

**REPORT ON THE STATUS OF HYDROGRAPHY IN MADAGASCAR
AND OF AtoN IN THE PORT OF MAHAJANGA**

(26 AUGUST 2011)

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I WORLD BANK QUESTIONNAIRE

1. Project Description.

The objectives are as follows:

Visit the Recipient States, Comoros and Madagascar, and engage in discussions with the relevant maritime authorities to establish the following to enable electronic nautical charts to be produced of identified ports and approaches and to improve the provision of aids to navigation, communications, search and rescue and other maritime safety services:

| N° | Questions | Answers |
|-----------|--|---|
| WB 1 | <p>The major ports of Moroni and Moheli that may require hydrographic surveying to be able to produce electronic nautical chart or charts of the port and its approaches.</p> <p><i>(Note:in the following questionnaire, the question has been transposed to the port of Mahajanga, Madagascar)</i></p> | <p>SHOM has completed the survey of the port of Mahajanga, as part of the WIOMH Project. As a result, some new ENC's (harbour and approach) are due to be released in 2014.</p> <p>Madagascar cannot produce ENC's or paper charts and the entire chart production and maintenance is assumed by SHOM.</p> |
| WB 2 | <p>the status of the current data in specific areas of the ports and their approaches to enable electronic nautical charts to be made. The areas where the data is insufficient or unacceptable for this purpose are to be identified and the necessary surveys undertaken.</p> | <p>Considerable changes have been observed in Mahajanga, with silting up to 10 metres or more. As a result, the survey took twice as long as expected (2008 and then again in 2010) and only got validated recently.</p> <p>The Charge Hydrographer concluded that all former soundings are superseded by the recent survey.</p> <p>An excerpt of the survey is at Annex 1.</p> |
| WB 2.4 | <p>the necessity to install of Automatic Information System (AIS) stations in the Comoros and in Madagascar. If such a station is required specific site information to enable a contractor to install a base station must be determined</p> | <p>AIS site information is available in Pierre Mouscardes' expert report, which concludes that Mahajanga's ENEM is perfectly eligible not only to receive an AIS station, but also to provide hydrographic training in the region economically.</p> <p>ENEM, <i>Ecole Nationale d'Enseignement Maritime</i>, is the Mahajanga's national college for Merchant Navy.</p> |
| WB 2.5 | <p>the support necessary to improve the communications between the Maritime Search and Rescue Stations in the region if applicable</p> | <p>Not fully investigated (but one may quote a cruel remark heard at the 7th SAIHC conference: "<i>Entre la Réunion et l'Afrique du Sud, il n'y a rien</i>", i.e between la Réunion and South Africa, there is nothing). Again, ENEM, as it is operating now, can provide an excellent basis for further improvement.</p> |
| WB 2.6 | <p>the need for training in both operation and maintenance of any work undertaken or equipment installed</p> | <p>All maritime & hydrographic trainings should be coordinated and dispensed, as far as possible, in Madagascar's ENEM.</p> <p>AIS training is accurately addressed in SAMSA's Invitation to Tender.</p> |

In accordance with the Project Objectives (Paragraph 2) the report shall include recommendations in accordance with international standards as set by the IMO, IHO and IALA, on the following:

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| WB 3 | <p>the status of essential aids to navigation in and around the port are to be assessed and where possible they are to be repaired, upgraded or replaced</p> | <p>Many changes have been observed. The lights are unreliable and frequently affected by power cuts.</p> <p>A major contribution from the project would be to provide reliable ground power supply. See report on Mahajanga AtoN in Annex 2.</p> |
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| WB 3.1 | What national administrations are responsible for the provision of up to date nautical charts, aids to navigation and other maritime safety information. | Charts and ENCs: in theory, FTM, the Madagascan geographic and Hydrographic national Agency. In practice, SHOM. AtoN and Maritime Safety Information: the Port and Waterways national Agency (APMF). |
| WB 3.2 | Do they have an official mandate and are they adequately funded? | Whilst APMF is self-funded, well run, well recognised and quite capable, FTM has undergone a change of statute and 4 changes of Director General in 4 years. Lack of funds is a serious problem to all Madagascan Government agencies. |
| WB 3.3 | Is there an official hydrographic policy and how is it administered? | The FTM last hydrographer (in fact, an oceanographer) passed away last year and has not been replaced yet. FTM has difficulties recruiting capable young personnel and keeping them in house. The new Director General, Mr Franck Razafindrabe is articulate and full of good will. He must be encouraged and supported, lest the whole structure becomes irrelevant. |
| WB 3.4 | Is the coastal State a member of the IHO and/or IALA and what IMO conventions is the coastal State a party to? | Although signatory to the LL 66, SOLAS, MARPOL, OPRC, CLC, STCW, FUND, FAL, IMO 48, SUA and UNCLOS conventions, Madagascar is neither an IHO, nor an IALA, member state. An updated Madagascar entry of the IHO Yearbook is at Annex 3. |
| WB 3.5 | What is the status of surveys, the quality of existing data and its compliance with standards for the production of electronic nautical charts (ENCs) and on the ability of local technical institutions to maintain such charts? | See excerpt of IHO's C-55 below and Madagascar Prioritised Survey and Charting Scheme at Annex 4. |

IHO C-55: Madagascar Updated 28 September 2005 INT Region H

Status of Hydrographic Surveys

| A1 | A2 | B1 | B2 | C1 | C2 |
|----|----|----|-----|----|----|
| 15 | 0 | 18 | 100 | 67 | 0 |

A1/A2 = % adequately surveyed 0-200m / >200m
 B1/B2 = % requiring re-survey at larger scale or to modern standards 0-200m / >200m
 C1/C2 = % which has never been systematically surveyed 0-200m / >200m

Comment

- Figures provided by France.
- Priorities are: a. Internal Routes: Coastal passages amongst reefs require full survey if used by modern vessels, especially cruise liners. b. Ports and Approaches: modern survey work needed for several ports and approaches.

Status of Nautical Charting

A = % covered by INT Charts, B = % covered by RNC, C = % covered by ENC

Offshore passage/Small

| A | B | C |
|-----|---|---|
| 100 | 0 | 0 |

Percentage of metric paper charts

Landfall Coastal passage/Medium

| A | B | C |
|-----|---|---|
| 100 | 0 | 0 |

Percentage of paper charts on a satellite datum

Approaches Ports/Large

| A | B | C |
|---|---|---|
| 0 | 0 | 0 |

Comment

- Figures provided by UK and France.
- Some old large scale fathoms charts are still published by UK.

Status of Maritime Safety Information

Local Warning

NO
Data provided by UK.

Coastal Warning

NO
Data provided by UK.

Port Information

NAVAREA Warning

NO
Data provided by UK.

Master Plan

Area A1
NO
Planned.

Area A2
NO
Planned.

Area A3

NAVTEX
NO
Data provided by UK.

SafetyNET

| | | |
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| WB 3.6 | Evaluate national and international nautical chart and navigation publication series and make recommendations for improvement. | Madagascan charts worldwide are all based on French original surveys. Recommended improvements are developed in the Prioritised Survey & Charting Schemes at Annex 4, with emphasis on local production and the extensive use of value-for-money satellite techniques. |
| WB 3.7 | Confirm that existing charts cover the required port and approach areas and if not recommend areas, defined by co-ordinates that should be surveyed for incorporation of the proposed ENCs. | The Mahajanga situation is critical. New charts and ENCs integrating the SHOM 2008-2010 all-inclusive surveys are planned for 2014. |
| WB 3.8 | Review the current situation for the upkeep of existing charts and of the manner of promulgation of both chart and maritime safety information. | Comoran charting relies entirely on France's (SHOM) chart production, chart updating and survey capacity. |
| WB 3.9 | Report on the current situation for the provision and distribution of radio navigation warnings, its co-ordination, the processing of incoming navigation warnings both coastal and NAVAREA. | See C-55 excerpt above. Serious coordination effort has to be made, involving the FTM, APMF and Madagascan Navy. This issue has not been addressed yet. |
| WB 3.10 | Report on the ability of the designated national authority to issue Hydrographic Instructions. | No capability to issue Hydrographic Instructions. |
| WB 3.11 | Report on whether a national tidal network exists, the efficiency of any tidal stations and on the processing and promulgation of the data recorded. | No tide tables and no tidal observations. A GLOSS/Coastmap-IO automated tide gauge has been installed in 2010 by SHOM in Toamasina. |
| WB 3.12 | Report on the provision of hydrographic information to the public. | No such facilities. |
| WB 3.13 | Investigate other maritime safety needs. | Not fully investigated, due amongst other reasons, to the complicate relation between various stakeholders. This should be improved if the National Hydrographic Committee (NHC) promised for the last 5 years materialises. |

The consultant shall also establish the following.

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| WB a | What national Administration is responsible for AtoN & AIS along the coast and within Ports & Harbours | The APMF (see § WB 1). |
| WB b | Have they been formally delegated and adequately funded? | APMF, operational since 2004, is well run and makes good usage of its limited resources. |
| WB c | What other bodies, if any, have responsibility for AtoN and/or AIS? | APMF also controls the ENEM, where the Mahajanga AIS station should be installed. |
| WB d | What international recommendations and guidelines in respect of AtoN and VTS are reflected in the Administration's policies and procedures? | Administration authority over large initiatives, such as the creation of new ports, must be reinforced, e.g. the port of Ehoala which was built and surveyed without FTM being even informed, let alone provided with the survey data. |
| WB | What national legislation is in place to support the provision of and compliance | Could be developed/improved on the occasion of AIS |

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| e | with AtoN and AIS systems? | installation at Mahajanga's ENEM. |
| WB f | What measures are taken to evaluate the effectiveness of AtoN and AIS (e.g. service availability, AtoN & AIS planning and inspections)? | AtoN's evaluation is performed systematically on the occasion of SHOM surveys and new charts (Toamasina, Anstiranana, Mahajanga). Only the Mahajanga AtoN are reported here (see Annex 2). |
| WB g | Does the Administration use a recognized quality management system, e.g., ISO 9001:2000, for AtoN or AIS? | Not to our knowledge. |
| WB h | The operational status of each current AtoN and AIS installations as listed by the authority | The AtoN status is depicted at Annex 2. The AIS operational status is still to be developed. |
| WB i | If the current AtoN & AIS meet the requirements, such as the traffic volumes, relevant risks and user requirements. This should include, but not limited to: the height, range, character, day mark, power supply for the equipment & availability. | Not relevant yet. As mentioned at § WB 3, power supply is the one critical issue that must be considered first. |
| WB j | How are the information dissemination and the upkeep of all information done which is necessary for safe navigation? | Unsatisfactory, according to IHO's C-55 and SHOM experience. Improvements could be expected from NHC effectiveness. |
| WB k | Identify any requirements/improvements/additions in order for the AtoN & AIS systems to meet international & local requirements. | If conducted thoroughly, the AIS project could provide a basis for all future improvements in Madagascar, starting with the port of Mahajanga, and involving financially stand-alone ENEM as much as possible. Coordination between local services is essential (APMF, FTM, Port authority, Madagascar Navy, Directorate of fisheries). |
| WB l | Is it possible to maintain and sustain an acceptable system and if necessary what additional resources are required in order to ensure that the AtoN & AIS meet international & local requirements, including availability? | Yes, definitely (cf. Pierre Mouscardes' AIS report to SAMSA). The importance of providing independent power supply is stressed again. |
| WB m | What are the training needs? | Specific AIS training is correctly addressed by SAMSA's AIS Invitation To Tender. All Madagascar Maritime related training needs, including hydrography can, and must, be centralised in ENEM. ENEM is depicted at Annex 5. |

II SAIHC QUESTIONNAIRE

| N° | Questions | Answers |
|------------|--|--|
| SAIHC 1 | <p>RHC Involvement.</p> <p>Note whether the country is an IHO member, and/or a member of the RHC.</p> <p>Note whether it was represented at the most recent Regional Conference, and whether a National Report was available to the RHC Study Team.</p> <p>Where none of these apply, note whether there is any routine liaison with the HO of a RHC or IHO member nation.</p> | <p>Madagascar is not an IHO member state, but participates to SAIHC conferences and similar events, provided that there is donors' support, (Norway, WIOMHP, etc.) .</p> <p>Routine liaison with the SAIHC, WIOMHP, IOC and SHOM depends on the Director General and national priorities, which until recently were very much centred on internal reorganisation.</p> <p>A close relationship has been established with the present Director General, Mr Franck Razafindrabe.</p> |
| SAIHC 2 | <p>Preliminary Liaison.</p> <p>Record any local assistance with co-ordination of the visit.</p> | <p>The visit was made possible, thanks to the support of Mr Razafindrabe and the French embassy in Antananarivo.</p> |
| SAIHC 3 | <p>Points of Contact.</p> <p>Confirm the accuracy of details in the IHO Year Book of the local first point of contact for hydrographic and MSI matters.</p> <p>Comment on any recommendations for change.</p> <p>Note any local difficulties in line accountability, and loss of top -level awareness and support for the national hydrographic capability, which will be discussed later in the report.</p> <p>Report any changes in local legislation or organisation which will result in changes to information published by the IHO.</p> | <p>See list below:</p> <p>Madagascar is registered in the IHO Year Book (28 July 2011 version) as an IHO non-member state.</p> <p>The Madagascar entry has been updated at Annex 3.</p> <p>1/ Apart the consequences of the political situation, which are not discussed in the present report, the main issue is the FTM repeated changes of statutes and Directors General for the last 4 years.</p> <p>2/ Since 2007, Madagascar has been considering</p> <ul style="list-style-type: none"> • Entering a cooperation agreement with SHOM, • Creating a NHC, • Validating the detailed prioritised Survey & Charting Scheme established by SHOM 4 years ago. |

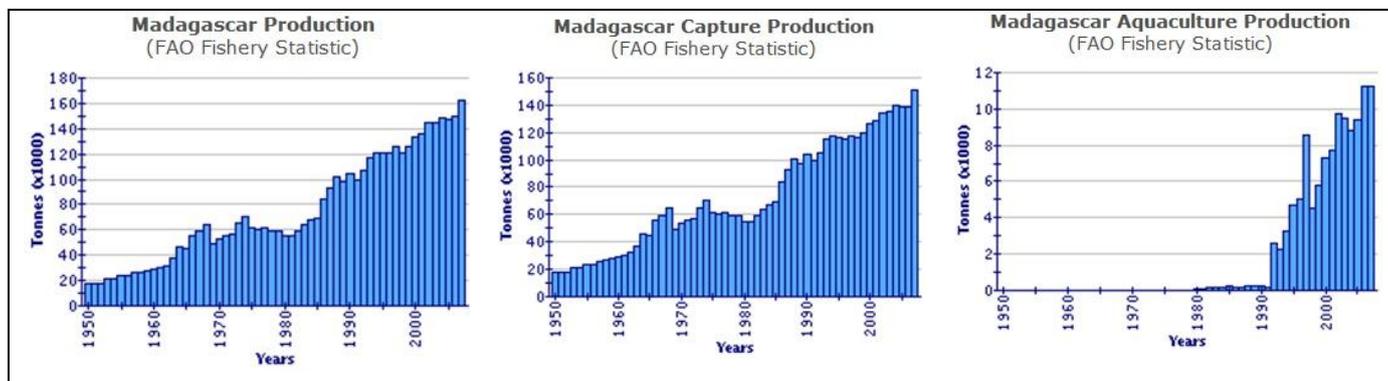
Main Points of Contact

| Name | Title | Telephone and email address | Remarks |
|---|--|--|---|
| Franck RAZAFINDRABE | Director General FTM | + 261 20 22 229 35 Mob + 261 (0)320 52 38 39 dgftm@moov.mg | |
| Bruno RAZAFINDRAZAKA-ANDRIAMPARANTSOA | Director of ENEM | Tel /fax : + 261 62 240 84 & + 261 33 12 553 83 enem@moov.mg | AIS & training - Conversant in English - Familiar with the WIOMHP |
| Captain Antoine de Padoue RANAIVOSEHENO | Commanding officer, Antsiranana naval base | + 261 (0)3 20 21 55 84 ranaivoseheno@gmail.com | FIG IHO "cat. B" port of Bordeaux graduate - French Naval & War colleges |
| Ms Noro RABEFANIRAKA | World Bank Senior Transport Specialist | + 261 (0)2 02 25 60 00 nrabefaniraka@worldbank.org | |

DESCRIPTION OF MARITIME ACTIVITIES

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| <p>SAIHC 4</p> | <p>National Maritime Affairs.</p> <p>Provide a thumb-nail sketch of the significance and salient features of the maritime sphere in the country visited.</p> <p>Note any individuals who have been especially helpful in building up this picture.</p> | <p>National Maritime Affairs organisation chart</p> <p>Because of the provisional nature of the Madagascan High Transition Authority, this issue has not been investigated in detail.</p> <p>Maritime affairs, as before, are spread between the Ministries of Decentralization & Planning (FTM), National Defence (Madagascan Navy, who mans the “<i>Atsantsa</i>” Coastguard vessel), Transport (APMF) and Fisheries (fisheries surveillance centre/CSP).</p> <p style="text-align: center;">Madagascar High Transition Authority</p> |
| <p>SAIHC 5</p> | <p>Trade and Maritime Traffic.</p> <p>Where possible provide statistics on shipping transit and port calls.</p> <p>Describe the main components of sea-borne traffic, and the patterns of activity in national waters, under the following headings:</p> <p>a. <u>Through Routes.</u></p> <p>Note any regional through routes which pass through the country's waters.</p> | <p>Due to Madagascar’s large size and other specific constraints, this issue has not been investigated in detail either. The former government had established a comprehensive Madagascar Action Plan (MAP), with UN Millennium Development support, addressing questions such as infrastructures, education, environment, etc. Although being officially sidelined, it has been confirmed that the MAP objectives are still pursued.</p> <p>a. Through Routes</p> <p style="text-align: right;">b.</p> |

| | |
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| <p>b. <u>Transshipment</u>. Comment on the existence of any hub ports.</p> <p>c. <u>Bulk Trades</u>. Comment on the significance of this element of international shipping and any impact on port development plans. Note the existence of refineries and of bulk-loading facilities.</p> <p>c. <u>Feeder, Coasting and Local Trade</u>. Comment on volume and patterns, and list significant ports, including ferry ports.</p> <p>d. <u>Offshore Supply and Support</u>. Comment on significance and on any particular influence on MSI and GMDSS requirements.</p> <p>e. <u>Tourism - Cruise Liners</u>. List all local ports of call and anchorages.</p> <p>f. <u>Tourism - Small Craft</u>. Comment on the significance of leisure cruising, and note major cruising areas and concentrations of marina developments. In some smaller island states this may be the most significant maritime segment of the economy.</p> <p>g. <u>Fisheries</u>. Note the volume and type of fishing in national and adjacent waters. Include both local artisanal and pelagic fisheries, and the presence of foreign vessels.</p> | <p>Transshipment Designed originally to export titanium ore, the new deep sea port of Ehoala built by Rio Tinto near the decrepit Southern port of Tolagnaro is increasingly absorbing traffic, including cruise liners. Toamasina has also been modernised and resurveyed by SHOM (2008).</p> <p>This should contribute to regulate the transshipment performed in RSA (Durban), Mauritius (Port Louis), and la Réunion (Port des Galets).</p> <p>The main international and local ports are plotted in the Madagascar Prioritised Survey & Charting Scheme at Annex 4.</p> <p>The two §“c” & § d. (Bulk Trades, Feeder, Offshore, etc A number of internal reports have been consulted, all in French, and established to prepare the now defunct MAP mentioned above. Unfortunately, these reports have been written before the 2009 events and subsequent consequences on the Madagascan economy. Excerpts and précis could however be provided upon demand.</p> <p>There are no offshore activities to report yet, but oil prospection on the West continental shelf.</p> <p>e. Tourism - Cruise Liners The ports regularly visited by cruise ship tourism are:</p> <ul style="list-style-type: none"> • Ehoala/Fort Dauphin/Tolagnaro • Nosy-Be • Tamatave/Toamasina • Diégo Suarez/Antsirana <p>f. Tourism - Small Crafts Madagascar’s hottest tourist destination is the North-West island of Nosy-Be, which has been recommended by FTM and local users for testing the Madagascan first space chart (see Annex 6). 90% of sailing boat hire actually takes place in Nosy-Be.</p> <p>g. Fisheries. Fisheries, which include industrial & artisanal captures and aquaculture, are one of the three main national resources with mining and tourism. There are fishing agreements with the European Union and Japan. Fishing surveillance is entrusted to CSP which owns 3 vessels and even hires planes to catch trespassers.</p> |
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| <p>SAIHC 6</p> | <p>Responsibility for Safety of Navigation.</p> <p>Record the authority which is responsible for the maintenance of channels, removal of wrecks, provision and maintenance of nav aids, and the promulgation of Notices to Mariners.</p> <p>Note any difficulties in conducting these tasks e.g. defective buoy-tenders.</p> | <p>See Part § WB 3.1</p> <p>The Mahajanga AtoN status, which has been further investigated for the WIOMHP, is depicted at Annex 2.</p> |
| <p>SAIHC 7</p> | <p>Defence Force Responsibilities.</p> <p>Note the roles of the Navy/Defence Force Coast Guard (CG). e.g. SAR, fishery protection, and operations to counter traffic in drugs or illegal immigrants.</p> <p>Comment on any specific defence requirement for improved hydrographic data.</p> | <p>The Madagascar Navy, which is virtually deprived of warship, concentrates on State action at sea, i.e. contribution to fishing surveillance, oil spill contingency plans, etc. It also crews the Coastguard vessel “<i>Atsantsa</i>”, although the latter was donated by an exclusively civilian international programme to assist in fishing surveillance.</p> <p>Since 1964, the Madagascar Navy has consistently expressed interest in hydrography and some naval officers have even received FIG/IHO cat. B training. The Navy could thus bring an important contribution to the national prioritised survey scheme by fielding crews and operators, in liaison with the FTM, ENEM and CSP, and further operating the “<i>Atsantsa</i>”, which could be equipped with a portable SBES, when not deployed for fishing surveillance.</p> <p>The setting of such a national coordination plan, which has received full support from the Navy chief of staff and the Minister of National Defence in person, should be given maximum priority.</p> |
| <p>SAIHC 8</p> | <p>Coastal Zone Management and Environmental Protection.</p> <p>Note the existence of any marine National Parks or other management zones, and the existence of any climate monitoring stations.</p> | <p>For the reasons explained earlier, this issue has not been investigated. Environment, however, is followed closely by the Director of Environment, la Réunion, with whom SHOM coordinates tightly within the WIOMH programme.</p> |

OUTLINE S-55 ANALYSIS

| | | |
|------------------------------------|--|--|
| SAIHC 9 | <p>Status of surveys within the National Maritime Zone.</p> <p>Summarise the status of surveys within the territorial sea and EEZ, and comment on any areas of particular concern in the light of the foregoing description of maritime activities.</p> | <p>See Part I, § WB 3.5.</p> <p>The C-55 is based entirely on French (SHOM) information, which is partly summarised in the Prioritised Survey & Charting Scheme at Annex 4.</p> |
| SAIHC 9 (cont ^d) | <p>Make particular note of any coastal areas which are charted purely from lead-line surveys.</p> <p>Note any offshore banks or other shoal areas which require sidescan sonar coverage to bring the area to full modern standards. Note the need to obtain co-ordinates for offshore oil and gas fields.</p> | <p>See Prioritised Survey & Charting Scheme at Annex 4.</p> <p>As a matter of interest it has been assessed that the completion of the Madagascan original survey scheme would take 30 years for a fully equipped vessel operating 2 full months per year (not counting deployments, calls, etc.).</p> <p>This bolsters the need to invest heavily in satellite charting.</p> |
| SAIHC 10 | <p>Collection and Circulation of Nautical Information.</p> <p>Assess the effectiveness of this crucial process, based on information from the HO with charting responsibility as well as the national co-ordination point. Note any advice which has been given to local authorities, and detail any assistance which is required from the HO with charting responsibility.</p> | <p>In theory port information is collected by the Port authorities and passed to the zone VIII coordinator (South Africa) by APMF. In practice, updates are mainly performed on the occasion of SHOM survey vessels deployment and chart production.</p> |
| SAIHC 11 | <p>Survey Capability.</p> <p>Comment on the state of any local hydrographic service/unit, and draw attention to any supporting documentation in accompanying Attachments e.g. Mission and Output Plan documentation.</p> <p>Summarise the future plans of the unit, and assess the sufficiency of manpower and equipment resources.</p> | <p>None for the moment.</p> <p>Mr Razafindrabe, however, envisages re-establishing a survey capacity within the FTM, by making use of the SBES and GPS receiver donated by the Coastmap-IO programme. FTM could then conduct limited control surveys in the Madagascan ports to help SHOM updating its INT charts & ENC's and also provide ground control to the future space charts (see Prioritised Survey & Charting Schemes at Annex4).</p> |
| SAIHC 12 | <p>Independent Chart Production Capability.</p> <p>Note any charts which are being produced locally, and comment on their standard.</p> <p>Summarise discussion of implementation of the INT chart scheme in the region, noting local comment on proposals for coverage.</p> <p>Report clearly any local proposals for modification or extension of coverage of INT small- scale, large-scale and port schemes.</p> <p>Report proposals for local surveys within the area of coverage of proposed new charts.</p> | <p>No paper charts or ENC production capability.</p> <p>Madagascar relies entirely on SHOM charting production, which is consistent with the recommended IHO capacity building strategy, phase 3.</p> <p>To this effect, the FTM has been envisaging for years to enter a bi-lateral agreement with SHOM, as recommended by the IHO.</p> <p>Should France opt to abandon some of its chart production in the South Indian ocean, this would create a serious gap in the regional charting coverage as no alternative has been seriously mulled over.</p> <p>The simplified Prioritised Survey & Charting Schemes presented at Annex 4 has been developed bearing in mind this unattractive contingency and the need to simplify, and possibly, re-localise some of the chart production.</p> |

PROPOSALS FOR CO-ORDINATION AND CAPABILITY BUILDING

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| <p>SAIHC 13</p> | <p>National Hydrographic Committee.</p> <p>Note the existence of any high- level co-ordinating bodies, and assess their awareness of the contribution of hydrography to national policy- making.</p> <p>State whether the Team has advised creation of a more focussed committee, and note any proposals for reporting route and frequency.</p> <p>Note whether the local hydrographic service/unit is making a technical contribution to delimitation, offshore resource exploitation, environmental management, maritime traffic control, or any other areas of National Maritime Policy</p> | <p>National Hydrographic Committee</p> <p>The NHC has reportedly been created by law in 2011.</p> <p>Delimitations</p> <p>Madagascar is currently engaged in discussions with the UN Commission on the Limits of the Continental Shelf to discuss the 1,500 km extension of the outer limits of the Republic’s southern continental shelf.</p> |
| <p>SAIHC 14</p> | <p>MSI Organisation and GMDSS.</p> <p>Summarise any proposals for improvement of liaison and effective passage of information between national and regional charting agencies.</p> <p>Comment on the requirement for liaison with Transport Ministries or Port Authorities.</p> <p>a. <u>MSI (Navigational Warnings).</u></p> <p>Note the existence of local navigational warnings and Notices to Mariners and other publications e.g. Lists of Major Nav aids, Tide Tables.</p> <p>Comment on their reliability.</p> <p>Comment on discussions with local authorities, and summarise proposals offered for improvement of MSI in national waters.</p> <p>b. <u>Information on Ports and Harbours.</u></p> <p>Comment on discussions with government representatives concerning the legal requirement and economic importance of timely supply of plans and co-ordinates of new development to responsible charting agencies. Note where the local hydrographic service/unit or port authorities need better top -level support in collation and dissemination of this information. Where there is no hydrographic unit comment on the capacity of the Land Survey Department to advise port authorities and other agencies.</p> | <p>See also Part I, § 3.1</p> <p>Liaison between FTM and SHOM should be improved thanks to the long envisaged bilateral agreement.</p> <p>Tides</p> <p>An IOC automated tide gauge has been installed in 2010 in the port of Toamasina.</p> <p>AIS</p> <p>In parallel with the present visit, the World Bank (SAMSA/South African Maritime Security Agency) has commissioned an expert to examine the possibility of locating an AIS station in Madagascar.</p> <p>If the expert’s conclusions are approved, an AIS station could be installed in Mahajanga’s ENEM:</p>  |

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|---------------------|---|---|
| | <p>c. <u>GMDSS Status.</u></p> <p>Summarise the status of GMDSS in local waters, and any advice offered to local authorities.</p> | |
| <p>SAIHC 15</p> | <p>Hydrographic Capability.</p> <p>Comment on the adequacy of top-level support and resourcing for the local hydrographic service/unit.</p> <p>Summarise any proposals which the Team has made for revision of line accountability of the unit.</p> <p>Where there is no local hydrographic unit, comment on the requirement for independent capability.</p> <p>a. <u>Provision of Survey Data.</u></p> <p>Clarify accountability for this task.</p> <p>Note any commitment to pass data to other HOs with INT or primary charting responsibility in the area.</p> <p>List any data which has been passed to the Team for onward transmission.</p> <p>b. <u>Survey Capability.</u></p> <p>Summarise the Team's judgment of current and potential capability.</p> <p>Comment on advice given by the Team. Identify areas where RHC members could assist by loan of experts or equipment.</p> <p>Note opportunities for regional collaboration.</p> <p>c. <u>Chart Production.</u></p> <p>Summarise the Team's judgment on current and potential capability, and on viability of local chart production.</p> <p>Comment on advice given by the Team.</p> <p>Assess quality of routine data management, paying particular attention to such measures as assessment of density of sounding coverage and development of capability in plotting bottom contact detail from side-scan sonar.</p> <p>Comment on the balance of effort devoted to data collection compared to local production of publications.</p> <p>d. <u>Potential for Regional Activity.</u></p> <p>Comment on volume of work in local waters and remaining capacity to assist</p> | <p>There are no FIG/IHO qualified hydrographers in the FTM and a previous attempt by SHOM and the WIOMHP to provide full cat. B training to young Madagascan recruits in Brest ended in catastrophe, leading to the conclusion that training in France should be definitely abandoned and re-localised in ENEM instead.</p> <p>The FTM Director General is fully aware of the need to recruit and train young hydrographers as the average age of his employees is around 49. A 1970 UN expert report concluded that Madagascar would need over 50 trained hydrographers to cope with the requirements at the time.</p> <p>a. Survey data</p> <p>The Madagascar original data are exclusively produced by France. Until the nineties, all fair sheets were analogic and are currently kept by SHOM in its Brest repository.</p> <p>Except in these ports subject to heavy silting like Mahajanga, the surveys, even ancient, are professional and should not be discarded, but completed as appropriate, and further integrated in satellite space charts produced at low cost.</p> <p>b. Survey capability</p> <p>The Madagascan survey capability should be limited, flexible, and adapted to the island constrained budget and very large size.</p> <p>RHC members could assist by providing instructors to the ENEM training facility and sensible guidance aimed at minimising survey costs, and moreover, by encouraging mutualised regional approach encompassing French speaking countries, including eventually Seychelles and Mauritius.</p> <p>c. Chart production</p> <p>The same could be said of chart production.</p> <p>Whilst high-quality products such as INT charts of main ports & maritime routes and ENC's should remain within well-established HOs, SHOM for the moment, a great deal of national charting could be performed at reasonable cost, locally, by combining valid ancient surveys and modern satellite imagery into a simple GIS.</p> <p>A potential production capacity of this kind has been identified in Antananarivo and is further developed at Annex 6.</p> <p>Conclusion: Making hydrography look simpler</p> <p>To sum up the previous considerations, there is a feeling that Capacity Building in Madagascar is somewhat made complicate by the constant reference to over conservative and stringent IHO performance standards, unsustainable state-of-the-art technologies and hydrographers' over-qualification.</p> <p>By making hydrographers' common sense prevail over</p> |

| | | |
|--|--|---|
| | <p>other states in the region.</p> <p>Make recommendations on the ability of the hydrographic service/unit to provide technical hydrographic advice to neighbouring states.</p> <p>Note any potential for regional burden-sharing e.g. DGPS provision.</p> | <p>impractical requirements, and giving local developments a chance, SAIHC could render a great service to countries like Madagascar who, judging by the large Madagascan community living in France, is potentially capable and has enormous human resources, providing their agencies receive the little something that could help them regain confidence in their own abilities.</p> |
|--|--|---|

PROPOSALS FOR ASSISTANCE

| | | |
|---------------------|--|--|
| <p>SAIHC 16</p> | <p>Training.</p> <p>Identify training priorities, and comment on advice given by the Team.</p> <p>Note the status of any National Indicative Plan.</p> <p>Comment on response to any assistance offered by IHB e.g. reserved places on the IMA Cat B Course.</p> <p>Summarise proposals for training available from other RHC or IHO member states.</p> | <p>Madagascar’s needs of trained hydrographers could be met inexpensively by ENEM in Mahajanga, which is described at Annex 5.</p> <p>The “cat. C” on-job training (SHOM <i>Aide-Hydrographe</i> certificate) provides a good start, which could be completed by a FIG/IHO compliant “cat. B” training, dispensed by the ENEM.</p> <p>Serious thoughts have been given to organise this course, in liaison, notably, with ENEM, SHOM and the WIOMHP Regional Coordinator, but there is still work to be done (appointment of a qualified SHOM instructor, TORs, budget identification, etc.).</p> <p>Participation to refreshing courses in Europe and/or in English speaking countries should be avoided, except for those who hold posts of responsibility and can prove they overcome the language barrier.</p> |
| <p>SAIHC 17</p> | <p>Equipment.</p> <p>Summarise any advice given for equipment procurement options, or for technical advice.</p> <p>Note where any special conditions (e.g. local topography and disruptive masking of GPS) need to be taken into account.</p> | <p>Amongst the option envisaged, the team recommends</p> <ul style="list-style-type: none"> - Exploring the possibility of lending equipment (SBES, OTT tide gauges, etc.) no longer in use in large HOs. This could be facilitated by the bilateral arrangement envisaged between Madagascar and SHOM. - Encouraging mutualisation of resources, equipment and survey vessels & boats in the SAIHC region. - Exploring possibilities offered by cheap and cheerful off-the-shelf new equipment, e.g. Valeport 740 tide gauges, basic MBES, Hypack hydrographic packages, etc. <p>It further recommends paying extreme attention to equipment sustainability.</p> |
| <p>SAIHC 18</p> | <p>Funding.</p> <p>Confirm that local authorities are aware of the information in IHO Paper M-2.</p> <p>Note any specific proposals for advice or lobbying by RHC or IHB.</p> | <p>Funding, bureaucracy, and moreover, coordination between the various stakeholders concerned by hydrography, are Madagascar’s triple crux.</p> <p>Lobbying to develop regional cooperation by making use of the Indian Ocean Commission initiatives and implementing WIOMHP phase 2 would be welcomed if Madagascar is allowed to participate, and the FTM and Madagascan Navy can be directly invited to show their mettle, for instance by participating to the production of one or more space charts.</p> |

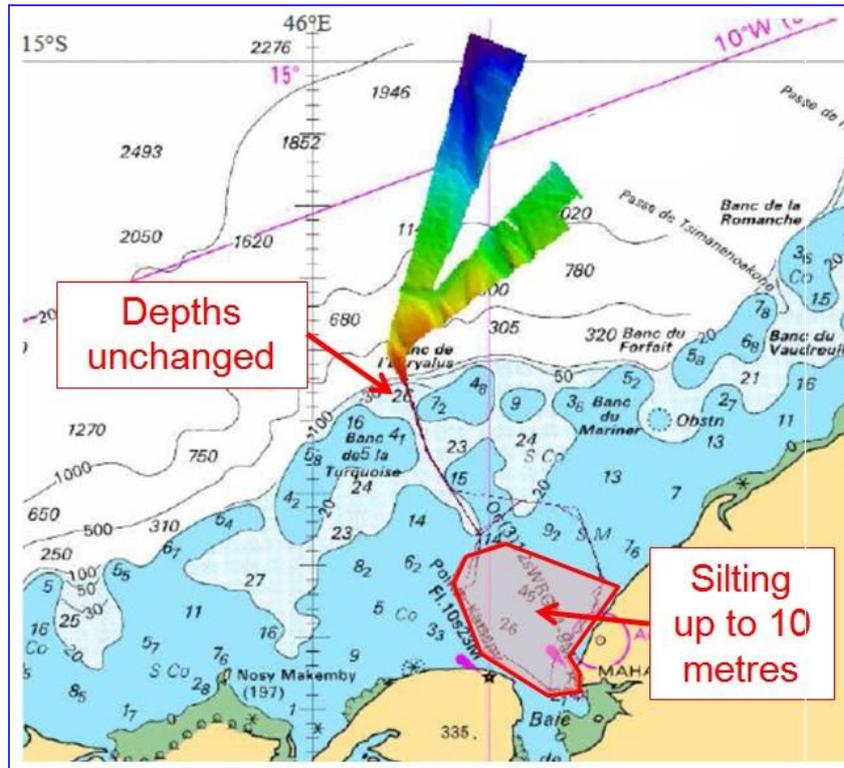
| | | |
|---------------------|---|--|
| <p>SAIHC 19</p> | <p>Encouragement of Formation of a NHC, Development of a National Hydrographic Strategy, and RHC Membership.</p> <p>Summarise recommendations for contacts, or supply of documentation.</p> | <p>Active participation to the SAIHC and sustained effort to develop local capacities is the best that can be expected.</p> <p>SAIHC and SHOM close monitoring has to be doggedly carried out until the FTM has succeeded in achieving concrete results such as running the NHC, completing the SHOM/FTM bilateral agreement, getting on the right track to recruit and propose decent jobs to reliable young hydrographers and implementing resolutely the Prioritised Survey & Charting Scheme .</p> <p>To conclude, IHO membership seems premature, and less urgent at this juncture than reinforcing regional and internal cooperation, participating in further WIOMHP expansion and the success of technical tests such as Madagascan space charts.</p> |
| <p>SAIHC 20</p> | <p>Encouragement of Effective and Timely Collection and Promulgation of Hydrographic Information.</p> <p>a. Note any commitment by the Team to forward Hydrographic Notes with urgent MSI.</p> <p>Note where copies are to be supplied to Hydrographic Unit and Maritime Services/Port Authorities to give them a format for subsequent routine communication of updates.</p> <p>(ACTION: Study Team.)</p> <p>b. Note any requirement for MSI/SAR liaison with local authorities.</p> <p>(ACTION: NAVAREA Co-ordinator).</p> | <p>a. There is no such commitment, but this will be addressed in the SHOM/FTM bilateral agreement.</p> |
| <p>SAIHC 21</p> | <p>Encouragement of Development of Hydrographic Capability.</p> <p>Note areas where the Hydrographic Unit merits assistance:</p> <p>a. Options for provision of consultative support including temporary secondments.</p> <p>(ACTION: RHC Members.)</p> <p>b. Options for transfer or loan of equipment.</p> <p>(ACTION: RHC Member States).</p> <p>c. Assessment of the case for regional investment in equipment purchase e.g. DGPS.</p> <p>(ACTION: RHC).</p> <p>d. Recommendations for follow-up technical assistance in development of a</p> | <p>FTM must simultaneously recruit young hydrographers and enter commercial agreements with Madagascan companies capable of assisting in the production of space charts and the digitisation process.</p> <p>a. Secondment of a seasoned instructor, capable of assisting ENEM in cat. B training courses must be considered as a matter of urgency.</p> <p>b. Loan of equipment should be envisaged first for the training in ENEM, rather than FTM, until capable hydrographers have been recruited.</p> <p>c. Mutualisation of resources within the SAIHC area is important at the beginning, but Madagascar is too big an island (the size of Belgium + France) to depend on this type of arrangement and must own its own equipment.</p> <p>d. Developing a National Plan for training, aggregating all</p> |

| | |
|---|--|
| <p>National Indicative Plan for training funding. (ACTION: RHC and IHB).</p> | <p>maritime issues with hydrography, is a good idea for Madagascar, which has an excellent training potential with ENEM.</p> <p>As for Comoros, coordination between support organisations (SAIHC, WIOMHP, Coastmap-IO, etc.), which is sometimes ineffective, must absolutely be reinforced in Madagascar, preferably under the leadership of the SAIHC Chairman.</p> |
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Annex 1

EXCERPT OF THE MAHAJANGA 2008-2010 SURVEYS



The Mahajanga 2008 – 2010 survey

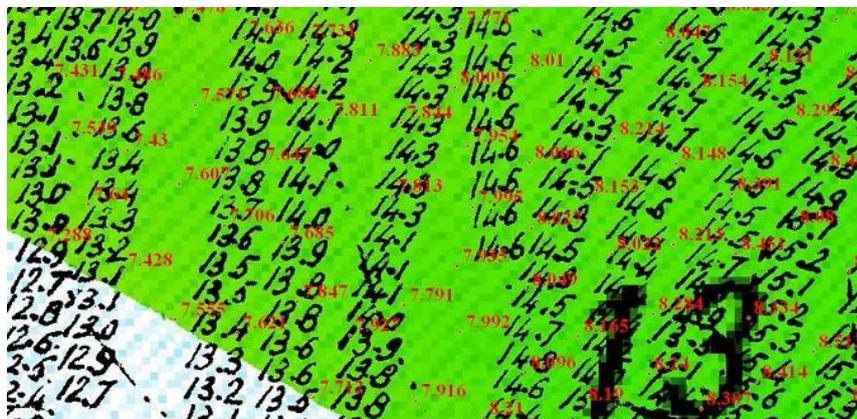
The Mahajanga survey was performed simultaneously in April – May 2008 by the ocean survey vessel “Beautemps-Beaupré” and her two survey launches, all fitted with MBES and up-to-date equipment.

The intention was to control the original 1960 chart of the port and approaches, originated from 1888-1892 and 1948 – 1963 surveys, and update the nautical information.

It was an all-encompassing survey, which included the observation of tide, currents, topography, conversion into WGS 84, thorough inspection of AtoNs, review of place names, etc.

The survey could not be completed in 5 weeks, which is exceptional, and had to be complemented in 2010 with further controls in the channel.

The reason was the exceptionally heavy silting observed in the port vicinity which can exceed 10 metres.



Comparison between the chart and the 2008 (in red) and the 1948 fair sheets

There is no reason why the silting from the rivers Amparihingidro and Betsiboka should cease, and the ports of Mahajanga and Boanamary will require regular controls in the future.

20 obstructions and 3 wrecks have been further detected.

The conclusion was that the new survey should entirely supersede the existing chart.

The first results show differences between the surveys and the chart mainly in the north west channel.

The area survey is delimited by the following positions (WGS84):

L= 15 Deg 40.88 Min South G= 46 Deg 12.09 Min Est

L= 15 Deg 40.23 Min South G= 46 Deg 12.82 Min Est

L= 15 Deg 42.95 Min South G= 46 Deg 17.70 Min Est

L= 15 Deg 43.76 Min South G= 46 Deg 17.28 Min Est

Due to important sediment transport from Betsiboka river, depths into this area are up to 7 meters less deep than sea chart's soundings.

Excerpt of signal sent to the NAVAREA VII coordinator

The new chart and ENC of Mahajanga will be released in 2014.

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Annex 2

MAHAJANGA'S AtoN STATUS

The 2008 Mahajanga survey included a complete inspection of all existing floating and fixed land marks.

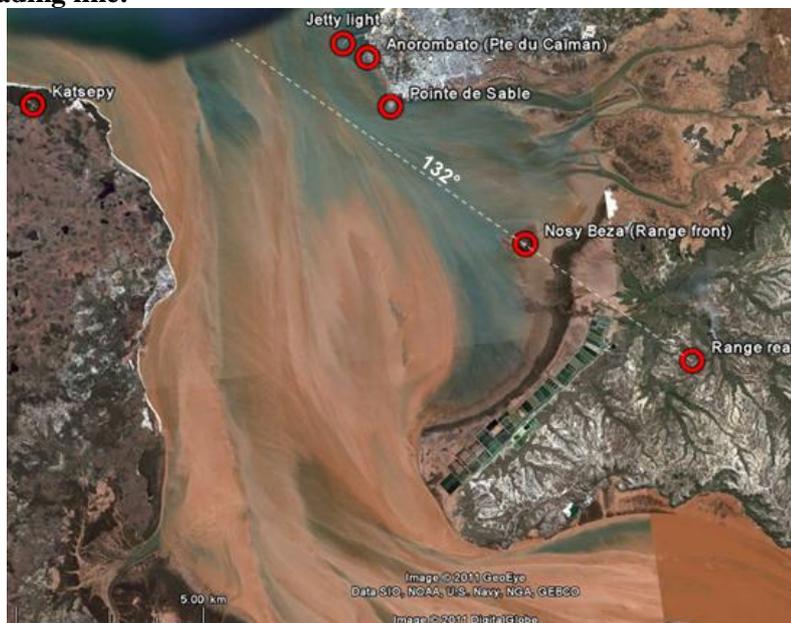
It was found that several of these don't exist anymore and that the lights were very unreliable, due to frequent power cuts and poor maintenance.

22 detailed beacon forms were established and sent to the SHOM Brest facility where they are presently validated.

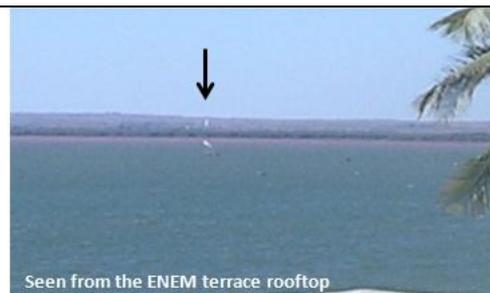
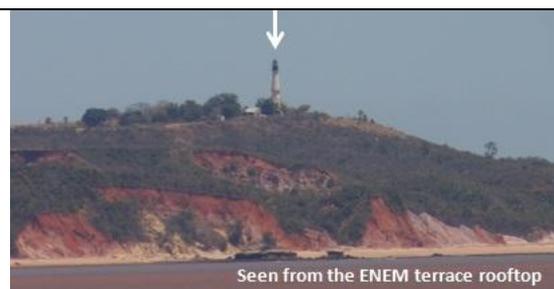
A copy of these forms can be made from September 2011 onwards and sent upon request.

In the meantime, the following features have been observed during the July visit to Mahajanga, from the ENEM terrace rooftop:

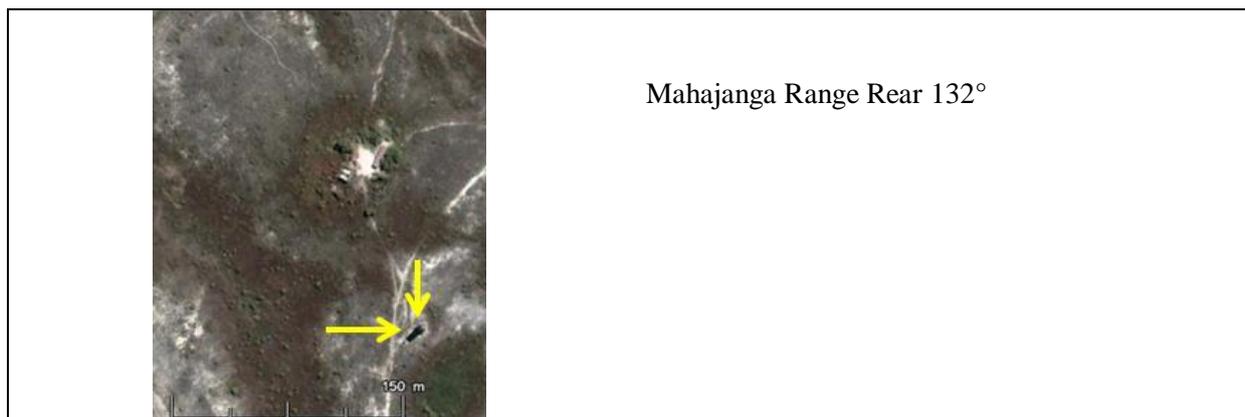
The 132° leading line:



The Katsepy black and white light house:



Nosy Beza (Île verte/Mahajanga Range Front 132°)



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Annex 3

CORRECTION PROPOSAL TO THE IHO YEAR BOOK

MADAGASCAR (REPUBLIC OF)



| INSTITUT GEOGRAPHIQUE ET HYDROGRAPHIQUE NATIONAL FOIBEN-TAOSARINTANIN'I MADAGASIKARA (F.T.M.) B.P. 323 ANTANANARIVO 101 – MADAGASCAR | |
|---|--|
| Department of which the Hydrographic Office is part - <i>Ministère dont dépend le Service Hydrographique</i> | Ministry of Decentralization and Territory Planning - <i>Ministère de l'aménagement du territoire</i> |
| Principal functions of the H.O. - <i>Attributions principales du S.H. -</i> | Hydrographic surveys, Nautical charts, Notices to mariners, Studies concerning hydrography and physical oceanography. |
| National day - Fête nationale | 26 June – <i>26 Juin</i> |
| Telephone : Fax : E-mail : | + 261 20 22 229 35 – <i>Mob: + 261 (0) 32 05 238 39</i> + 261 20 22 252 64 ftm@wanadoo.mg |
| Date of establishment and Relevant National Legislation - <i>Date de fondation et législation nationale concernée</i> | 2011 : <i>Public Administrative Establishment – Établissement public à caractère administratif</i> |
| Name and rank of the Director or Head - <i>Nom et grade du directeur</i> | Mr Franck Razafindrabe, Director General – <i>M. Franck Razafindrabe, Directeur général</i> |
| Tonnage | 1996 : 45 660 |
| Total Budget - <i>Budget total</i> | 4.1 billion Ariary, i.e.about 1 500 000 € (2011) |
| Staff employed - <i>Effectifs</i> | 142, reduced from 215 (2011) |
| - Hydrographers (Name and rank of managing staff) <i>- Hydrographes (Nom et grade du personnel de direction</i> | Basic geographic data - <i>Information géographique de base :</i> Nary HERILALAO IARIVO Oceanography - <i>Océanographie :</i> To be appointed Hydrography - <i>Hydrographie :</i> Nivoarimanga RATOVOARISON |

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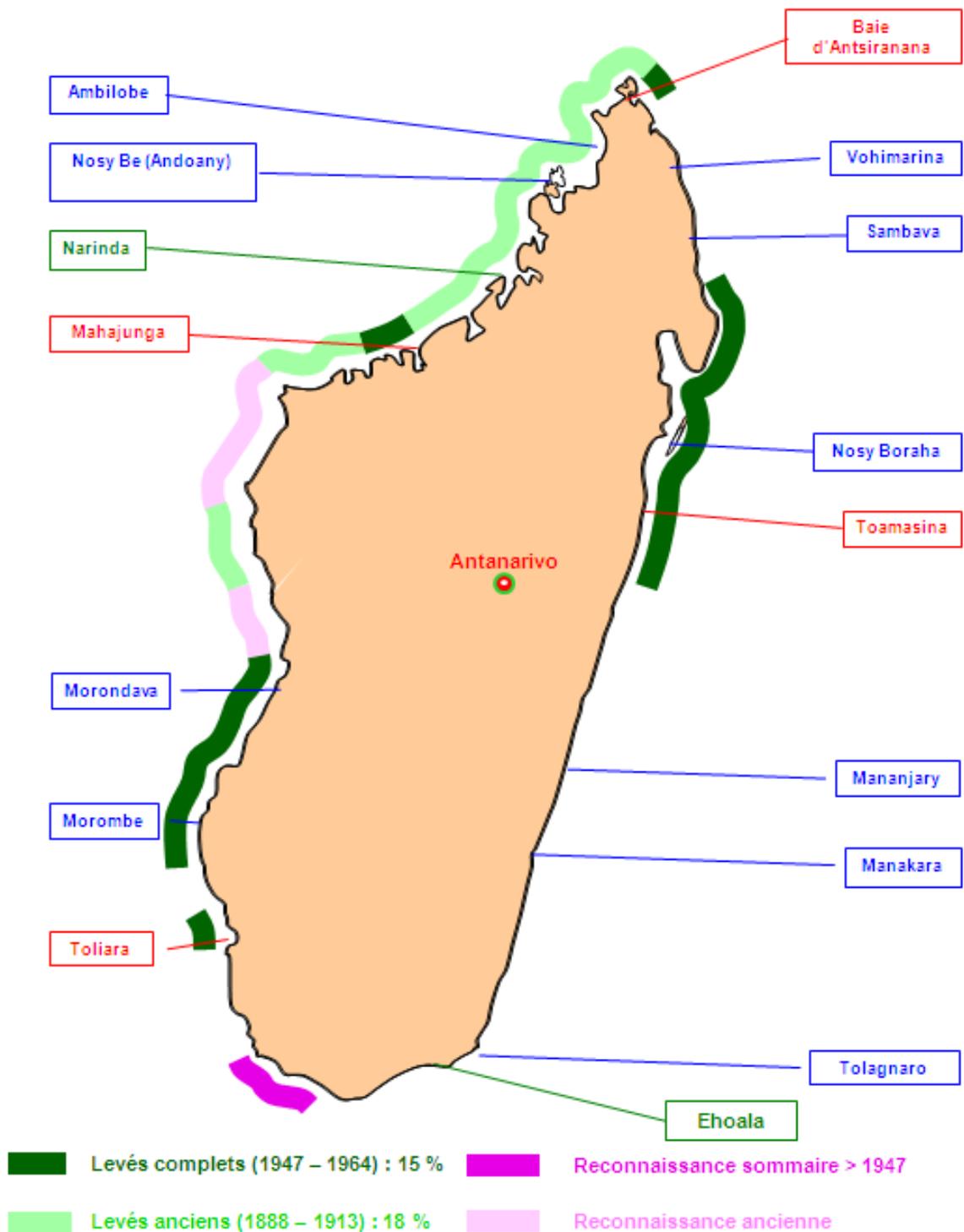
Annex 4

MADAGASCAR'S PRIORITISED SURVEY & CHARTING SCHEME

1. Background

History of surveys and charting

French surveys of Madagascar started in 1884 and became fully professional with the creation of a regular Survey Unit, the *Mission Hydrographique de l'Océan Indien* (MHOI), operating large survey ships and launches and eventually covering the following portion of the world's 3rd largest island:

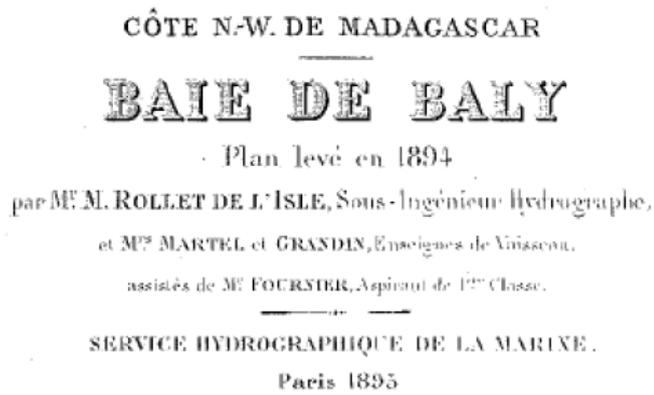


Early surveys were conducted in local geodetic systems, the records of which are usually – but not always – kept in SHOM repository.

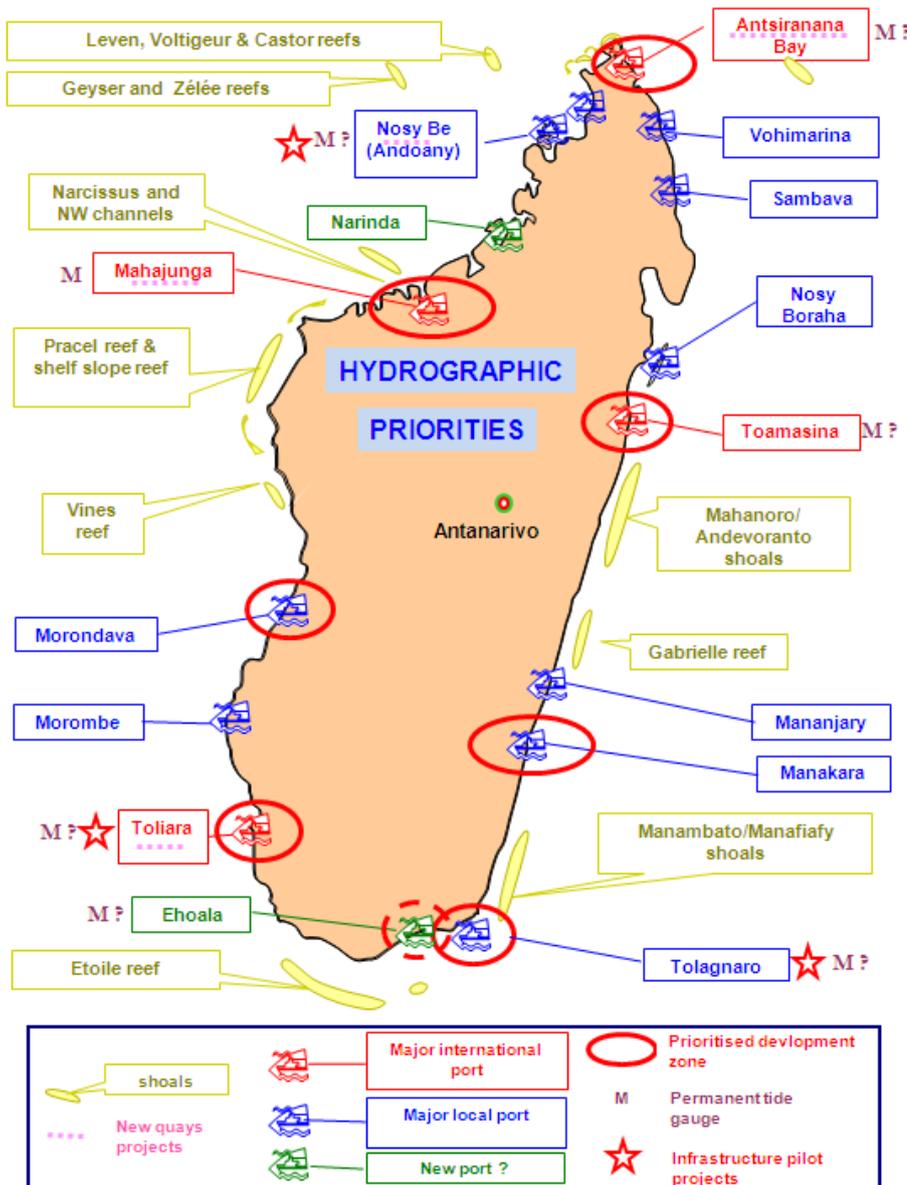
The most antiquated chart of Madagascar still in service is the 1895's Bay of Baly.

It should be noted at this stage that, unless facing massive silting like the port of Mahajanga, most charts, even ancient, are still valid and worth keeping. For instance a 2003 MBES exploration of the Antsiranana roads showed little or no difference with earlier lead line surveys.

The main inconvenience of ancient charts is their geodetic system which is not compatible with today's mariner GPS. Conversion to WGS 84 is therefore an urgent priority; another priority is the vectorisation of valid ancient data in order to produce satellite space charts, as seen at Annex 6.



Addressing Madagascar economic priorities



In 2007, by making use among other sources of the Ministry of Plan's excellent reports, SHOM established an exhaustive recollection of the known Madagascan priorities.

The intention was to prepare a Charting and Survey Scheme, have the hydrographic priorities confirmed by the FTM, and then submitted to the Government for inclusion in the Madagascar Action Plan mentioned in Part II, § SAIHC 5.

This, unfortunately, did not materialise but the project was well on its way as Madagascar issued a diplomatic requirement for assistance, both to France and Norway, in April 2008, to which France responded positively.

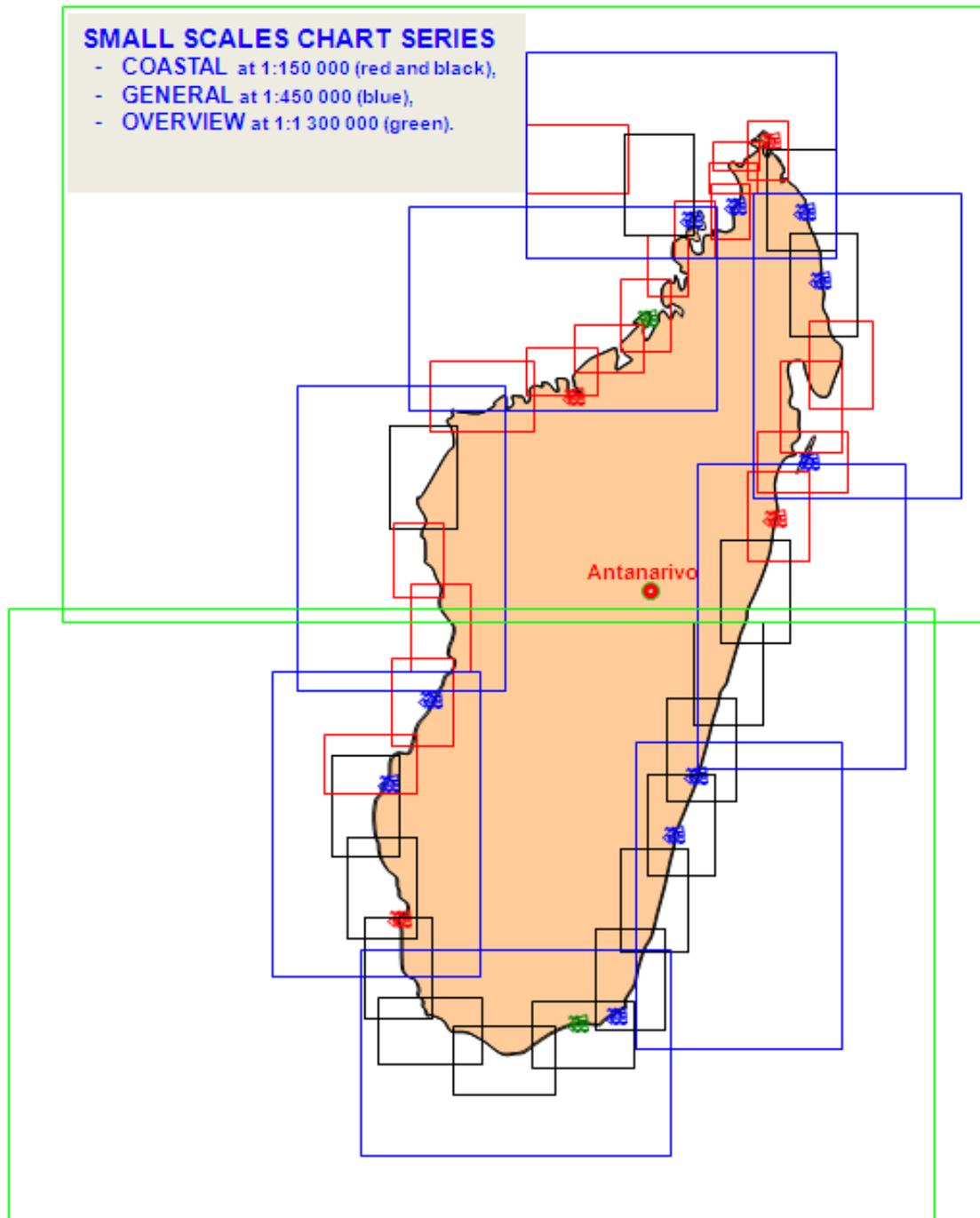
The original project had taken stock of the Madagascan 5 year's development plan and SHOM earlier recommendation that a decent chart scheme of Madagascar should consist of about 200 charts and plans, as opposed to 91 today.

The scheme already recommended the extensive use of space charts to depict at a reasonable cost the uncharted coastal areas, i.e. about 3,000 km of baselines, whilst meeting the ICZM need of accurate charting.

2. The 2011 prioritised charting scheme

The present development is an improvement and a simplification of the original project. It is as follows:

Small scale charts



- 19 existing charts (1 : 200,000 > scale > 1 : 80,000) to be modernised
- 16 new space charts (E = 1 : 150 000) to be produced

Large scale charts

LARGES SCALES CHART SERIES

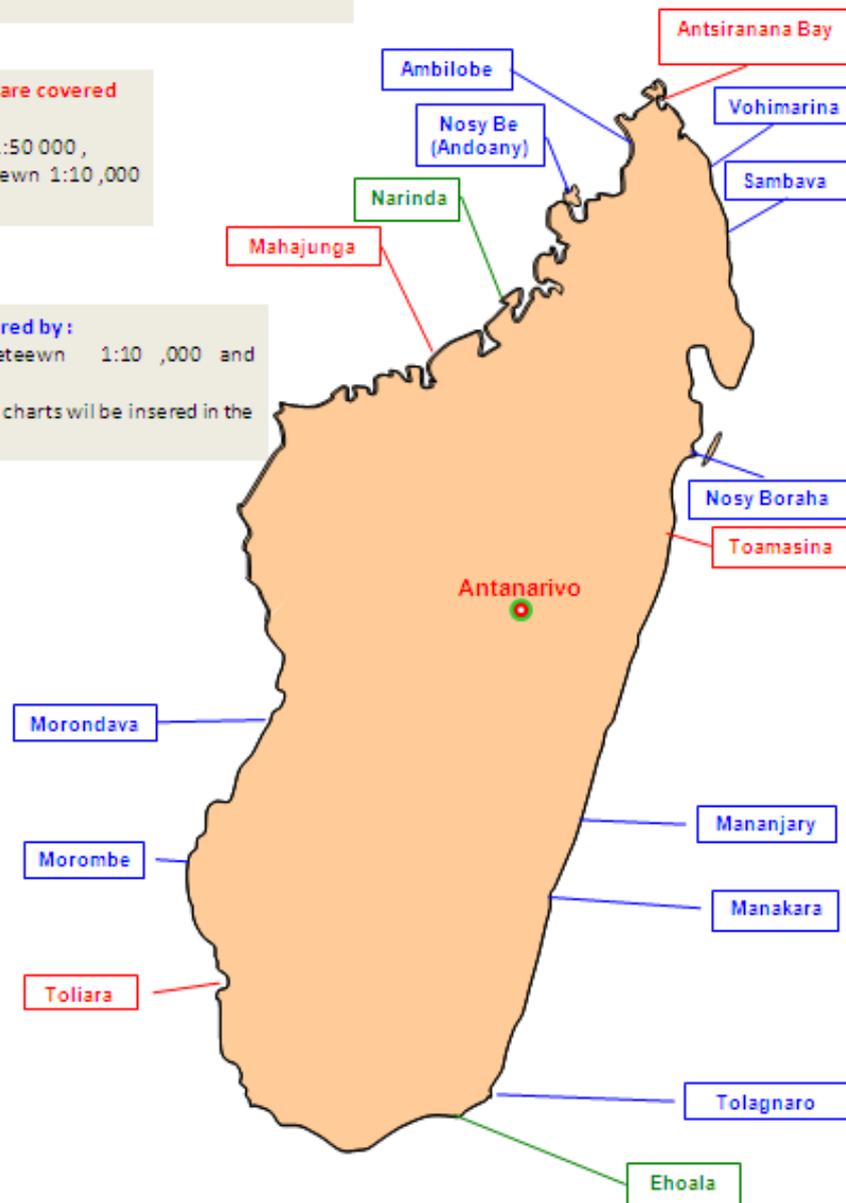
- APPROACH at 1:50 000 (red),
- HARBOURS at 1:15 000 (blue)

Main International ports are covered by 2 charts:

Approach usage band at 1:50 000,
Harbour usage band between 1:10 ,000 and 1:20,000.

Main Local ports are covered by:

Harbour usage band between 1:10 ,000 and 1:20,000.
Whenever feasible, these charts will be inserted in the 1:150 000 Coastal charts



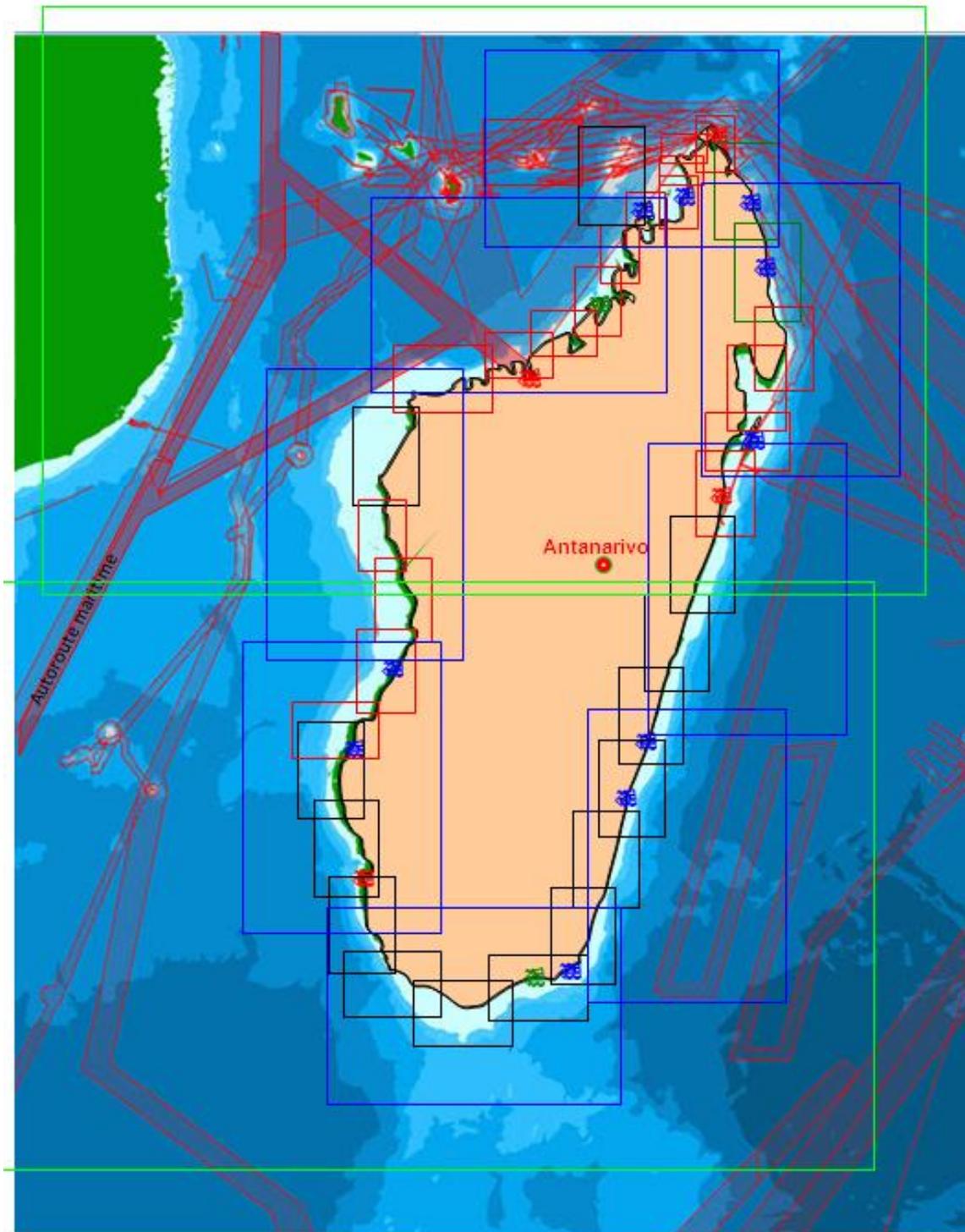
In all, the Madagascan complete charts series would comprise:

| Usage band | Number of charts |
|-------------------------------------|---|
| Overview > 1 : 1,500 000 | 1 |
| General 1 : 350,000 – 1 : 1,500 000 | 10 |
| Coastal 1 : 90,000 – 1 : 350,000 | 19 (updated) + 16 new charts at 1:150,000 |
| Approach 1 : 22,000 – 1 : 90,000 | 5 |
| Harbour 1 : 4,000 – 1 : 22,000 | 15 |
| Berthing > 1 : 4,000 | |

Importance of space charts

The 2/3rd of Madagascar is still uncharted. It is recognised that the only way to close this huge gap at a reasonable price would making use of moderns satellite imagery, both radar and optical.

This technique, which is the modern version of the “Navigation Sheets” recommended by SHOM’s most distinguished Hydrographers (Comolet-Tirman & al.) as early as 1970 (see Annex 6), would consist of producing 35 coastal charts at scale 1:150,000 for a cost still to be assessed, but which would be a fraction of a classical survey.



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Annex 5

THE MAHAJANGA'S NATIONAL COLLEGE FOR MERCHANT NAVY (ENEM)



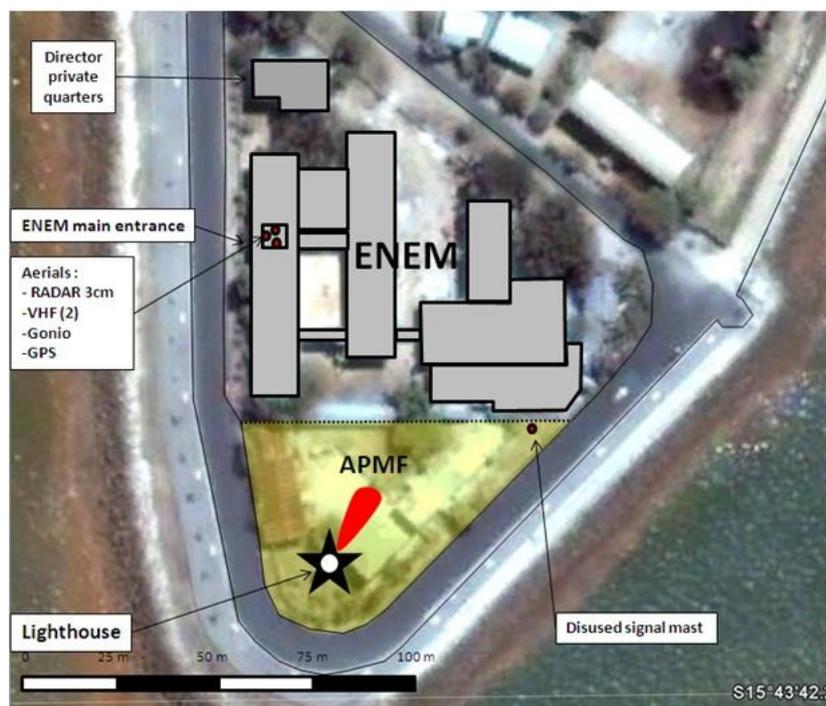
Founded in 1971, the *École nationale d'enseignement maritime* (ENEM) has been granted a new statute in 2004 to reinforce its autonomy, which is characterised by a 90% financial independence (10% Government subsidies only).

ENEM is located on Mahajanga's sea front and reputedly the best looked-after building in the whole city.

It is remarkably well run and disciplined.

It comprises:

- Three main buildings, 2 for the trainees (officers) of 15 boxes each and 1 for short courses (maximum: one month), capable of accommodating 20 boarders.
- Three dormitories to accommodate 50 apprentices.
- Six classrooms of 15 trainees each,
- A large conference room,
- 7 labs and resource centres
- A bridge simulator fully equipped (radar, radios, compasses, Met receivers, GPS, etc.



Moreover, ENEM is IMO fully compliant.

Education & Syllabus

ENEM teaches the following subjects to Fishing officers, Watch officers and Marine Engineers:

Maths – Physics – Navigation – Naval architecture – Oceanography – Fisheries – Biology – Maritime safety – Security - International regulations (STCW, MARPOL, SOLAS, ISPS, UNCLOS, etc.) –

Engineering – Electronics – Electricity – Meteorology – Instruments and Navigation – First aid and medical care.

Classrooms & workshops



The bridge



Bridge simulators



Engine workshop

Instructors

- 2 Senior Merchant Navy Captains
- 1 Naval Architect
- 2 Engineers
- 1 Fisheries instructor
- 3 English teachers
- 1 Doctor
- A number of occasional lecturers



Engine simulators



Communication room – GMDSS



Electronics/Electricity workshop



Language resource centre

Hydrography

Providing it is informed well in advance, ENEM would welcome a cat. B hydrographic course, for a fraction of the rate it would cost in Europe.

A Hydrographic Instructor seconded by SHOM would have to be appointed, ToRs developed, equipment lent or donated and a budget identified.

The syllabus has already been developed at the Hydrographic school in Brest and would only need adapting to the local environment.

As Hydrography would not provide a full-time job, but only last, say 6 months per year, other occupations would have to be found for the Instructor such as assistance to the preparation of space charts, validation of S-7 compliant paper chart digitisation, etc.

Needless to say, SHOM has already concocted several workable solutions and even identified possibilities to complete the theoretical training with on-the-job surveys. It would appreciate exchanging its views with the WIOMHP Regional Coordinator and SAIHC Chairman.

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Annex 6

DEVELOPING A REGIONAL SPACE CHART PRODUCTION CAPACITY

1. Object of this annex

Until today, SHOM has maintained under its own steam its chart series of the Indian Ocean, all based on SHOM original surveys of French overseas territories and French-speaking countries. Except for the main ports, these charts are becoming gradually obsolete.

This might change as SHOM Board of Directors is increasingly reluctant to fund charting of foreign countries at the taxpayer's expense.

As rescuers are unlikely to volunteer, one may wonder what will happen of the original 91 charts and chartlets of Madagascar and 15 of Comoros. A response has to be found locally.

The point of this annex is to show that a limited local space chart production capacity can complement economically, and coexist with, the well-established Hydrographic Offices high standard products, while meeting most of the countries' integrated coastal zone management (ICZM) basic requirements.

2. Comoran and Madagascan requirements

The following requirements have been identified in the Comoran and Madagascan Prioritised Charting Schemes:

| Usage band | Madagascar | Comoros |
|-------------------------------------|---|--------------------------------|
| Overview > 1 : 1,500 000 | 1 | |
| General 1 : 350,000 – 1 : 1,500 000 | 10 | 1 |
| Coastal 1 : 90,000 – 1 : 350,000 | 19 (updated) + 16 new charts at 1:150,000 | 2 space charts at 1:150,000 |
| Approach 1 : 22,000 – 1 : 90,000 | 5 | 3 |
| Harbour 1 : 4,000 – 1 : 22,000 | 15 | 10 |
| Berthing > 1 : 4,000 | | |

Converted in satellite images, the entire Madagascan and Comoran basic topographic information needed to produce coastal charts, port insets and small scale generalisations should arise from the production of 37 space charts at 1:150,000.

3. Previous experiences

3.1 The Madagascan UN report

Following the closure of SHOM Indian Ocean Survey Unit in 1964, the former French Charge Hydrographer was tasked in 1970 by the UN to write a report on the continuation of survey activities in Madagascar. Among this expert's suggestions was a recommendation to cover the unsurveyed areas (about 2/3rd of the island) with topographically accurate and geodetically consistent navigation sheets that mariners could use. Bathymetry would be added to the sheets later as surveys progress.

3.2 SHOM space charts and further developments

In the same line of thoughts, but 20 years later, and this time with satellite images and GPS, SHOM developed (1988) a number of space charts in the South Pacific overseas territories, merging standard hydrographic surveys and precise orthorectified satellite images. Depths up to 20 metres could be extrapolated from the satellite data but the image constraints were exceedingly demanding and the vertical precision (depths) mediocre.

With the Coastchart project (2005) conducted in support of ESA, SHOM also attempted to make use of radar satellite images in the West coast of Africa. The experience was unconvincing due mainly to the then radar satellites' imprecision, but also to the questionable tendering procedures, which, in our opinion, resulted in selecting the lowest bid at the expense of the technically motivated.

3.3 The Maldives project

More recently, SHOM and IGN-*Espace*'s expertise were besought by a private contractor to produce space charts of a large Maldives atoll. By using recent satellites constellation and better image processing tools, a razor-sharp team consisting of an experienced hydrographer, 1 GIS specialist and 2 satellite image experts, produced in a matter of months a basic vector chart offering the following characteristics:

| Scale | Precision | | Contractual cost | Comments |
|------------|------------|--------|-----------------------------------|--|
| | Horizontal | Depths | | |
| 1: 100,000 | > 5 m | 2 m | About 100 000 € at the very most. | <ul style="list-style-type: none"> • INT 1 cartographic standards • IHO compliant lidar survey, Gebco contours and a number of cartographic objects included in the model • WGS 84 consistent • Several larger scale charts (1: 50,000, 1: 10,000) produced as spin-offs |

Whilst being a long way from achieving IHO compliancy, the Maldives space charts are expected to cover 90% of the local ICZM requirement and provide a far better navigational tool to mariners and local users than the existing nautical chart. This at a much cheaper cost.

This is precisely the product that could replace the antiquated, but still valid SHOM charts, not only in the SAIHC, but also in other parts of Africa.

4. A new contractual approach

After several attempts to start an effective cooperation with the FTM, SHOM came to the conclusion that no significant progresses could be achieved solely by the virtue of bilateral agreements: Costs considerations and contractual commitments ought to replace bureaucratic sluggishness whenever significant production is envisaged and local resources can be exploited.

For instance, it was found that the French cadastre was being outsourced in a Madagascan private company, Makifi Data, which fields some 25 state-of-the-art workstations and employs over 50 Madagascan young operators.

With the assistance of SHOM and IGN experts, it appears that such a company could not only vectorise paper charts, but also offer cartographic experience to FTM trainees and contribute at reasonable cost to the production of Madagascar space charts.

With this in mind, it was decided to submit a space chart of Madagascar, based on the Maldives approach, to the WIOMHP Regional Coordinator for consideration.



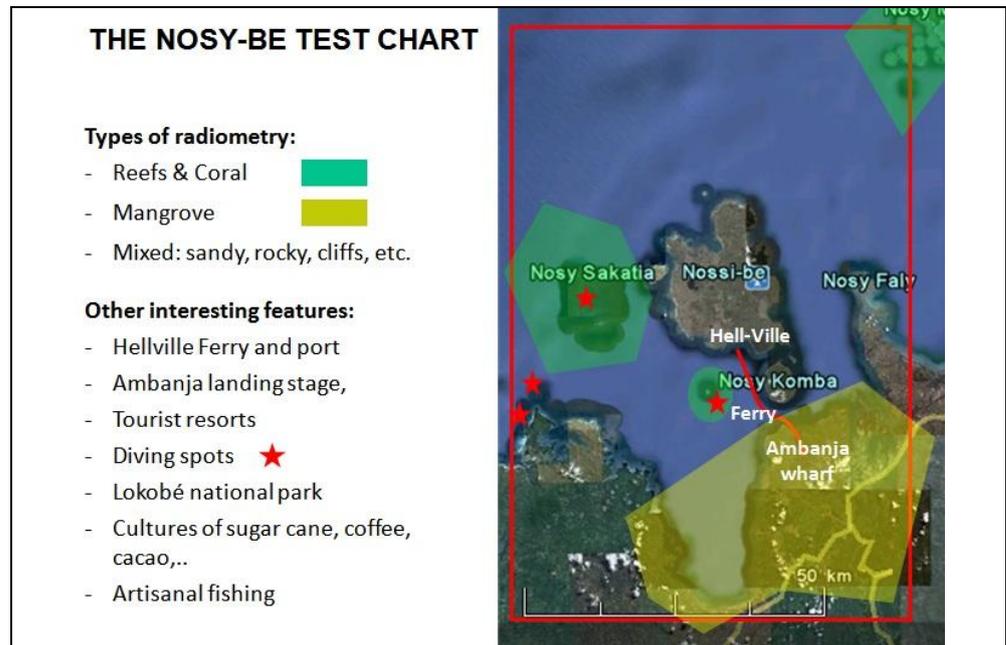
A Makifi Data's digitisation workshop

5. The Nosy-Be project

The region

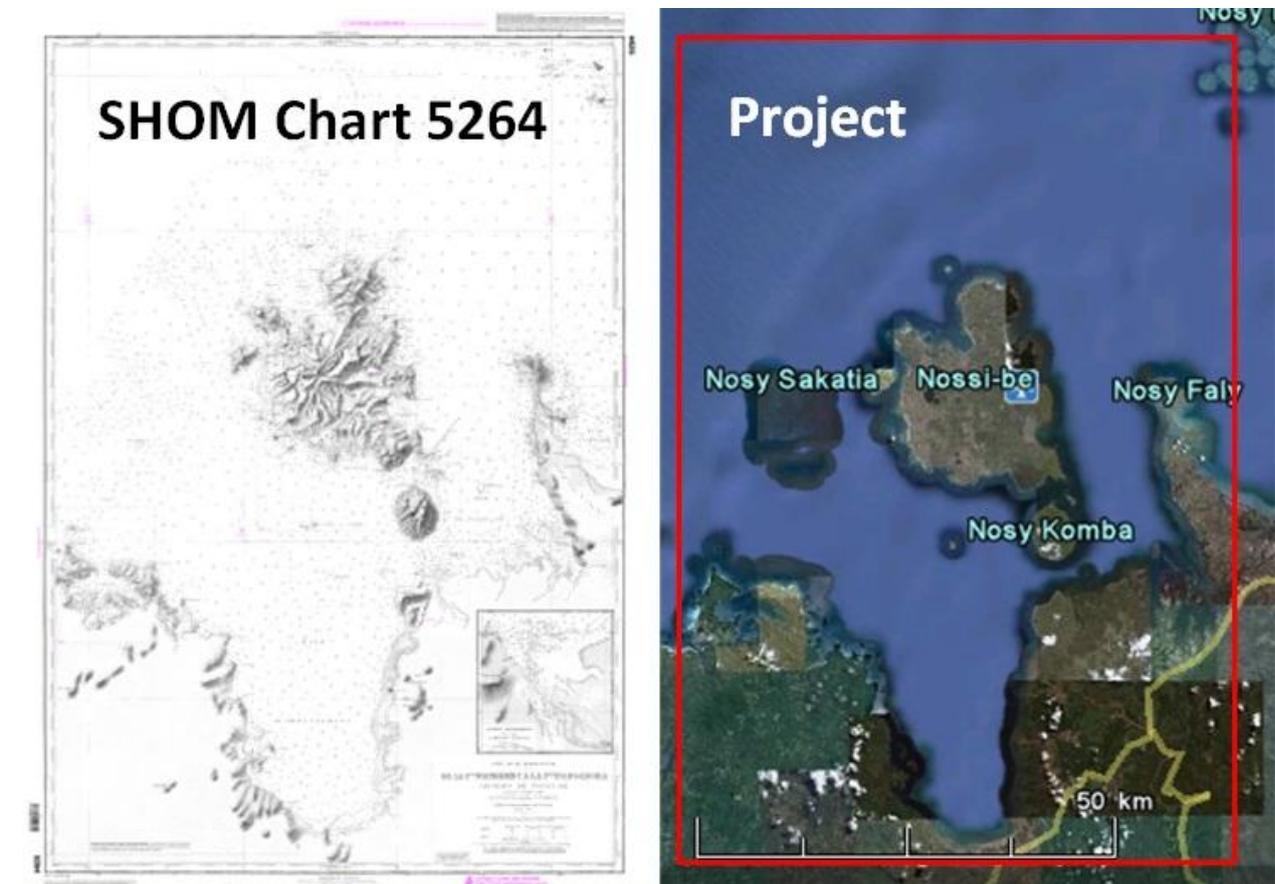
The Nosy-Be region has been recommended as the most likely to take advantage of being covered by the first Madagascan space chart.

Local features make it also a valid candidate for testing satellite images in a convoluted environment.



The existing chart

Nosy-Be is presently portrayed by a chart at 1:100,300 edited in 1908 from an 1895 survey carried out in an unknown geodetic system. The chart includes an inset at 1:40,000 of the river Antsahampa:



[For those interested in bizarre place names, Hell-Ville or Hellville, now Andoany although the old name still prevails, was termed after the French admiral Anne-Chrétien de Hell (1783 – 1864), then Governor of la Réunion].

The project

Following a preliminary appraisal, the project would consist of the following components:

- Production of a 1:100,000 space chart, including two insets of the port of Hellville at 1:10,000 and river Antsahampa at 1:40,000.
- RapidEye-type image processing allowing for the depiction of the coastline, tidal flats and 0-5, 5-10 & 10-15 depth ranges. Horizontal precision better than 5 m, depth precision +/- 2 m.
- Funding permitting, TERRASAR-type radar satellite image testing to depict the mangroves and cloud-covered lands.
- Digitisation performed in Antananarivo by Madagascan hands under hydrographic supervision so as to capture SHOM ancient data and have it transformed into WGS 84.
- Ground truth, place names, geodesy, tide observation in Hell-Ville, logistics, etc. conducted as much as possible with local team.
- Retrieval and inclusion of all FTM available environment data.

The contract

Due to the experimental nature of the project and its non-competitive aspect (sole source), a contract would be negotiated with the Regional Coordinator under the NAPNOC principle (no acceptable price, no contract).

A preliminary assessment has indicated that costs would be of the order of 100,000 € at the very most.

Time frame

If an agreement could be reached in time, field work could be completed in October before the rainy season so that the space chart could be produced and delivered for Christmas 2011. The “razor-sharp team” mentioned at § 3.3 is confident they can do it.

Follow-up

Apart the good exposure it would confer to the WIOMH Project, the test would help clarifying the space chart production costs, which in turn would make it possible to issue competitive tenders for further routine chart production.