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A Study on the Improvement of Philippine Maritime Traffic Environment and Safety Management System

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필리핀 해상 교통 환경과 안전 관리 시스템 개선에 관한 연구

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Abstract

The paper presents the Philippine maritime condition, safety systems and navigational aids. It aims to uplift the maritime safety systems and infrastructures by studying the different strata of the industry, thereby emphasizing on the structures, weaknesses and opportunities. It presents the different maritime agencies involved and each responsibilities. Data from PPA demonstrate the statistics of increase in the cargo throughput, passenger, shipcalls and cargo-container handled in the year 2014. It also highlights the insufficiency of different navigational aids, VTMS, MBS and TSS placed in the whole archipelago. It gathers data of maritime accidents in 10-year period, 2006-2015, showing the most occurred accidents, casualties and areas these accidents happened. It includes the weather phenomena which contribute to the maritime movements and accidents incidence. The results show that systems and infrastructures that focus on the lack of improvement in technology and over-lapping functions of different agencies of government require development and upgrading.

Key words : Maritime Accidents, Philippine Coast Guard, Maritime Industry Authority, Navigational aids, Philippine VTMS.

Ⅰ. Introduction

The Philippines has approximately 7,107 islands and its coastline extends to about 36,289 kilometers long (Philippines Environment Monitor, 2015). Most of the people converge in big cities and progressive municipalities because of economic opportunities, education, and livelihood. Hence, shipping plays a very important role in transporting goods and peoples between the islands especially in the central and southern regions of the country.

This archipelagic setting requires an efficient maritime transportation system and navigational safety infrastructures.

However, numerous sea accidents had caused thousands of lives of casualties. These tragedies occurred in the 80's, and 90's and most are still unresolved until the present time. Most of the maritime traffic and safety systems need upgrading, development and maintenance to efficiently function

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in this sector of transportation.

This paper uses a descriptive research methodology on the maritime situation in the country introducing the different maritime agencies that make the spectrum of safety, operational and systems, among others, that constitute the holistic structure of maritime behaviour prevalent in the country. Its ultimate aim is to demonstrate the maritime condition and safety system, and bring awareness to the present maritime condition for enhancement and further development.

The data were gathered from the different maritime agencies of the country presented in Section 2.1. The shipping statistics were taken from the PPA and CPA data in Section 2.2, and the traffic management in 2.4. A visit and face-to-face interview with VTMS personnel yielded the TSS data. The maritime accidents and AtoN data were contributed by the PCG and exhaustively presented and graphed in section 2.6. Data about the weather phenomena and other data were taken from the official and relevant websites duly noted in the references. These information are compiled and presented in graphs and figures.

Ⅱ. The Maritime Condition and Systems

1. The Philippine Maritime Agencies

The Department of Transportation (DOTr) is the main body in-charge to all manners of transportation in the country. Under its jurisdiction that handles maritime affairs are: Maritime Industry Authority (MARINA), the regulatory authority for shipping - supervision, regulation and rationalization of the organizational management, ownership, and operations of all water transport utilities; all sea-borne carriers and shipping companies, including those in logistics. (Maritime Industry Authority, 2016) The Philippine Coast Guard [PCG] promotes the safety of life and property at sea; the marine environment and resources; enforces all applicable maritime laws; and other seaborne activities. There are two agencies in-charge of ports operations, development, and regulations: the Philippine Ports Authority [PPA] and the Cebu Ports Authority [CPA]. CPA is responsible to all the ports under the Cebu City jurisdiction while the PPA is in-charge for the rest of the ports in the country. For the dissemination of timely weather condition information which the aforementioned agencies abide and make basis their shipping movement schedules is the Philippine Atmospheric, Geophysical & Astronomical Services Administration [PAGASA].

2. Maritime Traffic, Routes and Terminals

Data from Marina of the country's domestic fleet for the mid-year (June 2015) inventory was 11,368 vessels for merchant fleet, in different types of service, and the fishing fleet which is very vibrant in domestic shipping traffic was 12,293, 52% of total domestic fleet. Table 1 tabulates the domestic fleet inventory. Past the average 20-year olds are the tanker ships (20.96), tugs (28.40), dredgers (22.10) and others at 21.38. Maritime Industry Authority (2016b)

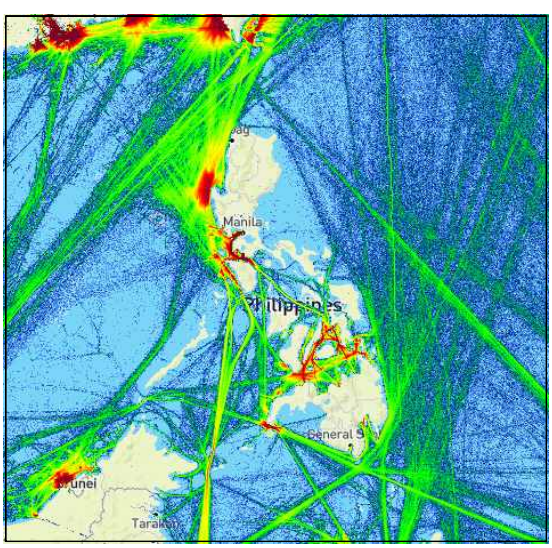
PPA, in its 2014 Annual Report, declared in its Shipping and Trade Performance that ship traffic or vessel calls at 362,994, up by 1.82%, 353,323 (97%) were domestic ships; passenger traffic at 55.900M, up by 3.94%; cargo throughput at 214.813MMTs, up by 6.31%, 135MMTs (63%) was foreign; and container traffic at 5.525M TEUs, an

<Table 1> Domestic Fleet Inventory (30 June 2015)

Type of Service	No of Vessels	Total GRT	Ave GRT	Ave Age
MerchantFleet	**11,368**	**2,456,032.59**	**216.05**	**12.82**
Passenger	6,979	404,318.13	57.93	9.53
Cargo	3,264	1,661,419.03	509.01	16.06
Tanker	252	268,374.76	1064.98	20.96
Tug	583	65,545.37	112.43	28.40
Dredger	29	13,707.20	472.66	22.10
Yacht	24	95.16	3.97	6.08
Spcl Purpose Ship	18	3,704.39	205.80	17.39
Misc Ship	90	20,584.42	228.72	11.45
Others	129	18,284.13	141.74	21.38
Fishing	**12,293**	**420,404.35**	**34.20**	**12.85**
TOTAL	**23,661**	**2,876,436.94**	**121.57**	**12.83**

Source: MARINA(2016b)

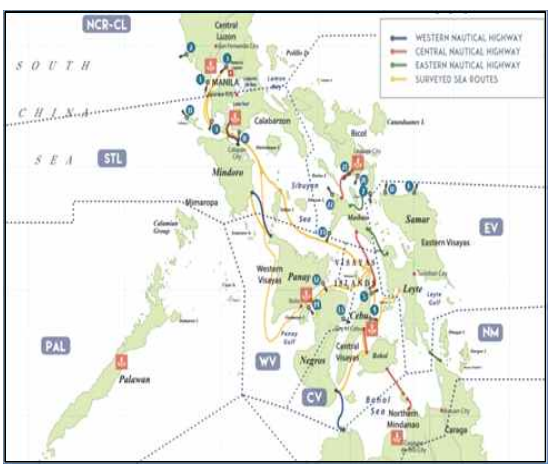
increase of 5.47M, where 61% foreign. All the increases are based from the previous year, 2013, statistics. (PPA Annual Report, 2014)



[Fig. 1] Philippine traffic density map for 2015.

Source: http://www.marinetraffic.com/en/ais/home/centerx.

[Fig. 1] shows the shipping traffic density for 2015. Most of the traffic is concentrated at the eastern part of the country to-and-fro Manila Bay area, off the coast of Lingayen Gulf in the province of Pangasinan and the central part between the islands converging at Cebu, Iloilo, Tacloban, Dumaguete, Cagayan de Oro, Davao, and other major cities. Customary routes used by the domestic shipping also show dense concentration of traffic at Verde Island passage, and the straits of San Bernardino, Zamboanga, Sarangani, Sibuyan and others.



[Fig. 2] Traditional sea-routes from Manila to Central Visayas regions and Northern Mindanao.

[Fig. 2] plots the traditional routes taken by domestic and foreign vessels from the main port of Manila to the major cities and destinations in the central Visayas and northern Mindanao. These areas are also the main storm-paths during the typhoon seasons (See [Fig. 8], Sec. 2.5).

3. The Navigational Aids

In the recent survey of lightstations Central Visayas alone found many issues or discrepancies to the AtoN in placed. These include lighthouse structure and colors; functions; naming; coordinates;

characteristics; protection and security of the equipment; obstructions, etc. from different records. In the same report also found issues with buoys although of lesser and different categories. (KOICA Interim Report, 2016)

<Table 2> shows the Philippine Coast Guard regional locations and status of the lighthouses in 2014 with 364 operational and 198 not operating either deactivated or under-construction. (PCG, 2014)

<Table 2> Philippine Light-Station Status as of 2014

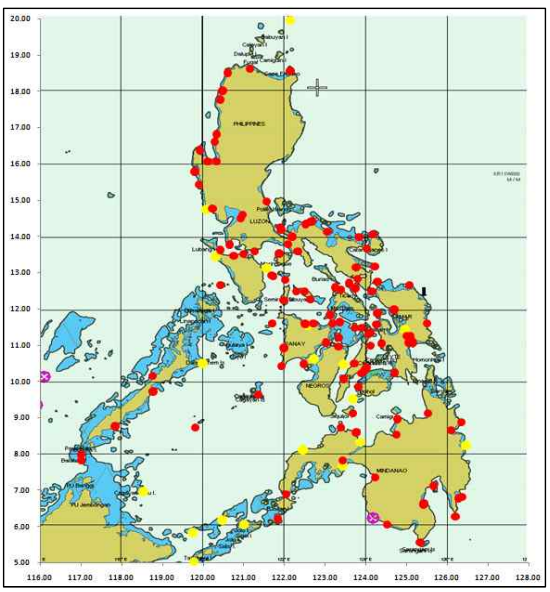
DISTRICT - REGIONS[6]	OPNL	NON-OPNL	TOTAL	%
National Capital Region – Central Luzon	27	12	39	69.2%
Central Visayas	52	18	70	74.3%
Eastern Visayas	23	34	57	40.4%
South-West Mindanao	12	6	18	66.7%
Palawan	33	0	33	100.0%
Southern Tagalog	67	34	101	66.3%
Western Visayas	22	26	48	45.8%
North-Western Luzon	15	10	25	60.0%
North-Eastern Luzon	6	8	14	42.8%
South-East Mindanao	23	9	32	71.9%
Bicol	45	24	69	65.2%
Northern Mindanao	39	17	56	69.6%
TOTAL	**364**	**198**	**562**	**64.8%**

Source: PCG (2014)

[Fig. 3] shows the lights of 11-20NM visibility range. The red dots are the operational and the yellow ones are “temporarily extinguished” or un-operational (UKHO, 2013)

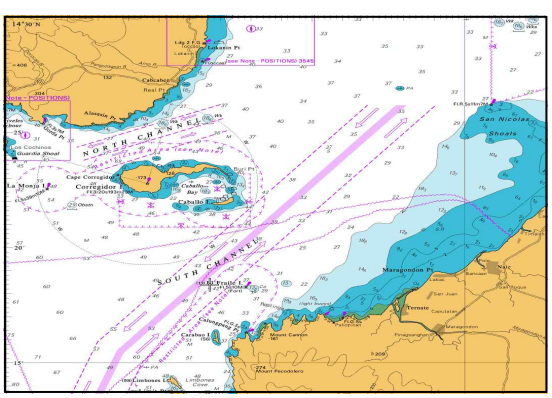
4. Vessel Traffic Management Systems

There are presently two fully-equipped VTMS installations in Manila Bay (MICT, Port of Manila and Corregidor Is), and in the port of Batangas.



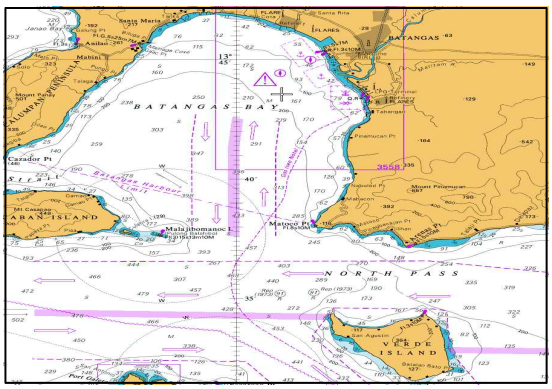
[Fig. 3] Light range 11-20nm visibility

These are operated by the PPA. TSS were likewise established at Manila Bay at the north and the south entrances to the Bay straddling the Corregidor Island [Fig. 4](PCG, 2003).

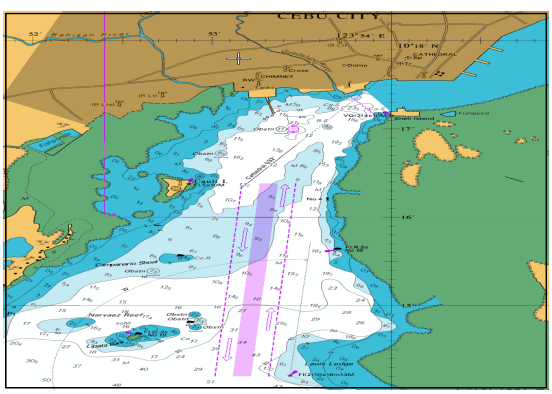


[Fig. 4] Entrance to Manila Bay - Northern and Southern Channels - TSS

The entrance to the Batangas Bay where an upgraded and modern port was built, there also established a TSS connecting with the traffic system covering the Verde Is. Passage ([Fig. 5]).



[Fig. 5] Batangas Bay & Verde Is Passage TSS



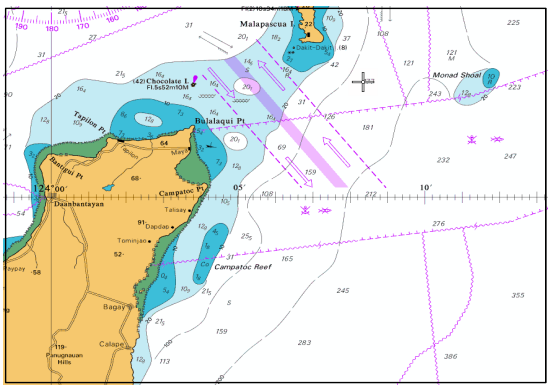
[Fig. 6] Southern entrance TSS to Cebu

In Cebu Island, TSS were also established at the southern entrance to Cebu City ([Fig. 6]) and another along the northern tip of the island between Chocolate Lt. and Malapascua Island ([Fig. 7]). All these traffic systems, however, were local regulations and are not IMO approved.

5. The Meteorological Systems

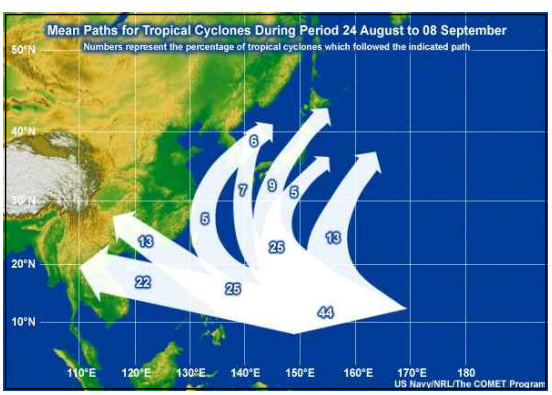
The country is located at what is known as the "typhoon belt" of the western side of the North Pacific Ocean. Typhoons averages at 20 entering the Philippine area of responsibility, although about only 9 make landfalls(PAGASA, 2015).

Most maritime accidents in these areas are



[Fig. 7] Chocolate Is. (Camotes Sea) TSS

attributed to bad weather, bad policies and poor judgment of management personnel onboard and in the company offices, among others.



[Fig. 8] Mean Paths of Tropical Cyclones During Period 24 August to 08 September

Source: http://www.westernpacificweather.com/education/tropical- cyclone-overview/

6. Maritime Accidents

Maritime accidents and incidents were culled from the years 2006-2015. The data provided by the PCG are those that the PCG Board of Marine Inquiry promulgated(Philippine Coast Guard Headquarters 2015). These cases were mostly the major accidents or cases with major impacts. There are other big and minor accidents that never

reached BMI investigations. There were 37 incidents from 2006-2015 tabulated in <Table 3> showing the nature of accidents, regions where they occurred, the casualties and those who survived. In 2012 accidents, no data were recorded of casualties.

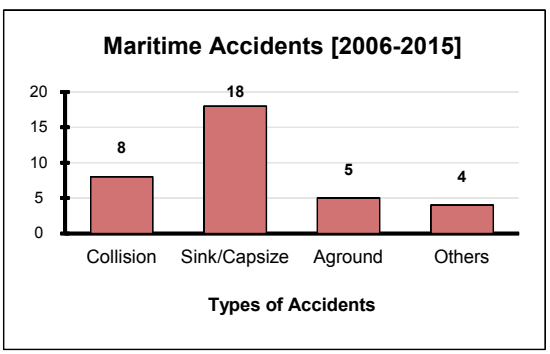
<Table 3> Maritime Accidents (2006-2015) HQ PCG - Board of Marine Inquiry

Year	Type of Incident	Region	Dead	Miss	Survive
2014	Collision	NCR	8	2	13
2013	Collision	Cebu	116	21	733
	Sinking	Bicol	2	7	61
	Capsize	Bicol	4		22
2012	Sinking	NCR			
	Aground	Palawan			
	Hitting	NCR			
	Sinking	WV			16
2011	Collision	SEM			
	Aground	CEV			
	Fire/Sink	CEV	3		71
	Collision	SEM	2		21
	Sinking	WV			178
	Aground	SEM			
	Collision	NCR	3		
	Collision	CEV			
2010	Sinking	STL	6	8	3
	Sinking	NCR		1	9
	Damaged	NCR			
	Near Miss	STL			
2009	Capsize	STL	6	42	70
	Collision	NCR	10	17	46
	Collision	CEV	NA		
	Capsize/Sink				958
	Aground	CEV			
	Capsize	STL	12		43
2008	Capsize	Reg. 2	47	30	45
	Capsize	WV R-6	14		30
	Capsize	Bicol	42	10	105
	Ramming	WV			
	Sinking	WV	2	2	24
	*Capsize	CEV	437	605	32
		EV		11	2
2007	Capsize	STL	11		126
	Burn/Sink	STL	5	12	282
	Aground	WV			
2006	Sinking	WV		2	16

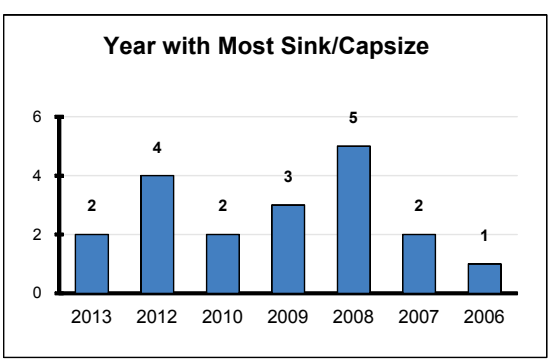
Source: Philippine Coast Guard Headquarters (2015).

2011 has the most accidents (8), however, it was the capsizing of MV "Princess of the Stars" in the vicinity of Sibuyan Island in 2008 (7 accidents) that has the most casualties (437 dead and 605 missing).

[Fig. 9] graphs the number according to the nature of accidents. Sinking/capsizing has the most at 18, followed by collision, 8 and aground by 5. Other, 4, include ramming, near miss, damaged and an undeclared cause.

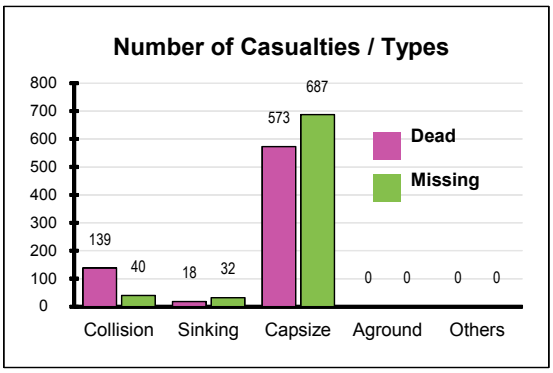


[Fig. 9] Maritime accidents promulgated by PCG-BMI from 2006-2015



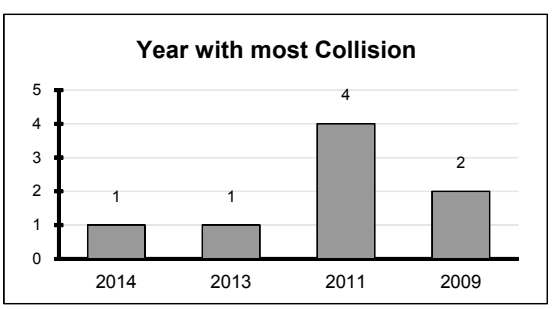
[Fig. 10] The year with the most sinkage/capsized

[Fig. 10] shows the most fatal of all accidents, sinking and capsizing. 2008 has 5 sinkage and it has also the most casualties (<Table 3> and [Fig. 11]). It was followed by 2012 with 4, and 3 in 2009.

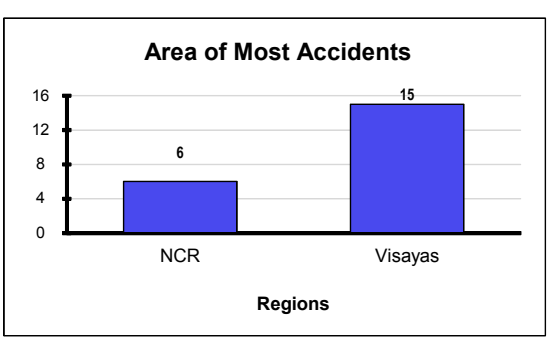


[Fig. 11] The types of accidents with the most casualties

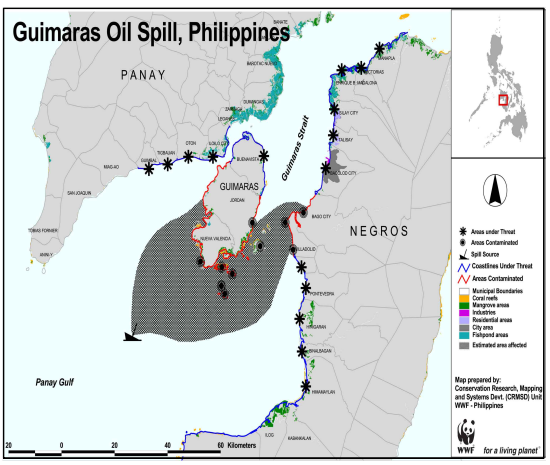
Collision accidents is graphed in [Fig. 12] at year 2011 with 4, followed by 2009 at 2. Collision occurred at NCR and Eastern Visayas regions with 3 each and 2 at Southeastern Mindanao. These are the areas also where most accidents between 2006-2015 occurred shown in [Fig. 13].



[Fig. 12] Year with the most collision accidents



[Fig. 13] Area/regions where most accidents occurred



[Fig. 14] MT 'Solar-1' oil spill effects
Source: https://www.guimaras+oil+spill

The sinking of motor tanker 'Solar-1' in 2006, [Fig. 14] and <Table 3>, occurred in Panay Gulf where two crew members were lost to sea and spilled about 2,000 tons of fuel oil to the sea contaminating 125 kilometers of shorelines and about 500 hectares of mangroves causing major impact to the fishing industry, marine life and ecosystem, and tourism industry in the Guimaras and Negros Islands ([Fig. 15]). (Solar 1, Philippines, 2006).

[Fig. 15] Damage to environment caused by the Guimaras Oil Spill
Source: http://www.greenpeace.org/

Ⅲ. Marine Accident Implication and Improvement on Technology

This paper showed the difficulties and weaknesses of the Philippine maritime infrastructures and safety systems;

① There are different maritime agencies that has overlapping functions and responsibilities, like the PPA handling of VTMS. The vast functions of MARINA that encroach on some PCG functions.

② The inadequate VTS systems in the country, only 2 at present in Manila Bay and Batangas Bay.

③ The inadequate and antiquated AtoN that includes MBS and maintenance of lighthouses and buoys.

④ The prompt dissemination of weather information. The delay or misinformation of weather condition specially at times of imminent typhoon occurrence contributed to sinking/capsizing accidents causing large casualties.

To enhance the maritime safety and improve the systems in the country, this paper, thus, recommends;

① Re-aligning the different functions of each maritime agencies and ensuring that responsibilities are assigned to respective agencies' expertise,

② Training of personnel handling vital systems, i.e. VTMS operations.

③ Proper maintenance and development of Lighthouses, MBS and VTS. Due to advancing technology, lightstations might seem irrelevant nowadays, however, these structures can be rehabilitated for further use and purposes.

④ Collision and sinking are the most occurred accidents with heavy toll of casualties. Strict implementation of safety maritime movement policies should be observed and rescinding those policies redundant or irrelevant to the contemporary time of maritime behaviour and practice.

Ⅳ. Conclusion

From the foregoing study, the maritime conditions in the Philippines show little improvement in the safety infrastructure and procedural systems. The DoTr and all the maritime agencies, including the GOCCs, are not developing the maritime sector while PPA shows increases in shipping and trade performance in the major ports of the country.

There is an increasing density of maritime traffic coasting in the eastern shores- from Bolinao in Pangasinan, Manila Bay and Cape Verde Passage, to the central parts of the Visayan waterways. The AtoN systems described the insufficient maintenance and upgrading: only 65% of lightstations are operational; only two VTMS are in place (MAnila Bay and Batangas Bay); lacking routing systems and TSS in the major shipping lanes; the untimely coordination of weather dissemination to maritime main and ancillary players which contribute to maritime accidents caused to vessels.

Although, the number of accidents is decreasing in recent years, the un-reported incidents are still prevalent, mainly due to the incapacity of PCG to monitor all the coastlines of the archipelago mainly because of procedural lapses and lack of equipment. The Visayas region shows the highest

volume of accidents with capsizing as the major cause.

As indicated in Chapter III, there is a necessity to improve the systems, re-study and revise when necessary the functions of the different maritime agencies and, install and upgrade maritime monitoring equipment to the present demands of technology to monitor safety; mitigate and prevent accidents in the maritime sector.

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