T. Geraldes Dias.

Due to its primary charting responsibilities, Portugal, represented by IHPT, is a member of EAtHC and Associated Member of SAIHC. Since September 2020 the Diretor-general of IHPT, RAdm Carlos Ventura Soares, is the chair of the EAtHC commission.

Regarding the period of this report, one can also mention the Portuguese participation in the Hydrographic Surveys Standards Project Team (HSPT), focused on the update of the S-44 publication, a project team which lasted around 3 years, finishing its works with the release of the new S-44 edition (edition 6.0) in September 2020. After HSPT, IHO decided to continue with the achieved momentum on hydrography and created the Hydrographic Surveys Working Group – HSWG to work on S-44, C-13 publications and add focus to all hydrographic issues. This is a working group in which Portugal is also participating, not only as a regular member but also in the chairing committee.

The detail of IHPT involvement in other IHO activities/working groups is listed in the table hereafter.

	Description	IHPT representation
HSSC	Hydrographic Services and Standards Committee	CDR João Vicente
IENWG	IHO-European Union Working Ggroup	Captain Miguel Bessa Pacheco
IRCC	Inter-Regional Coordination Committee	Radm Carlos Ventura Soares
CBWG	Capacity Building Working Ggroup	CDR João Vicente
MSDI	Marine Spatial Data Infrastructure Working Group	LCDR Paulo Nunes
S100WG	S-100 Working Group	Eng.ª Paula Sanches
S101PT	S-101 Project Team	Eng.ª Paula Sanches
SCUFN	Gebco Sub-Committee on Undersea Feature Names	Eng.ª Paula Sanches
WEND	Worldwide ENC Database Working Group	Eng.ª Paula Sanches
DQWG	Data Quality Working Group	Eng.ª Paula Sanches
HSPT	Hydrographic Surveys Standards Project Teams	Engª Cristina Monteiro
HSWG	Hydrographic Surveys Working Group	CDR João Vicente and CDR Carlos Marques (Secretary)
CSBWG	Crowdsource bathymetry Workin Group	Eng.ª Leonor Veiga and CDR João Vicente

b) Meteorological data collection

NTR.

c) Geospatial studies

Monitoring the evolution of the artificialized coastline:

Since 2019, the IHPT is monitoring the evolution of the coastal area surrounding the harbor of Sines, the only deep-water port located in national protected areas, and which includes São Torpes beach. The 5 years monitoring plan for the beaches of São Torpes, requires frequent surveys to describe the morpho-sedimentary characteristics of the system (beach and inner shelf) after winter,

spring, summer and autumn. The comparison of data acquired during the different seasonal situations allows quantifying and predicting the evolution in terms of topography and bottom sediments. In addition, the dominant oceanographic regime is characterized in order to understand the physical forcing of the observed changes.

d) Preparation for responses to disasters

IHPT, with regard to disaster response, created a multidisciplinary team within its many scientific/marine science capabilities (such as hydrography, physical oceanography, marine geology, chemistry and pollution and Data center) combined with the expertise in marine technology and ocean engineering.

The purpose of the Equipa Hidrográfica de Intervenção Rápida (Quick Response Hydrographic Team) is to support the national emergency coordinator in case of a natural or manmade disaster or emergency and also in Portuguese Naval Operations.

IHPT is working on the EatHC Plan for responses to disasters.

e) Environmental protection

EMODnet

The European Maritime Observation and Data Network (EMODnet), an initiative of the European Commission's Directorate-General for Maritime Affairs and Fisheries (DG MARE), is composed of a partnership of more than one hundred of European organizations working together to gather marine data from a variety of sources, with the aim of making them more accessible and interoperable.

Part of the work involves linking to national, regional or thematic data repositories in which lies the basic information and the creation of outreach products. Thematic groups have been set up to organize the data available from various sources, assess their quality, ensure that they are accompanied by metadata and provide such data through thematic portals in the areas of bathymetry, geology, habitats, biology, chemistry, physical oceanography, and human activities.

IHPT has been collaborating with this project for more than a decade, providing bathymetric and chemistry data in the Atlantic, Azores and Madeira regions.

The High Resolution Seabed Mapping (HRSM) project aims to create and maintain an operational service that provides free and open access to the seabed and coastal sea basin bathymetric models at the best resolution possible.

The overall objective is to bring together bathymetric surveys of European seas and to produce, publish and serve a harmonized and high-resolution Digital Terrain Model (DTM) of all European basins.

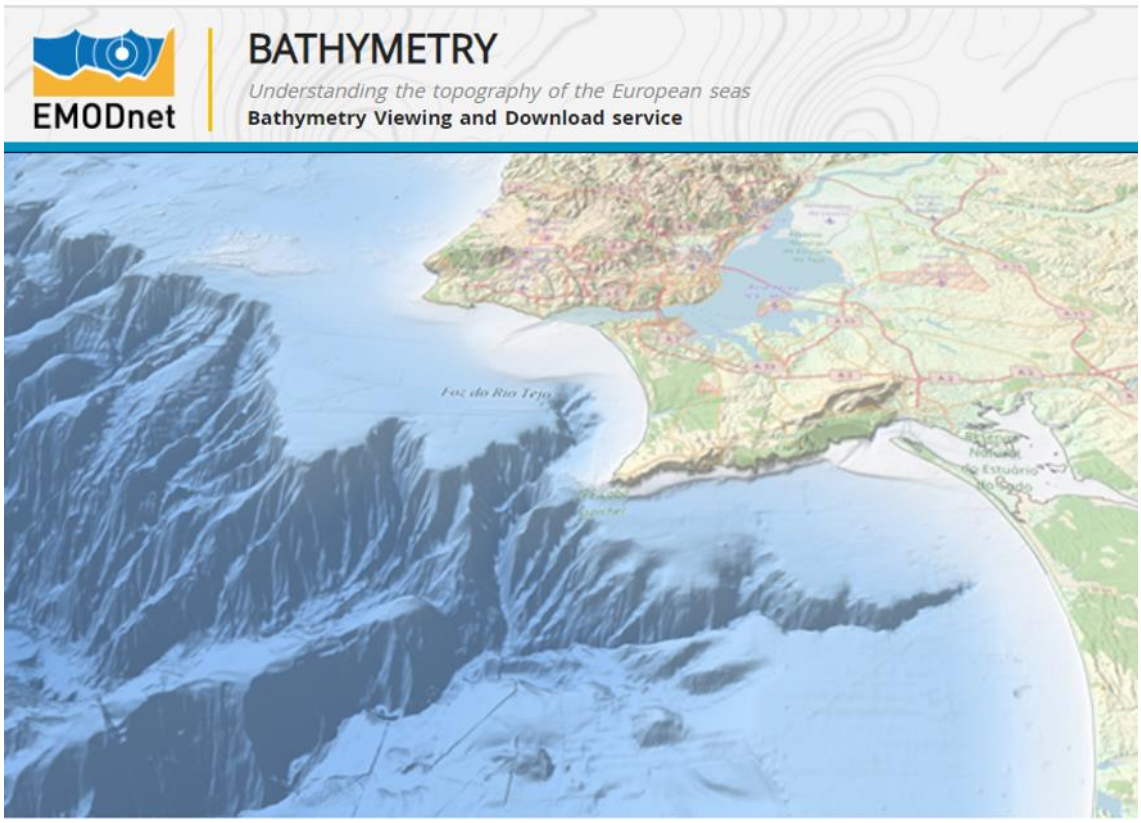

Figure 31– EMODnet Bathymetry Portal.

EMODnet Chemistry first goal is to provide interoperable, high quality and publicly available data and products on marine water quality issues. Its activity is firstly to collect, validate, and guarantee access to marine pollution data streams, and secondly generate and publish corresponding data products.

EMODnet Chemistry is focused on eutrophication, ocean acidification, contamination, and marine litter issues which are relevant to the Marine Strategy Framework Directive and to global climate change. The data have been brought together for different group of variables in seawater, sediment and biota.

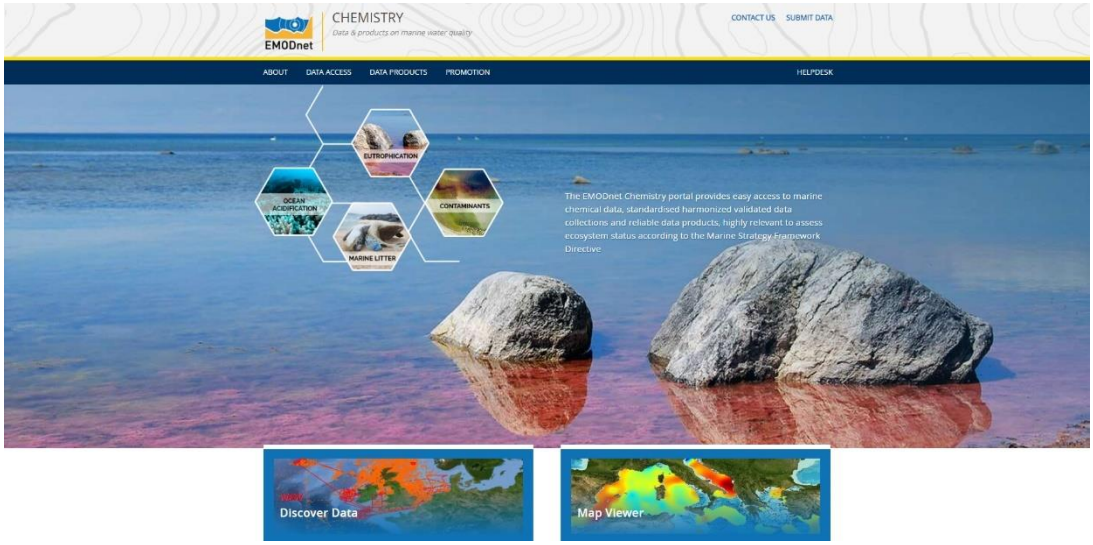

Figure 32 – EMODnet – Chemistry Portal (https://www.emodnet-chemistry.eu)

AQUASADO

In September 2017, IHPT started its participation, as partner, in the AQUASADO (Sustainable Aquaculture in the Sado Estuary) project. The project's main goal is to assess the environmental quality of the Sado estuary, from an integrating perspective and at the ecosystem scale, promoting the use of the natural element, the estuarine microalgae, as a food source in the sustainable production of bivalves, namely the Portuguese oyster (Crassostrea angulata) and other species with potential for production. As a multidisciplinary project, it includes, among other aspects, the study of the estuary's hydrodynamics and environmental status with monthly surveys being performed for more than two years, tasks of which IHPT was in charge.

Currently, with the project reaching its term, the final report is being prepared to be published by the end of 2021.

AQUIMAR

The project AQUIMAR (Marine Knowledge supporting Aquaculture, https://aquimar.hidrografico.pt/), coordinated by IHPT, started in August 2018 with the main goals of characterizing the oceanographic, hydrodynamic and biogeochemical conditions of selected areas of the Portuguese coast (continental platform and estuaries); and to identify the best suited locations, in these selected areas, for the settlement of aquaculture infrastructures. Between October 2018 and February 2021, four oceanic surveys (each one covering the five areas marked in yellow on Figure XX) and 16 estuarine surveys (covering the four estuaries – Ria de Aveiro, Mondego, Mira and Ria Formosa – marked with red dots on the same Figure) were conducted.

Currently, the information collected during the surveys is being processed and integrated. Given the large dimension of the data collected and the multidisciplinarity of the project, it is not expected that the final report can be finished before the second trimester of 2022.

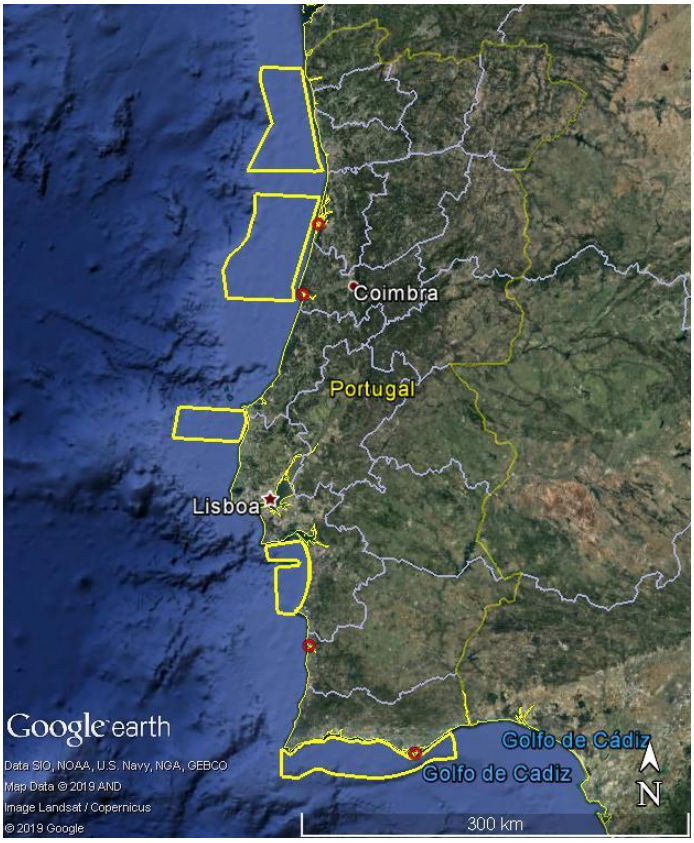

Figure 33 – AQUIMAR project – surveyed areas

i-plastic

The i-plastic project (Dispersion and impacts of micro- and nano-plastics in the tropical and temperate oceans: from regional land-ocean interface to the open ocean), in which IHPT is a partner, started in September 2020 and has its term planned for august 2022. The project intends to assess the dispersion and impacts of micro- and nano-plastics in the tropical and temperate oceans, from the regional land-ocean interface to the open ocean, and to elaborate models of plastics dispersion at the Atlantic scale. The first oceanic surveys were conducted in September 2020 and in the Mondego estuary at the beginning of 2021.

SEDMAR

A sustainable use of the natural resources requires management policies founded in scientific knowledge. Knowledge of the nature of the seabed is mandatory for activities of environmental protection measurements, scientific and economic development linked to the sea, namely actions to

preserve marine biodiversity (through the detection of any sensitive marine ecosystems or the harmful effects of human activity), inventorying, rational management of marine resources (energy, living and non-living), and other economic activities.

The aim of the seabed mapping in what concerns its physical properties (morphology and geology) grows on the need to increase the scientific knowledge of the coastal margins, so the proper measures to exploit natural resources, preserve marine biodiversity, and protect endangered ecosystems, can be adopted.

The ongoing "Mapeamento dos Sedimentos Marinhos – SEDMAR" project is the successor of the "Sedimentos Superficiais da Plataforma Continental - SEPLAT program" (1974-2010), executed at the Hydrographic Institute and fully financed by the MDN, which produced 8 sedimentological maps of the Portuguese continental shelf between the coastline and 500m depth, at scale 1 : 150 000.

These mapping programs are complemented with additional studies and projects that adopt multidisciplinary approaches, using acoustic and geophysical methods, such as lateral sonars, high-resolution seismic reflection systems and magnetometry.

MARRISK

This project aims to promote the smart and sustainable growth of the coastal areas of Galicia and Northern Portugal by assessing the most important coastal risks in a climate change scenario. Situations such as floods, intensification of extreme events, episodes of toxic algae or coastal erosion are examples of risks to be analyzed in order to improve the resilience of traditional economic sectors and other emerging sectors such as marine renewable energies.

The MarRisk Project is a project in which the Hydrographic Institute participates in the scope of the RAIA Observatory.

OCASO

This project aims to establish a transboundary oceanographic observatory in the southern region based on the existing monitoring network, for monitoring and detecting tsunamigenic activity, as well as providing, on an ongoing basis, relevant information for all activities carried out in the area, relevant to the economy from both countries.

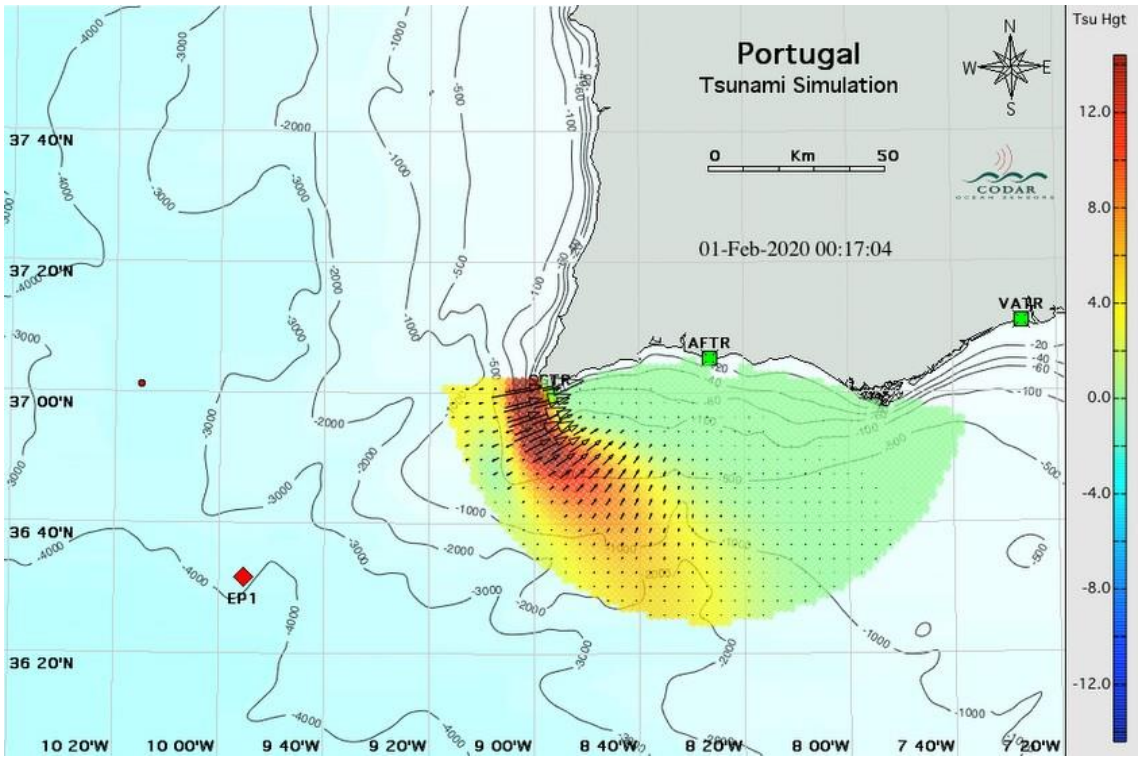

Figure 34 – Tsunami simulation based on HF Radar data - OCASO

f) Engagement with the Maritime Administration

Under this topic, IHPT, with the help of 3 other partners such as Portuguese National Maritime Authority (AMN), created a support system for Maritime Surveillance in the access to port areas; Developed a decision support tool for use by AMN using harbors of Vila do Conde, Nazaré and Portimão as case studies (SAGA project).

Also, IHPT is working continuously with harbor administrations in order to keep charts updated with the most recent information.

g) Aids to Navigation matters.

NTR.

h) Magnetic/Gravity surveys

NTR.

i) International engagements

IHPT has three bilateral agreements with other Hydrographic Offices (IHM, SHOM and UKHO). The agreements with IHM and UKHO are under revision.

Spanish:

IHPT and the IHM (Spanish Hydrographic Office) hold regular technical meetings (on an annual basis) in order to define joint cooperation actions, namely the surveys and the cartography in the national maritime border's areas. At this moment it is in progress the joint production of the nautical cartography in the border area between Portugal (north) and Spain and the determination of the difference between the Chart Datum from Portugal and Spain in that area (Minho River mouth).

Cape Verde:

IHPT signed, on 30th November 2017, a protocol with the Maritime and Port Institute of Cape Verde. This protocol came to formalize and reinforce the cooperation between the two countries in the hydrography works. In addition to updating Cape Verde cartography, this protocol will develop technical cooperation, institutional capacity building and training of technical staff of that country.

Guinea-Bissau:

IHPT signed, on 17th June 2015, a protocol with the Maritime and Port Institute of Guinea-Bissau. This protocol came to formalize and reinforce the cooperation between the two countries in the hydrography works. In addition to updating Guinea-Bissau cartography, this protocol will develop technical cooperation, institutional capacity building and training of technical staff of that country.

São Tomé and Príncipe:

Portugal signed, on 8th November 1988, a protocol with São Tomé and Príncipe in the fields of maritime development, hydrography, oceanography, safety of navigation and maritime signaling. This protocol needs to be revised.

j) Others - Naval Meteorological and Oceanographic Center

IHPT has developed state of the art tools and operational systems in the field of meteorological and oceanographic forecast, in-situ ocean observation networks and remote sensing techniques, along the Portuguese margin and coastal areas.

In November 2017, IHPT activated the new GEOMETOC center of the PRT Navy, named CGEOMETOC (Naval Geospatial, Meteorological and Oceanographic Center), under the direction of IHPT's Director-general.

12- FINAL REMARKS

a) Areas of significant achievement

The Chart 62102 (INT1960) – Cape Verde Archipelago, 1ª Ed, was publish with new bathymetric data acquired by IHPT and other scientific cruises (for example: RV Meteor).

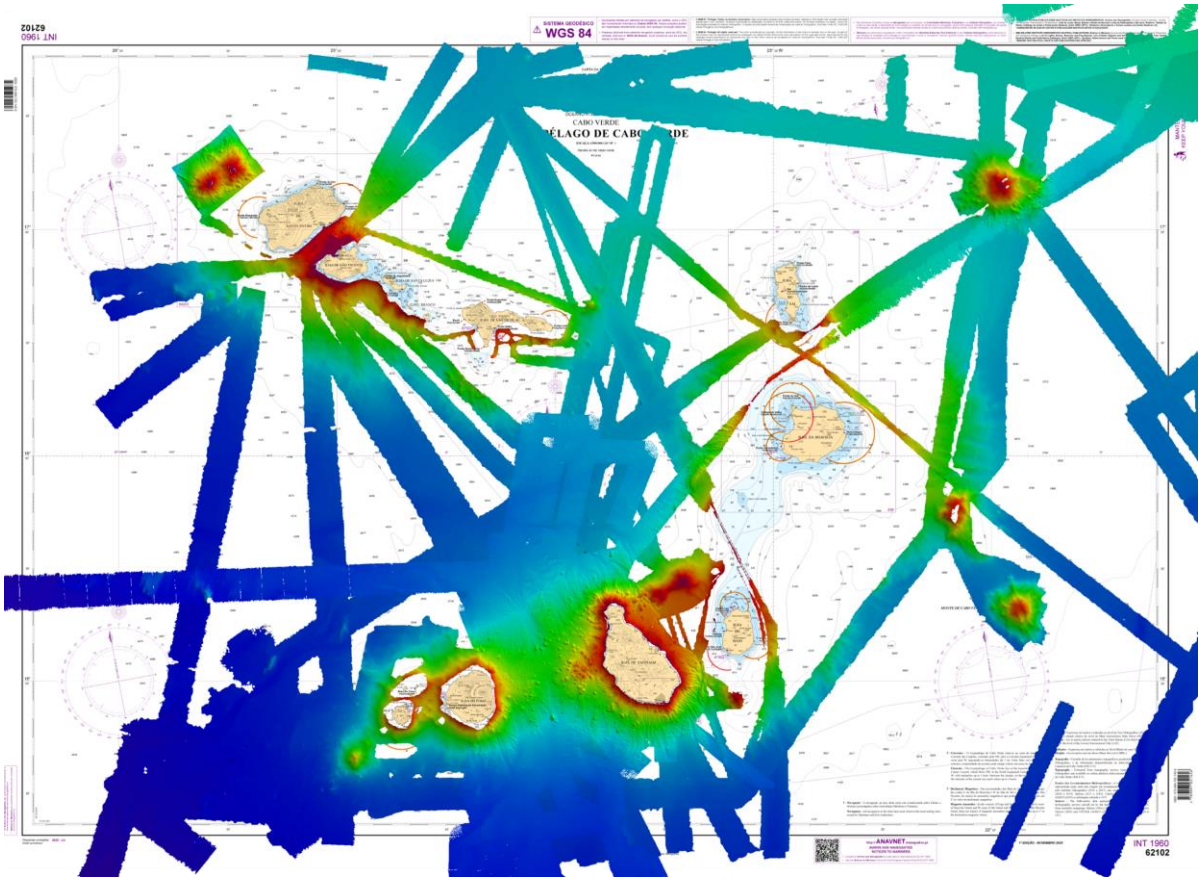

Figure 35 – IHPT and shared Cape Verde multibeam coverage.

b) Areas of particular concern

Access and share the data of the scientific cruises it is difficult task because the need of National Authorities authorizations.

Engage non-members states to be member of the IHO.

Due to the Covid-19 international health crisis, some capacity building activities which were scheduled for 2021/22 had to be postponed to 2022/23.

c) Any other matters of interest to the EAtHC

NTR.