



IHO Capacity Building Programme

The State of Hydrography and Navigational charting in The Republic of Bangladesh



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Contents

Abbreviations	4
Executive Summary	5
Recommended Actions	6
1 Introduction.....	7
2 Technical Visit Programme	7
3 General Assessment	8
3.1 <i>Bangladesh's Maritime Interests</i>	8
3.2 <i>Hydrographic Awareness</i>	9
3.3 <i>Bangladesh Navy Hydrographic Department</i>	10
3.4 <i>Hydrographic Surveying</i>	11
3.5 <i>Navigational charting</i>	12
3.6 <i>National Hydrographic Resources</i>	12
4 Options for the Way Ahead	13
4.1 <i>Multibeam Echo Sounder Operations</i>	13
4.2 <i>Multibeam Echo Sounder Upgrade</i>	13
4.3 <i>Hydrographic Survey Appraisal Process</i>	13
4.4 <i>Hydrographic Data Base</i>	14
4.5 <i>Production and Maintenance of ENC's</i>	14
4.6 <i>Environmental Data</i>	14
4.7 <i>Enhanced IT Capability</i>	14
4.8 <i>Nautical Publications</i>	15
4.9 <i>BNHOC Organization</i>	15
5 Technical Visit Conclusions.....	16
6 Recommended Actions.....	16
Annex A – List of Bangladesh Navy Contacts	18
Annex B – Technical Visit Programme	19
Annex C – Bangladesh Chart Production State	20

Abbreviations

AtoN	Aids to Navigation
BA	British Admiralty [Chart]
BN	Bangladesh Navy
BNHOC	Bangladesh Navy Hydrographic and Oceanographic Centre
BIWTA	Bangladesh Inland Waterways Transport Authority
Ed	Edition
EEZ	Exclusive Economic Zone
ENC	Electronic Navigational Chart
ICZM	Integrated Coastal Zone Management
IHB	International Hydrographic Bureau
IHO	International Hydrographic Organization
IMO	International Maritime Organization
MBES	Multi Beam Echo Sounder
MoU	Memorandum of Understanding
MSDI	Marine Spatial Data infrastructure
MSI	Maritime Safety Information
NE	New Edition (of a navigational chart)
NtoM	Notice to Mariners
RHC	Regional Hydrographic Commission
RNC	Raster Navigational Chart
SBES	Single Beam Echo Sounder
SOLAS	[United Nations] Convention of the Safety of Life at Sea
ToR	Terms of Reference
TTW	Territorial Waters
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea

Executive Summary

The Bangladesh Navy (BN) is responsible for the national hydrographic and charting programme for Bangladesh. It is clear that BN staff from the highest level downwards are fully aware of this national responsibility and takes intense pride in its successful delivery. The BN ensures through the country's membership of the International Hydrographic Organization (IHO) and the regional hydrographic commission, the North Indian Ocean Hydrographic Commission, that it takes a full part in international hydrography. Through the BN's myriad links within Bangladesh's maritime community it ensures that the national hydrographic message is heard and understood up to and including Prime Ministerial level.

The Bangladesh Navy Hydrographic Department (BNHD) was formed in 1980 and has made steady progress to its present position as a professional national surveying and charting authority. The BN has invested heavily in survey vessels with the latest, BNS *Anushandhan*, joining the fleet in 2010. The current survey fleet of five vessels and two launches carry out surveys to a carefully considered annual survey programme. Experienced with single beam echo sounder and sidescan sonar surveying the BN is now moving into the more complex world of swath surveys with two survey vessels and one launch now fitted with swath sounding systems. Due to the soft sedimentary nature of the seafloor in the north of the Bay of Bengal the BN operates shallow water seismic equipment for wreck search and investigation.

The Bangladesh Navy Hydrographic and Oceanographic Centre (BNHOC) is a well developed professional hydrographic office producing paper navigational charts – both in the national and international series – and tide tables. Of the proposed national chart series of 55 charts 19 are published with six more in preparation. The BN has produced and published all three of its INT charts. BNHOC does not, as yet, produce ENC's.

The Bangladesh Navy Hydrographic School (BNHS) was established in 1983, gained IHO accreditation for IHO Cat B Hydrographic course in 2005 and is awaiting a decision on its application for IHO Cat A Hydrographic course accreditation. This is a very creditable achievement for a relatively small organization. The BNHS's reputation is established and trains not only other government agency hydrographers and hydrographic staff but foreign students, currently five Nigerian officers attending the IHO Cat B course.

All national hydrographic offices continue to develop and face challenges in that development. Bangladesh is not alone. Whilst a number of minor areas of improvement are noted in this report there are two which require particular and early attention: the development of MBES capability and the establishment and development of an electronic navigational chart (ENC) production and maintenance capability.

The BN has the potential to operate its MBES to the standards required; however, through a limited and uncoordinated training programme and operational experience the BN's hydrographic officers lack the necessary experience and consequent confidence in the survey results. Having made a very significant capital commitment in new survey equipment and ships it is imperative that the BN develops a training programme such that this new equipment can be used effectively for the benefit of the safety of navigation in Bangladesh's waters. One of the BN's three MBES systems is operational whilst the second is completing installation and trials and the third is defective. All systems should be made operational before a training programme is initiated such that the maximum value can be gained from the training and that it can be put into use immediately. Of the three MBES systems one, fitted in BNS *Anushandhan*, will become unsupportable in the next few years and the BN should start the naval procurement process as soon as possible to prevent a capability gap from developing.

The staff of the BNHOC produce and maintain a growing number of national and international charts to a high standard but have yet to move into the realm of ENC production and maintenance. It is perfectly possible to transform the current paper series into ENC's given the right assistance and the BN should consult with its foreign hydrographic office partners to achieve this. In doing so it can acquire the necessary skills to produce the remaining ENC's in-country and maintain all of them as it does so successfully for the paper chart series.

The change to MBES technology and to ENC's will require major development in digital technology and storage at the BNHOC with specially trained officers and ratings to manage these systems and the data they contain.

The BN should note that the IHB and the IHO do not provide training other than through CB requests. Where it cannot address its own training requirements internally it should raise training and assistance issues with the NIOHC for initial resolution or through existing cooperation or bilateral arrangements with other national hydrographic offices.

The Bangladesh Navy Hydrographic Department is a well led, manned and equipped national hydrographic service with a clear vision of its purpose and future and the will to attain it.

Recommended Actions

The following recommended actions are provided for consideration by the Bangladesh Navy:

- (1) That the following plan of action to bring the BN's MBES operations to a fully operational state (see 4.1):
 - Approve the repairs to BNS *Anushandhan's* EM1002 system;
 - Pass MBES data sets to an experienced hydrographic office for appraisal and assessment of operator or system errors;
 - On completion of the first two stages conduct in-country MBES data gathering and processing training using BN survey vessels and equipment. Training to be provided by an experienced hydrographic office;
 - Provide at least one continuation training programme approximately one year after initial training at point three above. Training to be conducted if possible by the original training team.
- (2) That the BN Hydrographic Department commence a replacement programme for EM1002 system fitted in BNS *Anushandhan* before the system becomes unsupportable. See 4.2
- (3) That in conjunction with the training under 2 above, that the BN seek the assistance of an experienced hydrographic office to develop a MBES survey data appraisal system at BNHOC and train the staff accordingly. See 4.3
- (4) That BN investigate the provision of BNHOC with data storage and management systems to provide a unified national hydrographic database and that assistance is obtained from an experienced hydrographic office. See 4.4
- (5) That BNHOC, through existing cooperation or bilateral arrangements with other hydrographic offices, request professional assistance to enhance its tidal analysis and prediction capability. See 4.6
- (6) The establishment of a dedicated BNHOC website to include charts and publications available, notices to mariners, navigational warnings, details of surveys, etc. See 4.7
- (7) That the BN consider the upgrading of the tide tables to a 'Maritime Handbook' including the national List of Lights, Radio Signals, etc. See 4.8
- (8) That the Director Hydrography considers the Technical Teams comments on the proposed new BNHOC structure. See 4.9
- (9) That BNHOC, through existing cooperation or bilateral arrangements with other hydrographic offices, request professional assistance to convert its published paper chart series to ENCs. See 4.5
- (10) The BNHOC develop an effective ENC production and maintenance capability. See 4.5
- (11) That BN arrange sending more officers for IHO Cat A hydrography and IHO Cat B cartography courses in recognized institutions. IHO Member States should take careful note of this recommendation.



REPORT



1 Introduction

The International Hydrographic Organization (IHO) is an intergovernmental technical organization, currently comprising 81 Member States. The IHO seeks to ensure that all States with coastlines and maritime interests provide adequate and timely hydrographic data, products and services, thereby advancing maritime safety and efficiency in support of the protection and sustainable use of the marine environment. The IHO is the recognised competent authority of the United Nations for hydrography and navigational charting. The International Hydrographic Bureau (IHB), based in Monaco, is the secretariat of the IHO.

A proposal for a technical and advisory visit to Bangladesh to help assess the current status of charting and hydrography in the country and to provide advice to the government and to stakeholders on a way ahead was raised at the 11th meeting of the North Indian Ocean Hydrographic Commission (NIOHC). As a result the Capacity Building Sub Committee approved and funded a visit to Bangladesh to assess the current status of hydrography and navigational charting.

Mr Jeff Bryant and Mr Bob Wilson, both seconded from the United Kingdom Hydrographic Office (UKHO), carried out a hydrographic awareness and technical assessment visit to Bangladesh between 3 and 7 November 2012.

This resulting report has been written with the express intention of assisting the government of Bangladesh to arrange and strengthen its hydrographic effort to meet its current and future needs and also its international maritime obligations under the UN Convention on the Safety of Life at Sea (SOLAS). The report comprises a description of the visit, a brief audit of the current situation and an analysis of the nation's hydrographic needs, major conclusions and a number of recommended actions for consideration by the relevant authorities.

2 Technical Visit Programme

The IHO Technical Team arrived in Chittagong, Bangladesh, on Saturday 3 November, were met by the Bangladesh Navy Liaison Officer and taken to the Bangladesh Navy Command Mess at Chittagong. In-country arrangements for the technical visit were arranged by Captain S.M. HASAN BN, Director Hydrography, Bangladesh Navy. Meetings, in the form of individual visits, were held with Bangladesh Navy hydrographic and navigational charting stakeholders throughout the three days in Chittagong before the Technical Team transferred to the capital Dhaka on 5 November. In Chittagong the IHO Technical Team had extensive discussions with the Director of Hydrography and his staff and met with the Chief of the Naval Staff and the Assistant Chief of the Naval Staff (Operations) who is also the Chairman of the National Hydrographic Committee. Throughout the visit the IHO Technical Team was well received.

Details of those attending the various meetings are shown in Annex A – List of Bangladesh Navy Contacts whilst the visit programme is at Annex B – Technical Visit Programme.

3 General Assessment

The following is a general assessment of the situation in Bangladesh regarding hydrography and navigational charting services as it relates to the Bangladesh Navy Hydrographic and Oceanographic Department, the national hydrographic organization. A discussion of available options, several conclusions and recommended actions, supported by a number of Annexes then follows.

3.1 Bangladesh's Maritime Interests

The national economy has grown 5-6% per year since 1996. More than half of GDP is generated through the service sector with 45% of Bangladeshis employed in the agriculture sector with rice as the single-most-important product. Bangladesh's growth was resilient during the 2008-09 global financial crisis and recession.

The country's transport system is based on river and sea traffic. Bangladesh is laced with over 800 rivers and thus most of the country is situated on deltas of large rivers flowing from the Himalayas: the Ganges unites with the Jamuna (main channel of the Brahmaputra) and later joins the Meghna before discharging into the Bay of Bengal. Inland waterways are vital to the movement of goods and people; Bangladesh's total waterways extend to a total length of 8,370 km including up to 3,060 km of main cargo routes, the network is reduced to 5,200 km in the dry season) (2011).¹

The country has two main ports at Chittagong and Mongla. The main imports at Chittagong are food grain, cement clinker, sugar, salt, fertilizer, general cargo, iron materials, chemicals, coal and edible oil whilst exports from the port include ready made garments, knitwear, fertilizer, jute & jute products, hides and skins, tea, naphtha, molasses and frozen foods. The port is the country's container hub. Chittagong acts as the main hub for transshipment through the country's inland waterway system. A summary of the total number of vessels using Chittagong Port, the tonnage of cargo handled and the rate of increase in growth is shown in the table below.²

Year	Cargo		Vessels
	Total Tonnage	% Growth	
2006	30,139,657		1957
2007	30,799,388	2.2	1945
2008	31,150,761	1.1	2099
2009	38,169,124	2.5	2167
2010	45,396,663	19.0	2219
2011	49,273,937	8.5	2248

Mongla Port is the second port of Bangladesh. The range of imports and exports at Mongla are similar to those at Chittagong. A summary of the total number of vessels using Mongla Port, the tonnage of cargo handled and the rate of increase in growth is shown in the table below.³

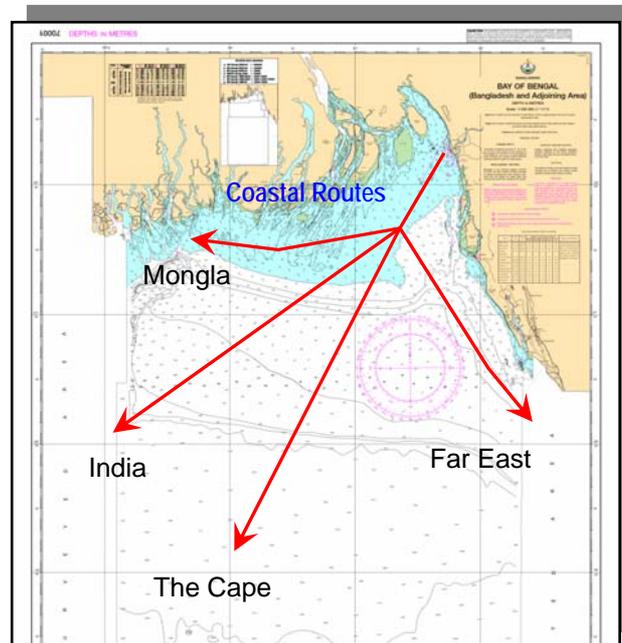
Year	Cargo		Vessels
	Total Tonnage	% Growth	
2006	1,482,644		391
2007	914,375	- 38.0	193
2008	722,834	- 26.5	126
2009	1,137,826	36.5	151
2010	1,649,283	31.0	187
2011	2,696,271	39.0	298

¹ <https://www.cia.gov/library/publications/the-world-factbook/geos/bg.html> [Accessed 7 Nov 2012]

² http://cpa.gov.bd/portal/home.php?option=article&page=82&link=statistical_info&item=port_statistics [Accessed 7 Nov 2012]

³ <http://www.mpa.gov.bd/Updatefile/ships%20&%20cargohandledatMonglaPort.pdf> [Accessed 7 Nov 2012]

International shipping routes, concentrated on Chittagong fan out across the Bay of Bengal to ports in Bangladesh, India, the Cape and past Burma to the Far East. Bangladesh's sea area is limited by its position at the head of the Bay of Bengal and the presence of India and Burma; consequently these sea routes cross most of Bangladesh's sea area and require it to be well surveyed.



The inshore and coastal waters in the delta areas on Bangladesh's south coast are heavily used by national feeder services and are an equally important area for surveys and charting.

Offshore activity in Bangladesh waters is limited. Fishing within the country's waters is restricted to local fishing with no deepwater fishery under licence. Maritime operations for defence and aid to the civil power are conducted throughout Bangladesh's sea and river delta areas. There is no maritime based tourism. Offshore gas exploration and extraction is increasing in the approaches to Chittagong in particular with announcements of further leases made in September 2012.⁴

3.2 Hydrographic Awareness

The Bangladesh authorities are well aware of the treaty obligations under the UN Convention on the Safety of Life at Sea (SOLAS) Chapter V Regulations 9 and 4 to ensure that appropriate national hydrographic and charting services are made available. Bangladesh is a State Party to this Convention.

The Bangladesh Navy is particularly aware at the most senior levels of the necessity of good hydrography to Bangladesh and does its utmost to fulfil the hydrographic obligations under SOLAS. It cannot fail to be aware as the Hydrographic Office within the naval base in Chittagong is adjacent to the river berths forming the main berthing area for the fleet and in full view of the port traffic. Chittagong is an extremely busy port with hundreds of merchant ships of all sizes in the river and on average around a hundred more in the outer anchorages.

National hydrographic effort is coordinated through the National Hydrographic Committee. The Bangladesh Navy, which has huge influence in the maritime affairs of the country, chairs the National Hydrographic Committee (NHC) which was constituted in 2001.

⁴ http://www.thefinancialexpress-bd.com/more.php?news_id=143409&date=2012-09-14 [Accessed 7 Nov 2012]

The NHC as constituted has the following members:

- Bangladesh Inland Water Transport Authority
- Bangladesh Navy (Chairman) including the Bangladesh Navy Hydrographic Service (Secretary)
- Ministry of Defence
- Ministry of Fisheries and Livestock
- Ministry of Foreign Affairs
- Ministry of Law, Justice and Parliamentary Affairs
- Ministry of Shipping
- Port of Chittagong Authority
- Port of Mongla Authority
- Survey of Bangladesh
- Water Development Board

Bangladesh takes a full part in international hydrography; in 2001 it became the 70th member of IHO, is an active full member of the North Indian Ocean Hydrographic Commission and maintains strong links with French Hydrographic Office (SHOM) and UKHO.

3.3 Bangladesh Navy Hydrographic Department

The national hydrographic authority is the Bangladesh Navy Hydrographic Department which was established in 1980. In 1983 the BN was given delegated authority by the government for hydrographic surveys and navigational charting of Bangladesh's coastal and offshore waters. Under SHOM capacity building programmes *Hydro Bangla 1* in 1996 and *Hydro Bangla 2* in 2001 the BN came into the digital surveying age and gained in both hydrographic and cartographic ability. In recent years the BN has invested in MBES technology although it is finding that optimization of the systems is problematic and officers lack the depth of knowledge to correct this situation.

The BN has invested heavily in survey vessels with the latest, BNS *Anushandhan*, joining the fleet in 2010. The vessels are well manned, maintained and equipped. The survey fleet is as shown below:

BNS Ship	Launched	Displacement	Primary Hydrographic Equipment
<i>Anushandhan</i>	1986	1477	EM-1002, EA-400, DGPS Receiver , Geodetic Receiver (Leica), SV Profiler (Valeport), Magnetometer(G882), Edgetech SSS, Edgetech SBP, Auto Tide Gauge.
<i>Shaibal</i>	1985	864	EM 3002D, EA-400, EURO-3000, Bathy 1500, E-sea Sound 103, DGPS Receiver, NDS-100 UHF Station, Geodetic Receiver (Promark 500), SV 53051, Marine Magnetometer (MAGIS- 1000), SSS, Auto Tide Gage.
<i>Agradoot</i>	2002	687	EA-400, EURO-3000, Knudsen 320 M, Hydrostar 4300, Navi Sound 215, DGPS Receiver, Geodetic Receiver (Leica), Marine Magnetometer SM-II, Edgetech SSS, SV-5305, Current Meter, OT-600, Auto Tide Gauge,
<i>Tallashi</i>	1983	83	Navi Sound 215, Atlas Deso-300, DGPS Aquarius 2, Sound Velocity meter (Valeport), Auto Tide Gauge.
<i>Darshak</i>	1983	83	Navi Sound 215, Atlas Deso-300, DGPS Aquarius 2, Sound Velocity meter (Valeport), Auto Tide Gauge.

The BN established a Hydrographic School at BNS *Issa Kahn* in Chittagong in 1983. This modest but well equipped school has a small core staff supplemented as required by hydrographic officers on short secondments to teach specific subjects. No officer is exempt from this responsibility with the lead taken by the Director of Hydrography. The school gained IHO accreditation for its IHO Cat B Hydrographic course in 2005 and is awaiting accreditation of its IHO Cat A course. The school takes not only BN students – officers and ratings – but in addition Bangladesh students from the Port Authorities and BIWTA and foreign students; currently (2012) five Nigerian officers are attending the IHO Cat B course. The BN, whilst awaiting accreditation of the IHO Cat A course makes use of foreign training facilities as opportunity permits; finding sufficient places on IHO Cat A courses is a source of concern to the BN. Even after IHO Cat A accreditation it is recommended that occasionally BN officers should undertake IHO Cat A courses overseas to gain from experiences outside of Bangladesh and provide Bangladesh experience to others.

The BN hydrographic structure is in four parts; the headquarters office, the BNHOC, the survey squadron and Hydrographic School based at Chittagong and the survey squadron based at Mongla. National hydrography is deeply imbedded in the naval organization with the Director of Hydrography being closely linked to the senior naval staff who also have a hydrographic responsibility with the Assistant Chief of the Naval Staff (Operations) (ACNS(O)) as NHC Chairman.

3.4 Hydrographic Surveying

Hydrographic surveys in Bangladesh are conducted by the navy outside of the port and river areas, within the ports by the Port Authorities and in the rivers by the Bangladesh Inland Water Transport Authority (BIWTA). The various authorities set their own hydrographic survey priorities with the BN tailoring its surveys to meet the BN's chart production and update programme. The annual survey programme conducted by the five vessels of the survey squadron with those of the Port Authorities fulfils the national hydrographic data gathering requirement. The issue facing all agencies within Bangladesh is optimization of the use of MBES; this is recognized by Bangladesh authorities and resolution of this should be the nation's primary hydrographic aim – see 4.1 Multibeam Echo Sounder Operations.

Currently BNS *Anushandhan's* EM1002 system is defective. It should be noted that the EM1002 is no longer in production having been replaced by the EM710 and that the BN may experience difficulty in operating this system for many more years.⁵ See 4.2 Multibeam Echo Sounder Upgrade. One of BNS *Anushandhan's* two EA400 SBES systems is also understood to be defective.

The current state of surveys as shown in IHO C-55 is shown below. It was not possible to check on the validity of the entry.

Area Code	Definition	C55 (%)
A1	Area adequately surveyed (<200m)	95
A2	Area adequately surveyed (>200m)	98
B1	Area requiring resurvey at larger scale or to modern standards (<200m)	3
B2	Area requiring resurvey at larger scale or to modern standards(>200m)	2
C1	Area which has never been systematically surveyed (<200m)	2
C2	Area which has never been systematically surveyed (>200m)	0

IHO C-55 Bangladesh - Status of Hydrographic Surveys [Updated 16 May 2007] ⁶

⁵ <http://www.km.kongsberg.com/ks/web/nokbg0237.nsf/AllWeb/D4149556C9BACC1DC12572F7002D4E32?OpenDocument> [Accessed 7 Nov 2012]

⁶ IHO C55 Region J http://www.iho.int/iho_pubs/CB/C-55/C-55_Eng.htm [Accessed 8 Nov 2012]

3.5 Navigational charting

The Bangladesh Navy Hydrographic and Oceanographic Centre (BNHOC) is a well established professional hydrographic office producing paper navigational charts – both in the national and international series – and tide tables. Of the proposed national chart series of 55 charts 19 are published with six more in preparation. Bangladesh does not, as yet, produce ENCs.

The BN has produced and published all three of its INT charts although one, INT 7425, has raised issues with India. The matter was discussed during the 12th NIOHC meeting and it was decided that the INT chart coordinator of Region J (India) will update the S-11 as per the proposal of Bangladesh.

The charts produced by the BNHOC rely heavily on new survey data obtained by its own ships and surveyors. The national practice is to survey, where possible, to the limits of the chart thereby minimizing the number of data sources used to compile or update the chart.

There is a chart catalogue available which portrays the national coverage in various scale bands and the scheming is logical with good overlaps. A summary of chart production is shown below whilst a review of the existing charting situation in Bangladesh is at Annex C – Bangladesh Chart Production State.

Scale	Planned	Published	In Preparation	Remarks
International Series				
Various	3	3	0	Producer nation is Bangladesh. Printer nation UK.
National Series				
700,000	1	0		Printer nation is Bangladesh
400,000	1	1		
250,000	2	1		
150,000	4	0		
75,000	12	5	2	
35,000	30	7	4	
25,000	2	2		
Total	55	19	6	

The BNHOC maintains strong links with the United Kingdom Hydrographic Office and other national hydrographic offices.

3.6 National Hydrographic Resources

Bangladesh has a number of government sponsored hydrographic resources, outside of the BN described in the preceding paragraphs, which are summarized below:

Agency	Resources
Bangladesh Inland Waterways Authority	EM 3002D, Navi Sound, E- Sea Sound, Atlas Deso, Auto Tide Gauge, SVP, DGPS, HYPACK software.
Chittagong Port Authority	Navi Sound NS 420, Atlas Deso 300, Bathy – 500 DF, PDR 1200, DGPS (Leica), Auto Tide Gauge, SSS (Edge Tech 4125), SVP (AML MinosX), Sontek ADP, HYPACK software, Caris GIS 4.5 software.
Mongla Port Authority	Bathy – 500 MF, DGPS (Leica 420 MX), Auto Tide Gauge, HYPACK software.

There are a number of strengths to Bangladesh's national hydrographic resources. The equipment purchased is common to all authorities making the training and exchange of personnel and experience easier. The training provided by the BN Hydrographic School can cater for all national students equally. Data arising from surveys conducted by individual authorities can be easily assimilated into BN charting products and in future a national database.

4 Options for the Way Ahead

4.1 Multibeam Echo Sounder Operations

The Bangladesh Navy (BN) obtained its first MBES system, a Kongsberg EM 3002D, in 2009. Since which time it has acquired two more systems an EM1002 fitted in BNS *Anushandhan* and an EM3002D fitted in the survey launch *Nimrod*. Training on these systems has been provided firstly by the manufacturer, Kongsberg, and by BN hydrographic officers attending a course in Australia provided under IHO CBC in 2011. In common with the experience of the Technical Team in other countries, the manufacturer's training is rarely sufficient to establish professional confidence on the part of the client in both the equipment and their ability to use it and produce quality data fit for charting. This, it is believed, is due to a combination of initial training being delivered by installation engineers rather than survey operators and the client's funding issues whereby training tends to be the first element to be deleted when the budget tightens.

The BN officers are aware that the water conditions in the northern Bay of Bengal are extremely challenging for MBES operations with a myriad of rivers emptying into the coastal waters producing complex and ever changing sound velocity (SV) regimes. The Technical Team were not convinced that the BN fully understood how to manage SV and MBES operations in such a complex environment. The BN may wish to investigate the acquisition of a moving vessel profiler.

Similarly the BN officers are aware of their MBES system knowledge limitations and know that they require guidance and instruction from experienced MBES operators to become proficient in its use such that there is confidence in the final data set passed to the cartographers for chart action.

Limited MBES survey operations have been conducted by the BN, however, the data arising from these surveys has not and cannot be appraised in Bangladesh due to a lack of experience.

The Technical Team recommends the following plan of action to bring the BN's MBES operations to a fully operational state:

- Repair EM1002 system of BNS *Anushandhan*;
- Pass MBES data sets to an experienced hydrographic office for appraisal and assessment of operator or system errors;
- On completion of the first two stages conduct in-country MBES data gathering and processing training using BN survey vessels and equipment. Training to be provided by an experienced hydrographic office;
- Provide at least one continuation training programme approximately one year after initial training at point three above. Training to be conducted if possible by the original training team.

4.2 Multibeam Echo Sounder Upgrade

The EM1002 system fitted in BNS *Anushandhan* is now out of production having been replaced by EM 710⁷, consequently it is considered that maintenance of this system in the medium term may not be viable. In the short-term to gain experience with MBES and use BNS *Anushandhan* effectively, it is recommended that the relatively low cost repairs are made to the system whilst putting in place an upgrade or replacement proposal to the appropriate authority. Carrying out these two actions together should ensure that BNS *Anushandhan* maintain the MBES operations for which she was purchased.

4.3 Hydrographic Survey Appraisal Process

Staff at BNHOC routinely conducted survey appraisals of SBES surveys conducted by the BN. A lack of training in both MBES and the more specialised MBES data appraisal process means that this vital element of survey data appraisal for MBES is currently outside the BNHOC's capability. It is recommended that in conjunction with the training under 4.1 above, that the BN seek the assistance of an experienced hydrographic office to develop a MBES survey data appraisal system at BNHOC and train the staff accordingly.

⁷ <http://www.km.kongsberg.com/ks/web/nokbg0237.nsf/AllWeb/D4149556C9BACC1DC12572F7002D4E32?OpenDocument> [Accessed 7 Nov 2012]

4.4 Hydrographic Data Base

The BNHOC has managed SBES data sets quite successfully for the production of navigational charts, the advent of MBES brings with it significantly increased data set sizes with data storage and handling issues. Given that other hydrographic agencies such as the Port Authorities and BIWTA are also operating MBES systems it is recommended that the BN investigate the provision of BNHOC with a data storage and management system to provide a unified national hydrographic database and that assistance is obtained from an experienced hydrographic office.

4.5 Production and Maintenance of ENC's

The BNHOC does not as yet produce or maintain ENC's although it has aspirations to do so in the near future, in the interim UKHO has produced 'GB' coverage of Bangladesh waters to support international voyages. The ENC coverage provided through UKHO is summarized below.

- a. GB300859
- b. GB300732
- c. GB300084
- d. GB300817
- e. GB200829

BN cartographers have received some training in ENC production from various sources, and BNHOC has a CARIS S-57 Composer licence but training in its use is vested in only a few officers.

The Technical Team consider that it is perfectly possible to transform the current paper series into ENC's given the right assistance and the BN should consult with its foreign hydrographic office partners to achieve this. In doing so it can acquire the necessary skills to produce the remaining ENC's in-country and maintain all of them as it does so successfully for the paper chart series. Therefore it is recommended that the BNHOC, through existing cooperation or bilateral arrangements with other hydrographic offices, request additional training and assistance with new cell production and maintenance.

4.6 Environmental Data

The BN gathers at least two environmental data sets during survey operations: tides and sound velocity, the latter becoming more common with the introduction of MBES operations.

Tidal data is gathered by the BN and a number of government hydrographic agencies, this data is analysed by BNHOC staff with tidal predictions developed from the resultant tidal constituents. BNHOC uses MIKE 21 software and whilst competent in its use the staff are not conversant with tidal analysis principles or of alternative tidal analysis software to produce a better estimate of tidal constituents and hence tidal predictions for publication. It is recommended that BNHOC, through existing cooperation or bilateral arrangements with other hydrographic offices, request professional assistance to enhance its tidal analysis and prediction capability.

The BN has gathered SV observations during SBES operations but will gather significantly more as its MBES operations grow. This is vital environmental data and should be appraised and stored as part of an early oceanographic data base.

These two data sets may be merged with the Hydrographic data base discussed at 4.4 above.

4.7 Enhanced IT Capability

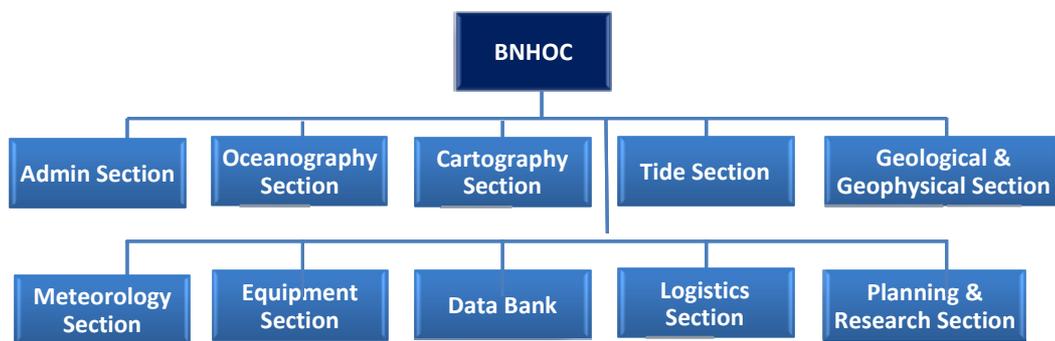
The BN Hydrographic Department stands on the edge of a huge increase in reliance on digital services and data – cartographic, hydrographic and oceanographic. The BN should consider the early recruitment and training of IT staff to manage this data and the systems associated with it. A further enhancement to BNHOC's services recommended by the Technical Team is the establishment of a dedicated website to include charts and publications available, notices to mariners, navigational warnings, details of surveys for example.

4.8 Nautical Publications

The BNHOC produces national tide tables but no other navigational publications such a Lights List and List of Radio Signals which are produced and sold by UKHO. It is recommended that, as is done very successfully in the Sultanate of Oman for example, the BN consider the upgrading of the tide tables to a 'Maritime Handbook' including the national List of Lights, Radio Signals, etc. The publication of such a book would enhance its service to mariner, potentially reduce costs for publications for the fleet and take another step towards full compliance with SOLAS. It is recommended that the BNHOC contact the Oman National Hydrographic Office

4.9 BNHOC Organization

The Technical Team were briefed on the proposed new structure for BNHOC and asked to comment; the team's comments are detailed after the diagram, however, it should be noted that the Technical Team had little time to consider the current and proposed structures in detail and hence its comments are, by necessity, limited. The revised structure as provided by BNHOC is shown in the diagram below,



The Technical Team's observations are as follows:

- *Data Bank* It is considered that this section might administer a national maritime spatial data infrastructure (MSDI) to include the entire nation's bathymetric, tidal and environmental data (SV, oceanographic observations, etc). It might be re-titled *National Hydrographic Data Infrastructure*.
- *Hydrographic Section*. There are sections for cartography, oceanography and meteorology but the Technical Team found it curious that there was not one for hydrography. Given the Technical Team's comments and recommendations regarding MBES survey data appraisal it is considered that this section should be added and include this function as part of its responsibilities.
- *Nautical Publications*. As noted in this report the Technical Team considers that BNHOC should develop a unified publication covering tides, List of Lights, Radio Signals and possibly Sailing Directions. As tidal predictions are the most complex element of the publication it is for consideration that the Tide Section takes on this additional work and be re-titled *Tides and NPs*.
- *IT Section*. Digital data management will become a greater element of BNHOC business as MBES operations and ENC production and maintenance increase. Publication of the BN and BNHOC's hydrographic services can be enhanced through the use of a dedicated website and the development and maintenance of this service would rightly fall to the IT Section.

5 Technical Visit Conclusions

Based on discussions and the facts obtained, the following principal conclusions have been reached:

- (1) The Bangladesh Navy Hydrographic Department is staffed by a professional, dedicated and predominantly well trained cadre of officers and men producing good quality surveys, charts and publications.
- (2) The Bangladesh Navy's survey squadron is well manned, maintained and equipped.
- (3) There are limitations in the Bangladesh Navy's survey squadron's ability to use MBES equipment through a need for training and the gaining of experience.
- (4) Defects with BNS *Anushandhan's* EM1002 MBES system and one EA400 SBES system limit the ship's effectiveness.
- (5) The Bangladesh Navy Hydrographic Department urgently requires training in MBES system operation and survey data appraisal to gain value from the Navy's considerable investment in hydrography.
- (6) The Bangladesh Navy Hydrographic and Oceanographic Office is an effective organization.
- (7) The BNHOC publishes national and International paper charts to the accepted international standards by well trained and motivated staff.
- (8) Although aspiring to do so the BNHOC does not produce or maintain ENC's.
- (9) Bangladesh Navy does not receive adequate IHO Cat A hydrography and IHO Cat B cartography training from recognized institutions which is necessary for her human resource development.

6 Recommended Actions

The following recommended actions are provided for consideration by the Bangladesh Navy:

- (1) That the following plan of action to bring the BN's MBES operations to a fully operational state (see 4.1):
 - Approve the repairs to BNS *Anushandhan's* EM1002 system;
 - Pass MBES data sets to an experienced hydrographic office for appraisal and assessment of operator or system errors;
 - On completion of the first two stages conduct in-country MBES data gathering and processing training using BN survey vessels and equipment. Training to be provided by an experienced hydrographic office;
 - Provide at least one continuation training programme approximately one year after initial training at point three above. Training to be conducted if possible by the original training team.
- (2) That the BN Hydrographic Department commence a replacement programme for EM1002 system fitted in BNS *Anushandhan* before the system becomes unsupportable. See 4.2
- (3) That in conjunction with the training under 2 above, that the BN seek the assistance of an experienced hydrographic office to develop a MBES survey data appraisal system at BNHOC and train the staff accordingly. See 4.3
- (4) That BN investigate the provision of BNHOC with data storage and management systems to provide a unified national hydrographic database and that assistance is obtained from an experienced hydrographic office. See 4.4
- (5) That BNHOC, through existing cooperation or bilateral arrangements with other hydrographic offices, request professional assistance to enhance its tidal analysis and prediction capability. See 4.6
- (6) The establishment of a dedicated BNHOC website to include charts and publications available, notices to mariners, navigational warnings, details of surveys, etc. See 4.7
- (7) That the BN consider the upgrading of the tide tables to a 'Maritime Handbook' including the national List of Lights, Radio Signals, etc. See 4.8
- (8) That the Director Hydrography considers the Technical Teams comments on the proposed new BNHOC structure. See 4.9

- (9) That BNHOC, through existing cooperation or bilateral arrangements with other hydrographic offices, request professional assistance to convert its published paper chart series to ENC. See 4.5
- (10) The BNHOC develop an effective ENC production and maintenance capability. See 4.5
- (11) That BN arrange sending more officers for IHO Cat A hydrography and IHO Cat B cartography courses in recognized institutions. IHO Member States should take careful note of this recommendation.

Annex A – List of Bangladesh Navy Contacts

Name	Post	Contact No <i>Direct</i> <i>Mobile</i>	Postal Address Email Address
Vice Admiral Zahir Uddin Ahmed	Chief of Naval Staff		Naval Headquarters, Banani, Dhaka-1213
Rear Admiral M Farid Habib	Assistant Chief of the Naval Staff (Operations) Chairman NHC		Naval Headquarters, Banani, Dhaka-1213
Commodore Muhammad Anwarul Islam	Commodore Commanding Chittagong (COMCHIT)		Commodore Commanding Chittagong, BNS <i>Issa Khan</i> , New Mooring, Chittagong
Captain Imdad Haque	Chief Staff Officer to COMCHIT		BNS <i>Issa Khan</i> , New Mooring, Chittagong. mirihaque@yahoo.com
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Commander M M K Chowdhury	Commanding Officer BNS <i>Shaibal</i>	+88 01769 726420	Commanding Officer , BNS <i>Shaibal</i> , New Mooring, Chittagong
Mr Jeff Bryant	United Kingdom Hydrographic Office	+44 (0)1823 337900 +44 (0) 776 815 2235	Admiralty Way, Taunton. Somerset, England TA1 2DN Jeff.bryant@ukho.gov.uk
Mr Bob Wilson	United Kingdom Hydrographic Office	+44 (0)1823 723415 +44 (0) 777 181 0114	Admiralty Way, Taunton. Somerset, England TA1 2DN Robert.wilson@ukho.gov.uk

Annex B – Technical Visit Programme

Saturday 3 November

IHO Technical Team arrived in Chittagong. Met by Bangladesh Navy Liaison Officer and transferred to the Command Mess, Bangladesh Naval Base, Chittagong.

Sunday 4 November

Visit to the survey vessel BNS *Anushandhan*

Visit to Bangladesh National Hydrographic and Oceanographic Centre (BNHOC)

Call on the Commodore Commanding Chittagong

Lunch hosted by Commodore Commanding Chittagong and staff officers

Discussions with the Director of Hydrography and his staff

Dinner onboard BNS *Anushandhan* hosted by the Director of Hydrography and senior hydrographic staff

Monday 5 November

Visit to the survey vessel BNS *Shaibal*

Visit to the Bangladesh Navy Hydrographic School

Lunch hosted by the Head of BNHOC

IHO Technical Team transferred to Dhaka

Tuesday 6 November

Call on the Director of Hydrography

Call on the Assistant Chief of the Naval Staff (Operations) and Chairman of the NHC

Call on the Chief of the Naval Staff

Discussions with the Director of Hydrography and his staff

Lunch hosted by Director of Hydrography and his staff

IHO Technical Team transferred to the Ascott Residence Hotel, Dhaka

Wednesday 7 November

Mr Bryant returned to UKHO

Thursday 8 November

Mr Wilson left for Singapore

Annex C – Bangladesh Chart Production State

International Chart Series

INT No National No	Title	Scale	Date of Publication	New Edition
INT 7425 35001	Malancha River to St Martin's Island	350,000	26 Aug 2010	
INT 7426 1002	Approaches to Hiran Point	100,000	21 Aug 2011	
	Pavanga Shoal to Jayman Reach	100,000		
	Tatral Point to Khulna	100,000		
	Mongla Port	25,000		
INT 7428 1001	Approaches to Chittagong	100,000	13 Dec 2007	Ed.2 1 Jan 2009
	Chittagong Harbour	35,000		

National Chart Series

1:700,000 Series

No.	Title	Date of Publication	New Edition	Remarks
70001	Bay of Bengal (Bangladesh and Adjoining Area)			

1:400,000 Series

No.	Title	Date of Publication	New Edition	Remarks
40001	Malancha River to St Martin's Island	20 Jan 2003	Ed.2 1 Jan 2009	

1:250,000 Series

No.	Title	Date of Publication	New Edition	Remarks
25001	Hariabhanga River to Hatia Island			
25002	Hatia Island to St Martin's Island	10 Sep 2009		

1:150,000 Series

No.	Title	Date of Publication	New Edition	Remarks
15001	Hariabhanga River to Rabnabad Channel			
15002	Char Rangabali to Hatia Island			
15003	Sandwip Island to Cox's Bazaar			
15004	Elephant Point to St Martin's Island			

1:75,000 Series

No.	Title	Date of Publication	New Edition	Remarks
7501	Hariabhanga River to Pussur River			
7502	Pussur River – Akram Point to Mongla			
7503	Bhangra River to Baleswar River			
7504	Baleswar River to Bura Gauranga River			
7505	Kuakata to Dhal Char			
7506	Shahabajpur River and Adjoining River			
7507	Approaches to Shahabajpur River			
7508	Hatia Island to Sandwip Island			
7509	Sandwip Island to Sangu River	8 Oct 2003		
7510	Sangu River Approaches to Matarbari Island	8 Oct 2003		
7511	Matarbari Island to Elephant Point	29 Jun 2009		
7512	Teknaaf to St Martin's Island			

1:35,000 Series

No.	Title	Date of Publication	New Edition	Remarks
3501	St Martin's Island and Adjoining Area	17 Jan 2002	Ed.2 14 Jan 2009	
3502	Teknaaf and Adjoining Area			
3503	South of Elephant Point – Monakhali to Inani			
3504	Elephant Point and Adjoining Area			
3505	Approaches to Maiskhali Point and Adjoining Area	2 Mar 2002	Ed.3 27 Jan 2010	
3506	Kutubdia Channel and Adjoining Area	23 Mar 2002	Ed.2 4 Jun 2009	
3507	Approaches to Sangu River			
3508	Patenga Point to Sandwip Island			
3509	Sandwip Channel – Bhatiary to Sitakunda			
3510	Urir Char and Adjoining Area			
3511	Sandwip West Channel – Bhasan Char to Sandwip Island			
3512	Hatia Channel – Bhasan Char to South Hatia Island			
3513	East Coast of South Hatia Island			
3514	Nijhum and Adjoining Area			
3515	Shahabazpur River – Char Nijam to Manpura Island			
3516	Shahabazpur River – Manpura Island and Adjoining Area			
3517	Shahabazpur River – South Hatia to Bhola			
3518	Char Gazaria and Adjoining Area			
3519	Entrance to Shahabazpur River			
3520	Sonar Char to Char Biswas			
3521	Approaches to Rabnabad Channel			
3522	Approaches to Andarmanick River			
3523	Approaches to Haringhata River			

No.	Title	Date of Publication	New Edition	Remarks
3524	Supati to Baleswar River			
3525	Approaches to Bhangra River			
3526	Pussur River Outer Bar			
	Approaches to Hiran Point			
3527	Pussur River – Pavanga Shoal to Zafor Khal	13 Jun 2002	Ed.2 11 Feb 2010	
	Pussur River – Zafor Khal to Monkey Point			
3528	Pussur River – Monkey Point to Mongla	13 Apr 2002	Ed.2 18 Nov 2008	
3529	Entrance to Raimongal and Malancha River			
3530	Malancha River to Raimangal River			

1:25,000 Series

No.	Title	Date of Publication	New Edition	Remarks
2501	Shahamant Bridge to Silok Bazar	20 Jan 2010		
2502	Digraj to Deotala Godalpur	28 Apr 2010		
	Deotala Godalpur to Lobanchora			
	Lobanchora to Khulna			