

**MESO AMERICAN – CARIBBEAN SEA HYDROGRAPHIC COMMISSION  
(MACHC)**

**25<sup>th</sup> CONFERENCE OF THE MESO AMERICAN – CARIBBEAN SEA  
HYDROGRAPHIC COMMISSION (MACHC25)**

**Panama City, Republic of Panama – December 3 to 6, 2024**

**NATIONAL REPORT FROM BRAZIL TO THE MACHC25**

**1. Hydrographic Office / Service:**

- a) Name of the institution: Directorate of Hydrography and Navigation (DHN).
- b) Description: DHN is responsible for hydrographic surveys and its analysis, nautical chart production, nautical publication release, weather forecast broadcast, maritime safety information and navigational warning broadcast, oceanographic data analysis, hydrographic training and capacity building implementation.
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**2. Surveys:**

- a) Coverage of new surveys: from November 2023 to November 2024, the Brazilian Navy Hydrographic Vessels carried out surveys in the Amazon Basin, contributing to the nautical cartography production of the area.

<b>Vessel</b>	<b>Survey – Area</b>	<b>Period</b>
“Aviso Hidroceanográfico Fluvial Rio Tocantins”	Amazon River (Between “Mangabal” Island and the mouth of the “Jari” River)	Jan to Mar. 2024
“Aviso Hidroceanográfico Fluvial Rio Xingu”	Port of “Belém-PA” (“Tutoca” Channel)	Mar. 2024
“Aviso Hidroceanográfico Fluvial Rio Xingu”	“Guajará” Bay and “Pará” River	Mar. to Apr. 2024
“Navio Hidroceanográfico Balizador Ten.Castelo”; Aviso Hidroceanográfico Fluvial Rio Xingu”	Amazon River (Between “Patacho” and “Santarém”)	Apr. to Jun. 2024
“Navio Hidroceanográfico Balizador Ten. Castelo”; Aviso Hidroceanográfico Fluvial Rio Xingu”; Aviso Hidroceanográfico Fluvial Rio Tocantins”	Amazon River (Between “Caldeirão” Island and “Santa Rita” Island)	Jun. to Jul. 2024

“Aviso Hidroceanográfico Fluvial Rio Tocantins”	Amazon River (South Bar)	May 2024
“Aviso Hidroceanográfico Fluvial Rio Solimões”	“Madeira” River (From the mouth of the “Madeira” River to “Guajará” Island - charts 4711 and 4712)	Feb. to Apr. 2024
“Navio Hidroceanográfico Fluvial Rio Branco”	“Madeira” River (From the mouth of the “Madeira” River to “Guajará” Island - charts 4713, 4714 and 4715)	Feb. to Apr. 2024
“Aviso Hidroceanográfico Fluvial Rio Negro”	“Juruá” River (Between the mouth and the city of “Eirunepé”)	Jan. to Apr. 2024
“Aviso Hidroceanográfico Fluvial Rio Solimões”	“Branco” River (between the mouth and the city of “Santa Maria do Boiaçu-AM”)	Jan. to Feb. 2024
“Navio Hidroceanográfico Fluvial Rio Branco”	Amazon River (“Tabocal” Passage and Mouth of the “Madeira” River)	Mar. to May 2024
“Aviso Hidroceanográfico Fluvial Rio Negro”	“Branco” River (between the mouth and the city of “Caracaraí-RR”)	Jun. 2024
“Aviso Hidroceanográfico Fluvial Rio Solimões”	“Madeira” River (between charts 4711 to 4753)	Jul. to Sep. 2024
“Navio Hidroceanográfico Fluvial Rio Branco”	Amazon River – multibeam survey in the Amazon River in specific sections of chart 4032 and single-beam survey in specific sections of charts 4030 and 4711.	Aug. to Sep. 2024

b) Coverage of new surveys carried out by private entities:

DHN is responsible for controlling the hydrographic surveys performed in the jurisdictional waters of Brazil by Brazilian Navy survey vessels and private companies. From December 2023 until November 2024, 19 hydrographic surveys were carried out in Amazon Basin.

c) New technologies and /or equipment:

Three additional photogrammetric surveys were conducted using the Unmanned Aerial Vehicle (UAV), model Dji Mavic 2 Pro PPK. This equipment features a PPK module, enabling kinematic post-processing, and a camera capable of achieving a 25cm resolution. The results were again assessed as suitable to support the cartographic update process.

Additionally, a new multibeam echosounder, the Kongsberg EM 2040P, has been acquired. It will be used as portable equipment, operated by ship crews according to the demands set by the DHN.

d) New ships: XXX.

e) Crowdsourced and satellite-derived bathymetry - national policy:

CSB and SDB are still not recognized as valid sources for chart updates and remain under evaluation. The volume of CSB data received is limited, and its quality is often difficult to assess due to insufficient information regarding the methods and conditions under which the data was collected, making it challenging to assign reliable metadata and CATZOC values. Additionally, SDB has proven difficult to apply in Brazil, with only a few regions where its use is feasible, further complicating its integration into the national cartographic services.

f) Challenges and achievements:

- The river mouths in the region are highly complex environments, and the tides are influenced by astronomical factors (astronomical tide), meteorological phenomena (meteorological tide), and the water levels of the rivers (ebb and flood). These factors are the focus of meetings and discussions regarding navigation safety in the area.
- Provision of trainings in hydrographic data analysis and charting production to the Regional Hydrographic Branches in Belém-PA and Manaus-AM is a particular challenge due to the great distance and the difficulty to harmonizing DHN with their own production.

### 3. New charts & updates:

a) ENC coverage, gaps and overlaps:

Brazilian ENCs don't present gaps neither overlaps due to internal and external (IC-ENC) systematic checks.

06 (Six) new cells were produced since last MACHC Conference:

BR400222 – Do Canal Grande Do Curuá À Baía De Macapá

BR404011 – De Macapá à Ilha Salvador

BR404018 – De Prainha a Monte Alegre

BR404019 – De Monte Alegre à Arapixuna

BR504018 – Plano da Prainha

BR504019 – Plano de Monte Alegre

33 (Thirty-three) ENC cells were updated since the last meeting:

BR221010 – Do Cabo Orange à Ilha de Cajutuba

BR321300 – Do Cabo Norte ao Cabo Maguari

BR400204 – Das Ilhas Pedreira à Ilha de Santana

BR400221 – Barra Norte do Rio Amazonas

BR400222 – Do Canal Grande Do Curuá À Baía De Macapá

BR400242 – Da Ilha dos Porcos à Ilha de Santana

BR400304 – De Mosqueiro a Vila do Conde

BR400305 – Da Ilha do Capim à Ilha da Conceição

BR400306 – Da Ilha da Conceição aos Estreitos

BR400321 – Porto de Vila do Conde  
BR404011 – De Macapá à Ilha Salvador  
BR404021 – Do Lago Armaná à Ilha do Amador  
BR404023 – De Óbidos as Ilhas do Caldeirão  
BR404025 – Das Ilhas do Caldeirão à Ilha do Mocambo  
BR404027 - Da Ponta dos Mundurucus à Parintins  
BR404030 – Da Ilha Panumã à Novo Remanso  
BR404032 – De Novo Remanso à Manaus  
BR404055 – Da Ilha de Codajás a Coari  
BR640323 – Terminais da Reman  
BR441011 – Da Ilha Salvador à Ilha Grande de Gurupá  
BR441021 – Da Ilha do Sarapoí a Almeirim  
BR441022 – De Almeirim a Prainha  
BR441031 – Da Ilha do Mouraba a Costa do Ituqui  
BR441032 – Do Paraná do Ituquí a Ilha do Meio  
BR500206 – Porto de Santana  
BR504211 – Da Foz do Rio Jari a Ilha Xavier  
BR54020A – Porto de Santarém  
BR540231 – Paraná de Santa Rita  
BR540261 – Paraná do Mocambo  
BR540291 – Paraná do Serpa  
BR540292 – Terminal de Itacoatiara  
BR504411 – Da Foz do Rio Trombetas ao Lago Paru  
BR504413 – Do Lago Paru à Ilha Jacitara

b) ENC distribution method:

Brazilian ENCs are distributed by IC-ENC. Since 2018, the Brazilian company EMGEPON began working as reseller of VAR PRIMAR (<https://cartasnauticasbrasil.com.br/>).

c) RNCs:

DHN provides 508 units of Raster Navigational Charts (RNC) for NAVAREA V. Around 170 RNC belong to the MACHC region and are currently available at no cost for the entire community (<https://www.marinha.mil.br/chm/dados-do-segnav/cartas-raster>).

d) INT charts:

XXX

e) National paper charts:

The paper charts new editions were:

222 – Do Canal Grande do Curuá a Baía de Macapá;  
4011 – De Macapá à Ilha Salvador;  
4018 – De Prainha a Monte Alegre;  
4019 – De Monte Alegre À Ilha do Ituqui; e

- 4020 – Da Ilha do Ituqui A Arapixuna.
- f) Other charts, e.g. for pleasure craft:  
XXX.
- g) Challenges and achievements:  
The maintenance of S-57 ENC's and the production of the first S-101 nautical charts represents a significant challenge for DHN and its hydrographic branches. DHN provides training to Navy local hydrographic branches focusing on hydrographic data analysis, upload and validation of bathymetric and cartographic databases and production of all nautical products. Key technical personnel specialized in Hydrography and Cartography have been transferred to those branches, aiming to improve their production capabilities and to create critical mass of expertise.

#### 4. New publications & updates:

- a) New Publications:  
Tide Tables DG6, 61th Edition, Brazil, 2024.  
Nautical Almanac DN5, 80th Edition, Brazil, 2024.  
List of Lights DH2, 39th Edition, Brazil, 2024.
- b) Updated publications:  
XXX.
- c) Means of delivery, e.g. paper, digital:  
Accessible through paper format (EMGEPRON's website <https://cartasnauticasbrasil.com.br/>) and digital format (DHN's website - <https://www.marinha.mil.br/chm/dados-do-segnav/publicacoes> ).
- d) Challenges and achievements:  
XXX.

#### 5. MSI

- a) Existing infrastructure for MSI dissemination:  
Brazilian Navy Hydrographic Centre is responsible for the reception, processing and promulgation of MSI for NAVAREA V, on behalf of DHN, in accordance with GMDSS Master Plan. Navigational warnings and meteorological information are broadcast by SafetyNET II service at scheduled times (0030 and 1230 UTC) twice a day. Meteorological information is broadcast at scheduled times (0730 and 1930 UTC) twice a day. Bad weather warnings are forwarded any time, whenever it's necessary. MSI is also broadcast in VHF/HF by the Brazilian Navy Radio Station in Rio de Janeiro, at least twice a day. Local navigational warnings are broadcast only by VHF/HF.
- b) Statistics on work of the National Coordinator

Country / Territory	PHASE 1. MSI STATUS	MSI 2020	MSI 2021	MSI 2022	MSI 2023	MSI 2024	Training Date	Training Date
Brazil (NAVAREA	Fulfilling all obligations	160	86	34	30	14	Apr-2011	Oct-2018

V)								
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c) New infrastructure in accordance with GMDSS Master Plan

SERVICE	YES	NO
MASTER PLAN	X	
A1 AREA	X	
A2 AREA	X	
A3 AREA	X	
NAVTEX		X
SafetyNET II	X	

d) Challenges and achievements:

XXX.

## 6. Status of Hydrographic Surveying and Nautical Charting Worldwide (C-55)

C-55 was updated with information from Brazil in May 2024.

C-55 Region B was subdivided in 3 regions: Amazon Basin, Brazilian Coast, and São Pedro and São Paulo Archipelago.

a) Status of hydrographic survey:

Survey coverage, where:

A - Percentage which is adequately surveyed.

B - Percentage which requires re-survey at larger scale or to modern standards.

C - Percentage EEZ which has never been systematically surveyed.

1 - Amazon Basin

	A	B	C
0 - 200m	88	12	0
Depths > 200m	---	---	---

2 - Brazilian Coast – Brazil – INT Region B

	A	B	C
0 - 200m	84	13	3
Depths > 200m	100	0	0

3 - São Pedro and São Paulo Archipelago

	A	B	C
0 - 200m	0	100	0
Depths > 200m	100	0	0

b) Status of nautical charting:

Coverage of charts published by your organization, where:

A - Percentage covered by INT series/paper chart series meeting the standards in S-4.

B - Percentage covered by Raster Navigational Charts (RNCs) meeting the standards in S-61.

C - Percentage covered by ENC's meeting the standards in S-57.

1 - Amazon Basin

Chart coverage	Passage (%)	Coastal (%)	Port (%)
INT	---	---	---
RNC	---	---	100
ENC	---	---	88
Status of Paper Charts			
Paper charts with depths in meters (%)		100	
Paper charts referenced to a satellite datum (%)		86	

2 - Brazilian Coast – Brazil – INT Region B

Chart coverage	Passage (%)	Coastal (%)	Port (%)
INT	100	100	100
RNC	100	100	100
ENC	100	100	100
Status of Paper Charts			
Paper charts with depths in meters (%)		100	
Paper charts referenced to a satellite datum (%)		82	

3 - São Pedro and São Paulo Archipelago

Chart coverage	Passage (%)	Coastal (%)	Port (%)
INT	100	100	---
RNC	100	100	---
ENC	100	100	---
Status of Paper Charts			
Paper charts with depths in meters (%)		100	
Paper charts referenced to a satellite datum (%)		100	

7. Capacity Building

a) Offer of Capacity Building:

The following courses are offered annually by DHN at no cost to MACHC Members and friendly Navies:

COURSE	DESCRIPTION	DURATION
C-Esp-HN	Aims to qualify the student to be a technician in Hydrography and Navigation issues.	42 weeks Jan – Nov
C-Ap-HN (Recognized by IBSC-IHO as Cat. “B”)	Aims to increase the capability of the student to be a technician in Hydrography and Navigation.	35 weeks Apr – Dec
CAHO	Aims to provide the student with the capability to	50 weeks

(Recognized by IBSC-IHO as Cat. "A")	plan, to conduct and to execute the activities related with the Hydrographic Service.	Jan – Dec
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- CAHO - Course in Hydrography for Officers.
- C-Ap-HN - Course in Hydrography and Navigation for Petty Officers.
- All courses are in Portuguese and students must be fluent.
- These courses are usually offered free of charge to MACHC member countries, with the availability of meals throughout the week, however, there is no possibility of offering accommodation.
- Interested countries must send their requests through the military Attaché of the Brazilian Embassy.

b) Training received, needed, offered:

In 2023, at the DHN, two (2) Officers, one from Cameroon and another from Bolivia, have completed the CAHO, course recognized by IBSC/IHO as Cat "A".

In 2024, at the DHN, three (3) Officers, two from Cameroon and another one from Bolivia, are performing the CAHO, and one (1) Sergeant from Ecuadorian Navy is taking the Marine Aids to Navigation Course.

From November 6 to 10, 2023, a Workshop was held in the city of Singapore, with the objective to develop knowledge to convert the current "Electronic Navigational Chart" (ENC) in S-57 format to the new S-101 format, defining the best way to perform the conversion and the main errors observed. The event was supported by the IHO training fund and also by the IHO-SINGAPORE LAB. DHN (Brazil) was represented by an Officer.

In March 14, 2024, a virtual meeting was organized by CHM (Brazil) and supported by the Spanish Hydrographic Institute. This event had many participants and was attended by representatives from SWAtHC (Brazil, Argentina and Uruguay). The main objective was to expand knowledge related to S-100 products and to learn how to develop an implementation plan, as well as the conversion of the electronic chart standard S-57 to S-101.

In May 6th to 10th, 2024, the "International ENC Validation Training Course" was held at "Educational and Training Center Admiral Radler de Aquino – CIAARA/DHN/Brazil. This course was taught by IC-ENC instructors, with simultaneously translation into Spanish. Students from several countries participated (Argentina, Brazil, Chile, Ecuador, Panama, Peru, Uruguay and Venezuela), sixteen (16) attendees in total.

c) Status of national, bilateral, multilateral or regional development projects with a hydrographic component. (In progress, planned, under evaluation or study):

DHN undertakes to carry out activities together with other National Hydrographic Services. In this way, it is possible to optimize efforts and expand the potential to promote technical training.

DHN continues to support The Fluminense Federal University (UFF), in the implementation of a hydrography training at the University.

The University has a hydrographic vessel to support the practice of the program, which remains moored with the other DHN survey vessels.

d) Description of proposals and requests to the IHO/CBSC:

For 2025, Brazil has sent to the SWAtHC Capacity Building Coordination and to the CBSC a submission to carry out a “S-57 to S-101 conversion and S-100 production Course”, which was accepted by the President of the SWAtHC and intends to invite two representatives from MACHC. However, to this date, this event has not received the financial resources approved from CBSC program.

## 8. Oceanographic activities

a) General:

Deployment of XBTs by Brazilian Navy Ships in international waters, maintenance of 8 (eight) moored buoys of the PIRATA Moored Array Project by Brazilian Navy Survey Ships. Mooring of 7 (seven) metoceanographic monitoring buoys: 6 (six) in the Brazilian Coast, and 1 (one) in the Antarctic Peninsula. Furthermore, it has been cast 2 ARGOS floats in Drake Passage.

b) GEBCO/IBC’s activities, GEBCO Seabed 2030 activities

GEBCO surveys are performed by the Brazilian Navy Survey Ships during all hydrographic and oceanographic surveys and in transit. DHN continues its effort to provide reliable data to Seabed 2030 initiative.

c) Tide gauge network:

252 active tide gauges are distributed throughout the Brazilian territory (October 2024), including a permanent tide gauge in Fernando de Noronha archipelago. 101 active tide gauges are placed in the MACHC region.

d) New equipment:

First Slocum Glider deployment in December 2023.

e) Challenges and achievements:

XXX.

## 9. Spatial data infrastructures

a) Status of MSDI:

Our Marine Spatial Data Infrastructure (acronym in Portuguese: IDEM-DHN, Infraestrutura de Dados Espaciais Marinhos da DHN) is implemented and continuously improving. It utilizes Geonetwork for metadata insertion, Geoserver for the insertion of geoinformation layers, and it also features an integrated, interactive data viewer (GeoPortal). It is widely available, free of charge, to the general public at <https://idem.dhn.mar.mil.br>.

Throughout this year, new data and metadata have been inserted into IDEM-DHN, primarily metadata from topogeodetic stations, totaling hundreds of updates.

- b) Relationship with the NSDI:  
The IDEM-DHN (our MSDI) is a “Proper Node” of the Brazilian National Spatial Data Infrastructure (acronymous in Portuguese: INDE - Infraestrutura Nacional de Dados Espaciais), which means that we manage and update (store, insert, change, and delete) all our data at INDE. INDE is managed by the Brazilian Institute of Geography and Statistics - IBGE, of the Brazilian Government (<https://inde.gov.br/>). All data and metadata inserted into IDEM-DHN are automatically updated in INDE, significantly enhancing its findability and accessibility.
- c) Involvement in regional or global MSDI efforts:  
DHN continues its active participation in all relevant working groups related to IHO MSDIWG.
- d) National implementation of the Shared Data Principles:  
All open DHN data is shared according to its Open Data Access Policy, published in 2018 (NAD-DHN), which is available at:  
<https://www.marinha.mil.br/dhn/sites/www.marinha.mil.br.dhn/files/Port13-2018-DHN-Aprova-NAD-DHN.pdf>
- e) MSDI national portal:  
The IDEM-DHN contributes with marine data and information as a “proper node” of the NSDI.
- f) Best practices and lessons learned:  
We highlight the work in conjunction with the other Departments of our Institution, which provides more agility in a more decentralized working environment. Recently, it was established by the Navy Hydrographic Center (CHM) a series of small meetings called “CHM Talks”, which cover several technical aspects, including “Future formats of S-100”, “Hydrographic awareness and advances” and “MSDI”. It has had a very positive effect on spreading knowledge, leading to a better-integrated final result in all processes.  
It’s also noteworthy to register of the continuous collaboration with the Brazilian Institute of Geography and Statistics (IBGE), which provides free training in Geoserver and Geonetwork systems, as well as other concepts that are essential for training new managers of the IDEM-DHN.
- g) Challenges and achievements:  
The current challenges remain to keep inserting the maximum possible amount of layers/metadata outlined in our Open Data Access Policy (NAD-DHN); the continuous improvement of the IDEM-DHN’s GeoPortal; and also the revision of the Open Data Access Policy (NAD-DHN), which has just started.

## 10. Innovation

- a) Use of new technologies:
- Brazilian Marine Spatial Data Infrastructure (IDEM-DHN)
  - Marine Environmental Prediction system (PAM)
  - Oracle Exadata Service

- Tests with an Autonomous Underwater Vehicle (AUV)
  - Slocum Glider unit
  - Studies about Global Ensemble (public) with AI and data to improve predictions
  - Using of drones to collect topo-geodesics information
- b) Risk assessment:  
XXX.
- c) Policy matters:  
XXX.

## 11. Other activities

- a) Participation in IHO meetings:  
IHO Council (C-8), SWAtHC-18, HSSC-16, IRCC-16, S100WG-9, S-101PT13, ENCWG-9, NCWG-10, ABLOS-31, TWCWG-9, HSWG-6, HSWG-7, IBSC-47, WWWNWS-16 e WENDWG-14.
- b) Meteorological data collection:  
Meteorological data are collected with fixed meteorological stations placed all over Brazil and along the coast, by ships and are also received from other institutions through internet links. All data are used for the Brazilian Marine Meteorological Service products, broadcast at no cost along and offshore the Brazilian coast and available at internet.  
The transmission of the products of the Brazilian Marine Meteorological Service is carried out through several channels, such as: the INMARSAT SafetyNET II satellite service; the Brazilian Network of Coastal Stations (in VHF and HF); the Brazilian Navy Radio Station in Rio de Janeiro (ERMJR) in HF; the webpage (<https://www.marinha.mil.br/chm/banner/servico-meteorologico-marinho>), “Previsão Ambiental Marinha (PAM)” and the “Boletim ao Mar” applications for tablets and smartphones.
- c) Geospatial studies:  
DHN has consistently updated its application the Marine Environmental Forecast system (PAM), which exhibits forecasts of oceanographic and meteorological numerical models in a dynamical way. The system is available at a website and for mobile devices, for Android and iOS.
- d) Preparation for responses to disasters:  
DHN provides a 24/7 service with telephone and e-mail.
- e) Environmental protection:  
DHN created a segregated MPA layer at its cartographic database where all informed protected areas are coded. It’s been prepared for future S-100 needs. This information is represented at paper charts and ENCs.
- f) Engagement with the Maritime Administration:

The Brazilian Maritime Administration is under the Brazilian Navy structure. DHN maintains straight collaboration with the Brazilian Directorate of Ports and Coasts, an important body of the Brazilian Maritime Administration.

- g) Aids to Navigation matters  
Brazilian Navy sent participants to attend IALA Events, as well IALA Council Meetings 77, 78 (Brazil) and 79 (France) and participation in VTS Committees IALA 54 and 55 (France). Moreover, preparation of a Technical drafts was delivered to “Estado Maior da Armada” (EMA) with the purpose of defending the position of the Brazilian Navy in the National Congress to support the transformation of IALA into an International Governmental Organization (OIG), culminating in the deposit of the instrument of ratification of the Convention on 14 June 2024.
- h) Magnetic and gravity surveys:  
DHN conducted magnetic surveys related to Brazil’s submission to the United Nations’ Commission on the Limits of the Continental Shelf.
- i) International engagements:  
DHN actively participates of workgroups and commissions at IHO, IMO, IALA, IOC and WMO. It also contributes with smaller organizations that discuss adjacent topics to the previously mentioned ones (e.g. IEHG, IC-ENC).
- j) Others: XXX.

## **12. Conclusions**

DHN reassures its commitment with MACHC and plans continuous hydrographic activities so as to keep its nautical charts updated, as stated in regulations V and IX of the SOLAS Convention.