National Hydrographic Capacity as Catalyst for credible ocean governance.

When assessing the environment in African waters, we quickly encounter themes like Maritime Domain Awareness (MDA) and Maritime/Ocean Governance (MG), mainly to learn that efforts are crucially needed to improve the latter's if we are to expect a better overall Maritime Safety and Security Situation (MSS) that has the potential to lead to economic growth, peace, and stability.

While Maritime/Ocean Governance can shortly be understood as the formulation and operationalization/ implementation of maritime policies, in a broader scope, it is the ability of the government, through direct actions and partnerships with private, non-governmental, and international entities, to exercise effective control over its Maritime Domain. MDA on its part is defined by the International Maritime Organization (IMO) as the effective understanding of anything associated with the Maritime Domain that could *impact the security, safety, economy, or environment* (1). Therefore, MDA is a key enabler for Maritime Safety issues like Anti-Piracy patrols, in the way that, to conduct effective maritime patrols, you need the ability to execute efficient MDA. In other words, you can't be effective against Maritime piracy if you don't know what is going on in your waters. The same can be said with National hydrographic capacities (*shortly understood as the demonstrated ability to efficiently survey, describe and predict the behavior of the maritime environment under one's jurisdiction and beyond for the primary purpose of safe navigation and in support of all other marine activities*) relatively to Maritime/Ocean Governance. Simply stated, National hydrographic capacities are key enablers to credible Maritime Governance. Credible Maritime/Ocean Governance being one that is efficient and sustainable.

Hydrographic capacities because they help to better know the maritime environment in terms of navigability of waterways and availability of other resources within that realm (living resources like fish stock or nonliving resources like oil, gas, and other minerals) contribute to improving MDA. One can also contend that as long as we have a better understanding of what is available as resources in the Maritime environment thanks to hydrographic capacities, a good decision tool is hence available contributing to better Maritime Governance through proper maritime policies and implementation to achieve the overreaching goal of getting the best out of the Blue Economy

without jeopardizing the environment, consequently a better MSS is a prerequisite.

The dynamism inherent to the Maritime environment imposes if we want to be efficient to also accommodate a dynamic Maritime/Ocean Governance to be able to quickly adjust to the complex and ever-changing environment (by the ability to monitor and properly predict its behavior thanks to hydrographic capacities). The overall poor Maritime Governance classification in African waters mostly stems from the inability of many Maritime policies to address the problems of security, safety, environmental and economic concerns so central to the sector. Mainly because of lack of awareness and poor hydrographic capacities.

The mismatch can also be seen in the fact the Nation-state tends to be the Maritime Authority and Policymaker while the Maritime Industry is more and more globalized. The reality is indeed more complex as there are other stakeholders sometimes Non-Governmental Organizations that should have a say when it comes to policymaking. The nation-state should not be considered the only policy-making Authority since most of the ocean is considered common, not owned by a single nation-state or person. We end up all exploiting the common, the ocean, without all having the same environmental or sustainability concerns (in fact without equal or collective responsibility when it comes to taking care of it). Hence the poor governance classification. Considering the importance of optimizing the blue economy through the exploration and exploitation of the oceans for the sake of African states, there is the need to emphasize the importance of hydrographic capacities and discuss what should be done to reach that status. In that prospect, this paper will discuss the following. The Role of hydrography in Ocean Governance in Africa, efforts to develop hydrographic capacities in Africa and the contribution of IHO, and optimizing national hydrographic capacities for Ocean Governance in Africa.

I- The Role of Hydrography in Ocean Governance in Africa.

Awakening from what some called see blindness in Africa, there is now a growing awareness of what the maritime environment has to offer in terms of potential for economic growth, peace and stability through the blue economy as illustrated by the continental 2050 *Integrated Maritime Strategy (2050 AIM)* (2), even though the means and capacities needed to fully get to the expected stage are yet to be completely developed. This is the case of

hydrographic capacities that appear to be essential to be fully aware of what the African Maritime environment can offer in terms of resources (quantitatively and qualitatively), and take the appropriate decisions. From the ability to know navigable waters that will optimize maritime transportation, ensure the safety of life at sea and allow the exploration and exploitation of other maritime resources like fish stock, oil, gas, etc. Yet there is a suboptimal hydrographic capacity in African waters that gears ocean governance as an awareness tool even if one can consider there is a lot of room for improvement. This section will highlight the role of hydrography in Ocean Governance in Africa. In other words, how hydrography helps and can further help to make sound decisions when it comes to maritime policies and implementation in African waters to get the best out of its maritime environment.

From the definitions of Hydrographic Capacities and Maritime/Ocean governance given above, we come to the evidence that we can't properly/effectively manage what we don't know well enough, therefore it is easy to understand the essential role hydrography has in Ocean Governance in Africa. The full definition of hydrography given by IHO is very straightforward when it comes to governance prospectives : *Hydrography is the branch of applied sciences which deals with the measurement and description of the physical features of oceans, seas, coastal areas, lakes, and rivers, as well as with the prediction of their change over time, for the primary purpose of safety of navigation and in support of all other marine activities, including economic development, security and defense, scientific research, and environmental protection.* Some will say hydrographic capacity is a prerequisite to any credible or viable governance of oceans, we tend to agree it's a catalyst, a key enabler to credible ocean governance in Africa as anywhere else. In this light we just need to imagine what hydrographic capacity has currently created in the arctic region, after identifying new navigable ways in the artic there is currently a race for the arctic ocean's resources from nations trying to get the best out of this opportunity but sustainably thanks to their ocean governance mechanisms. No need to say that if there wasn't any hydrographic capacity around no one would be aware of the existence of such opportunity. More specifically in African waters, hydrography has the role to :

- Chart waters, identify tides currents, and dangers like wrecks in so doing help establish areas that are safe or unsafe for navigation, maritime trade, tourism, etc.

- Identify the sea bed, predict the behavior of the environment, delineate marine boundaries, basically helps to claim and access maritime resources (oil, gas, fisheries, etc.), and other activities la cable laying, tourism, marine engineering, etc.,

In reality, as pointed out by IHO to highlight the importance of hydrography: *In addition to supporting safe and efficient navigation of ships, hydrography underpins almost every other activity associated with the sea, including, resource exploitation (fishing, minerals,..), environmental protection and management, maritime boundary delimitation, national marine spatial data infrastructures, recreational boating, maritime defense and security, tsunami flood and inundation modeling, coastal zone management, tourism, marine science.*

Some of the elements listed above are illustrated in a practical case in Ghana where the importance of hydrographic surveying in the development of a water/lake transportation system is highlighted (3).

Hydrography because it helps better know the Maritime environment as far as Bathymetry, underwater topography, sea bed, tide, current, wave, chemical properties of water are concerned is indeed a very useful tool in the hand of the decision-maker (maritime policy maker as well as enforcer). As a consequence, hydrography in a matter of Ocean Governance will help to set policies (transportation waterways, the safety of life at sea, Engineering of Marine Infrastructures, preservation of the environment, pollution, sustainability, marine resource management, marine exploration, and exploitation, etc.); and enforce the above policies to get the most out of the maritime environment (Blue Economy) in a sustainable way and without jeopardizing it.

II- Efforts by the African Coastal States to Develop Hydrographic Capacity and the contributions of the International Hydrographic Organization in that prospect

The African continent has 54 countries out of which 38 have access to the sea, although 9 of the countries are members of the International Hydrographic Organization (IHO), only Egypt has national hydrographic capacities at international standards. The truth is that even though since July 2002 there is an obligation for contracting governments to provide hydrographic services, for the Safety of Life at Sea (SOLAS) convention of the

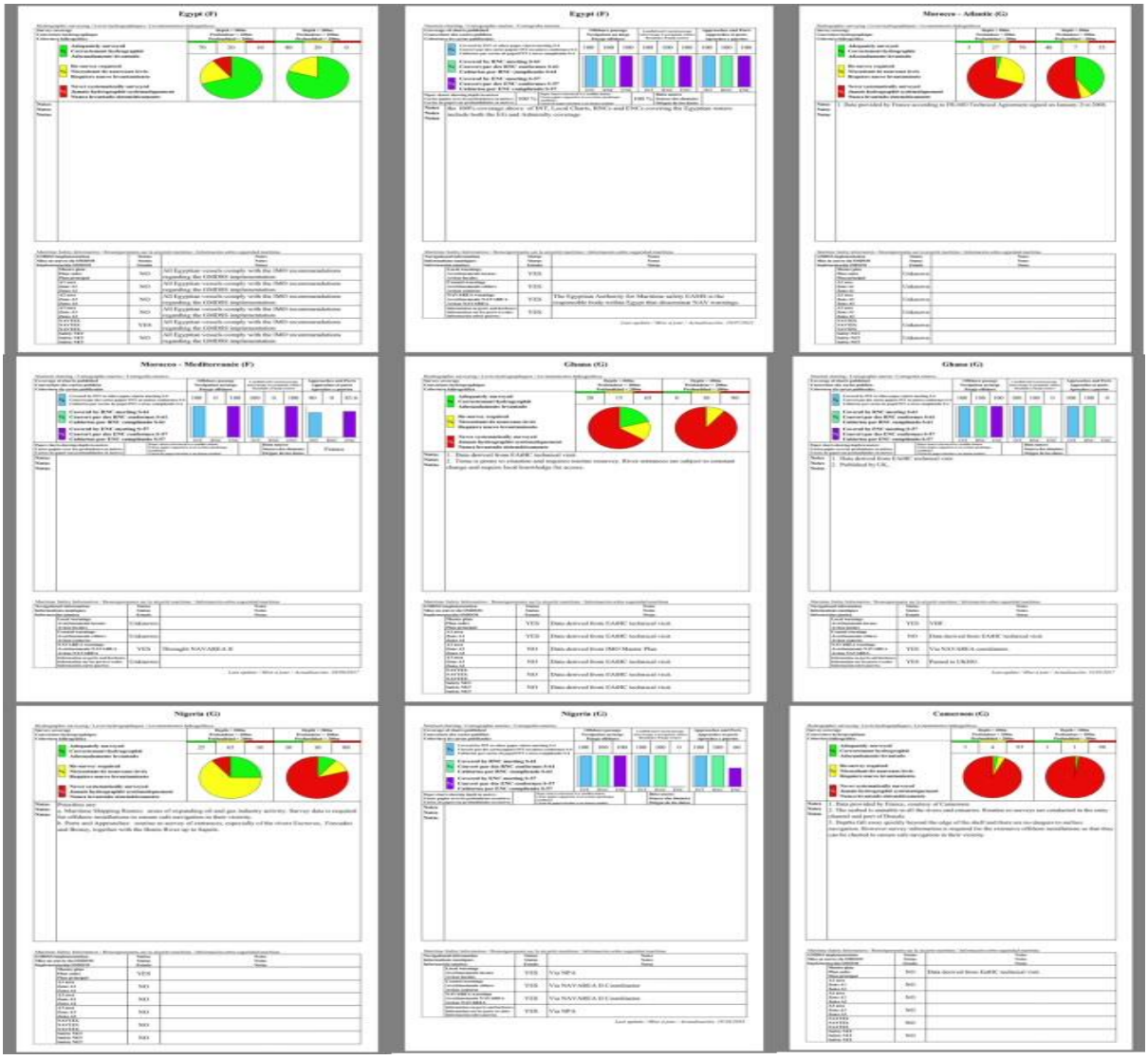
International Maritime Organization (IMO), chapter V regulation 9(5), further supported by a United Nation Resolution in December 2003, even in the few places where those services exist, they are mostly sub-optimal. The reason behind this situation is a lack of awareness and finance. This means there are uncharted waters on the continent with the loss of potential deriving outcomes (safety of navigation, blue economy component, etc.). While this assessment is about all African coastal states, the focus will naturally be on the members of IHO, since they seem more interested in hydrographic capacities with relatively more to bring on the table compared to others (mostly at the awareness and planning phase with various results).

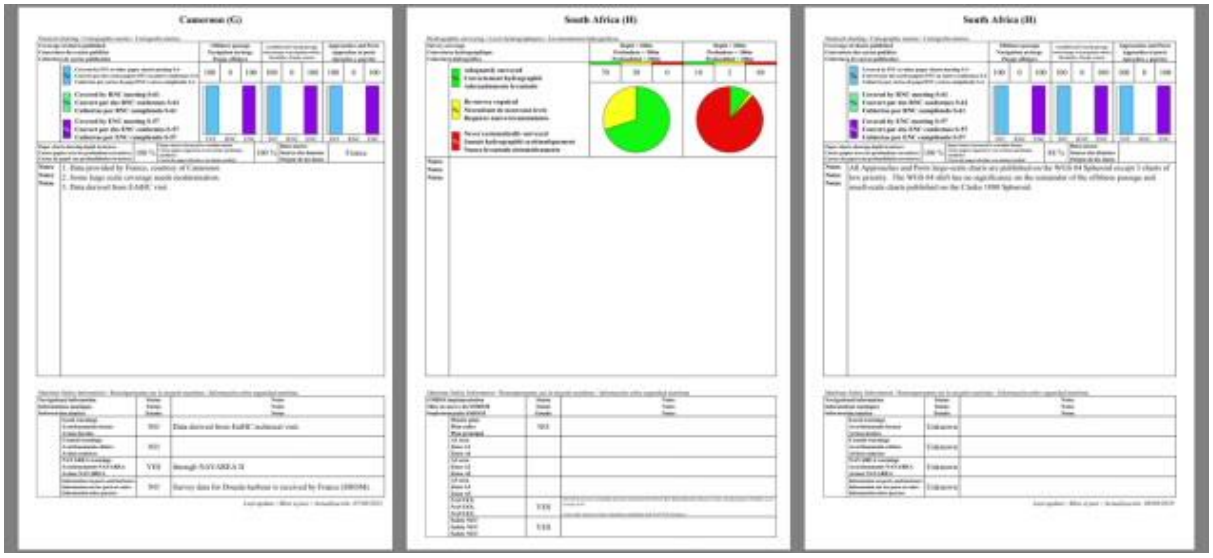
IHO Membership [4]

Out of the 9 African countries members of IHO (excluding the suspended Democratic Republic of Congo), we will bring forth the data of 6 countries for illustration purposes. The criterium used here is respectively, status of hydrographic surveys in the maritime area, Marine Safety Information (GMDSS implementation, collection, and circulation of nautical information), hydrographic survey capacity of the country, independent chart production capacity. Broadly speaking the situation is rather better in the Northern part as compared to the southern part of the continent.

Egypt stands out with an average of 100% in nautical charting, over 75% in hydrographic surveying, and Maritime Safety Information (MSI) requirements fulfilled. In the south of Sahara,

besides South Africa, Nigeria and Ghana are gradually following the steps in terms of capacity building to reach IHO objectives. Besides charting requirements globally poorly fulfilled, Maritime Safety Information is mostly only partially fulfilled. Generally speaking, in the case of Nigeria, it is worth mentioning the recent acquisition of a hydrographic vessel NNS LANA, the declaration of the A3 GMDSS area, and the expected finalization of the creation of a National hydrographic survey agency, are important steps towards fulfilling the obligations and objectives stated above. In the case of Ghana, the gradual availability of hydrographic survey programs at the Regional Maritime University of Accra provides a sorely needed training venue in the region. Though limited hydrographic capacity exists, the creation of the National Hydrographic and Oceanographic Committee is an important step towards fulfilling the countries obligations in the matter.





Status of hydrographic capacities in Egypt, Morocco, South Africa, Ghana, Nigeria and Cameroon [6]

Because of the situation above, efforts are being carried out on the continent to upgrade the overall hydrographic capacities, from technical visits, seminars workshops to the academic level as illustrated by the creation at the Regional Maritime University in Accra of a program designed to train professionals in the field as a major step towards capacity building in Hydrography (5). Most of all, most of those initiatives are done with the assistance or under the umbrella of IHO. In fact, IHO has a global strategy to advance the hydrography agenda around the world adopted October 10, 2014, that somehow particularly focuses on Africa given its original level in the matter. Starting from the assessment of the current hydrographic capacity of a given government and arrangements to assist the latter to achieve sustainable development and improvement of its abilities to achieve its hydrographic, cartographic, and maritime safety obligations, particularly keeping in mind the recommendations from UNCLOS, SOLAS convention, and other international instruments. The current assessment is illustrated in the IHO Publication: Status of hydrographic Surveying and Charting Worldwide (6).

The bottom line is, IHO considers hydrographic capacities a vital component of the efforts from organizations and international instruments to support UN development goals. IHO strategy is consistent with several principles (individual national needs for infrastructure, appropriate skills and technology transfer, regional coordination of projects, when possible, capacity building embraced as national interest for the receiving government, etc.).

Aiming at short/medium term (mainly awareness and planning) and long-term objectives (mainly action towards the obligations), the IHO capacity building process is built around 4 important steps: *Awareness, Assessment, Analysis, and Action.*

	IHO	CBSC	RHC	Country
Awareness	XXX	XXXX	XX	X
Assessment	X	XXX	XXXX	XX
Analysis	XXXX	XXX	XX	X
Action	X	XX	XXX	XXXX

Table 1: Degree of engagement (X = Low, XX = Medium-low, XXX = Medium-high, XXXX = High)

The overall process and Phases of the development of hydrographic surveying and nautical chart capability[6] *Nota CBSC: Capacity Bulding Sub Committee, RHC: Regional Hydrographic Commission*

There is eventually no question about whether it is worth fulfilling the hydrographic capacity requirement, since experts evaluate the benefit cost ratio associated around 10[7].

III- Optimization of National Hydrographic Capacity for Ocean Governance in Africa.

In their efforts to set up hydrographic capacity as described above; African states face many challenges that should be addressed if we want to optimize national hydrographic capacities for ocean governance in Africa. One of the main issues surrounding the development of hydrographic capabilities by local governments is the *financial weight* it represents (quality hydrographic services come with a cost, from permanently meeting the Maritime Security Information Requirements, acquiring state of the art survey types of equipment, to locally producing internationally recognized navigation charts). Even though the cost-benefit aspect is not in question. Next is *the*

level of expertise or training needed particularly for a country starting from almost nothing. One should not forget the fact that in some cases, *some governments are not aware* of their obligations in terms of hydrographic capacities but also of the benefit expected for the overall economy. Drawing from the Arctic example with the correlated rush to resources or optimized trade routes, since most African waters are poorly surveyed (in terms of hydrography) one could easily imagine new opportunities following the resolution of this problem. From optimized waterways trade routes to new venues for resources exploitation, etc. with the known consequences on the blue economy.

Lack of awareness

This situation can be addressed through sensitization campaigns to let governments officials and other high-level decision-makers when it comes to hydrographic capacities, know the importance of the latter as related to safety to navigation, human security, blue economy, peace, and stability. This approach is already put into practice by IHO through its capacity-building strategy.

Finance.

One of the ways to address financial issues in setting up state-of-the-art hydrographic capacities is to follow IHO recommendations, mainly the one suggesting to consider where possible a regional approach. This can also be done through instances like Regional Hydrographic Commissions. In this case, many neighboring countries can individually develop skills that will benefit the group and contribute to fulfilling SOLAS obligation regarding hydrographic capacities cost-effectively, Regional Hydrographic institutions can also be used to quickly train in a cost-effective way the professionals needed to efficiently meet the obligations. Expensive assets like survey ships, navigation chart systems, or to fulfill their survey, charting, and Maritime Safety requirements while gradually acquiring national assets for the same purpose. While setting their hydrographic capacities, African states by investing in new technologies can also cut down on the price of hydrographic survey types of equipment, reducing at the same occasion the financial burden. This is particularly true in the sector of Hydrographic survey in waters less than 50 meters deep. This sector includes internal waters, approaches. Waters around seaports, etc. This sector is most of the time set as a priority by countries gradually engaging in hydrographic surveys. Taking advance of new technologies, this sector can be surveyed without the need of

a survey ship, standard ships can be used with specific assets tailored to execute the Hydrographic survey, in a very cost-effective way.

Levels of Expertise

Besides the finance to buy hydrographic assets needed to conduct surveys, the science of hydrography requires a precise level of expertise particularly if the ambition is to fulfill all the IHO requirements (conduct surveys, provide MSI, production electronic or printed navigation chart). In the case of Africa, one way of optimizing hydrographic capacities might be by gradually training entry and mid-level hydrographers in regional hydrographic institutions. Then training senior-level hydrographers at world-renowned hydrographic institutions to train the trainers. With this approach, each state doesn't have to have a training institution in Hydrography, yet once the momentum is gained, the skills professional previously training can gradually help set up those national hydrographic training institutions. One of the objectives of the regional hydrographic training instruction should also be to be able to end up training senior professionals in hydrography.

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Resource sharing and prioritization.

A country with assets and skills in hydrography can also use its expertise to cover at a cost the needs of a neighboring country and provide services like hydrographic surveys, navigation chart production, On Job Training in the same spirit, etc. The same can be done with human resources (professional hydrography, lecturers, and scientists) as described above.

By prioritizing specific locations like ports vicinities, entrance channels, maritime approaches, etc the few resources available can the used to provide the most one can get by safeguarding sea trade and ports operations with the expected outcome on the blue economy. The same can be done with the very few charting capacities available on the continent, by prioritizing region services.

The approaches described above will help to get the most out of the limited hydrographic capacities in Africa for Ocean Governance, by creating a particular dynamic and synergy, hence optimizing the process.

The African continent's hydrographic capacities is currently under the required international standards/obligations even for many coastal states signatories of the SOLAS convention. This results in uncharted waters with the related safety concerns, maritime trade limitation and overall blue economy consequences as decisions makers are yet to fully not what is going on in their maritime environment and how to effectively set policies and implement them to get the most out of it. When this potential is exploited (like in fisheries), it is done without the overall picture, and without pollution control or the idea of sustainability. Yet the potential of the African blue economy is huge and mostly untapped. It follows that national hydrographic capacity is a key enabler to credible ocean governance. But as awareness is slowly growing about the positive outcomes of hydrographic capacities with the help of institutions like IHO, hope is still around. Proper strategic decisions on the continent can even help optimize national hydrographic capacities on the continent for Ocean governance. This can be done through sensitization on the issue, regional approach to address financial concerns, investment in human resources, resource sharing and prioritization. Efforts in hydrography are worth it as experts consider that the return on investment is good as the benefit cost ratio is around 10. Leaving not doubt about the question: should we act?

Therefore, as curious as it might first seem, despite the limited income level of many coastal states in Africa, it makes more sense to invest the money needed to fulfill IMO's requirements relative to national hydrographic capacity as this will unleash their potential and boost their economy. The potentially huge blue economy in Africa will be given a change, in a sustainability way, with the long-term effects known as human security, peace and stability.

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