Threats, challenges and opportunities to marine protected areas in the coral triangle area: a case study of Indonesia sea

Baso Hamdani
Threats, Challenges and Opportunities to Marine Protected Areas in the Coral Triangle Area: a Case Study of Indonesia Sea.

By

Baso Hamdani
Student Number: W1701278

A dissertation submitted to the World Maritime University in partial fulfillment of the requirements for the award of the degree of

MASTER OF SCIENCE
In
MARITIME AFFAIRS
(OCEAN SUSTAINABILITY, GOVERNANCE AND MANAGEMENT)

2018

Copyright Baso Hamdani, 2018
Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University,

(Signature):    .................................................................
(Date):        .................................................................

Supervised by:            Dr. Mary Wisz
Supervisor's affiliation   World Maritime University
Acknowledgement

I am most grateful to God Almighty for the guidance, protection and physical and mental health bestowed on me to succeed my studies at the World Maritime University (WMU) in Malmo, Sweden. My special appreciation and thanks to Indonesia Endowment Fund for Education (LPDP) for sponsoring me throughout my studies at the university.

It is beyond of my capability and hardly possible to produce an academic piece of work of this research without appropriate guidance from certain personalities. In this respect, my most appreciation and sincere goes to my supervisor, Dr. Mary Wisz for his patience, guidance and precious time. Furthermore, some firm criticism and candid with respect to succeed this project.

Next, my profound gratitude goes to the head of OSGM faculty, Professor Larry Hilderbrand and the internal staff and administration of WMU for their precious time, guidance and counseling throughout my academic process at WMU.

In this dissertation, I also appreciate to my mother, Sitti Hadyang, and my sisters, Indo Esse and Besse Jumriani, for the moral support, encouragement, love, and assistance in my whole study period as well as my grandmother, Hj Ummi Hani, who had rested in peace in my study period.

To my lovely Indonesian friends of WMU (Rouland Prakarsa Koswara, Tri Wahyunita, John Freddy Bastanta Lubis, Ardy Kusuma, Obby Hadrian and Kaisar Akhir), Rishi Mondal, Taofik Boumgard, and my flat mates (Enrique Blazques Cor and Gonzalo Pena Rojas), I wish to express my deep and sincere appreciation for your time, togetherness, and support during my life in Malmo. You are the key of my life during my study through strongest of hope and inspiration.

Finally to all my family, friends, S18 classmates, and OSGM classmates, I say thanks for the unrelenting continuous encouragement, time, memory and collaboration.
Abstract

Title of Dissertation: Threats, Challenges and Opportunities to Marine Protected Areas in the Coral Triangle Area Case Study of Indonesia Sea.

Degree: MSc

The Coral triangle is world epicenter of marine biodiversity and covers the tropical area between the Indian and Pacific oceans. Indonesia is one of the countries in The Coral Triangle that has committed to support Aichi Biodiversity Targets by enhancing the status of biodiversity protection including coastal and marine areas at least 10%, reaching 20 million Ha in 2020. However, there are many issues arise in managing this rich marine biodiversity. One of the threats is ship grounding, for example, in 20017, the Calledonian Sky cannot be a risk but it is a real happened causing huge impact to marine environment in Raja Ampat, Indonesia while the challenges is providing adaptive management and governance for MPAs. Furthermore, to provide recommendation of MPA management in Indonesia SWOT and followed by Modified Institutional Analysis and Development IAD through systematic literature review, interview and GIS analysis. Data are gathered from Ministries in Indonesia (Ministry of Marine Affairs, Ministry of Transportation, Ministry of Environment and Forestry, and Coordinating Ministry of Maritime Affairs) and some stakeholders such as NGOs. There are several recommendation provided for ship grounding and MPA management which are effective and integrated adaptive MPA management, long-term analysis of ship traffic, ship line in MPA zone for tourism purpose and monitoring of ship traffic, liability and compensation of ship accident, Particularly Sea Sensitive Areas (PSSA) designation.

Keyword: Ship grounding, MPA, SWOT, Coral Triangle, Indonesia Sea, Calledonian Sky.
# Table of Contents

Declaration ........................................................................................................................................... ii
Acknowledgement ............................................................................................................................... iii
Abstract ................................................................................................................................................ iv
List of Figure .......................................................................................................................................... ix
List of Table ........................................................................................................................................... x
Chapter 1 ............................................................................................................................................... 1

**Effective Management Factors of MPAs in Coral Triangle and the Vulnerability of the MPAs** .............................................. 1

1.1 Introduction ...................................................................................................................................... 1
1.2 Effectiveness Factors ....................................................................................................................... 2
  1.2.1 Procedural Aspects ...................................................................................................................... 3
    1.2.1.1 Budget Capacity/Sufficient finance for sustainable management ..................................... 3
    1.2.1.2 Staff capacity/presence ........................................................................................................ 4
    1.2.1.3 Implementation of Planned Management Activities .......................................................... 5
    1.2.1.4 Degree of Monitoring of Managements, Users, and/or Resource Condition .................... 5
    1.2.1.5 Level of Enforcement ........................................................................................................... 5
    1.2.1.6 Delineation of Protected Area Boundaries ......................................................................... 6
    1.2.1.7 Appropriateness of Regulations Controlling Use ............................................................... 6
    1.2.1.8 Level of Legislative Support ................................................................................................. 7
  1.2.2 Substantive Aspects ................................................................................................................... 8
    1.2.2.1 Stakeholders Engagement .................................................................................................... 8
    1.2.2.3 Species or Habitat Condition .............................................................................................. 8
    1.2.2.3 Status of Environmental Threats .......................................................................................... 8
    1.2.2.4 Degrees os Social Conflicts ............................................................................................... 8
    1.2.2.5 Well-Being and Affected Communities .............................................................................. 10
1.3 Objectives of the Study .................................................................................................................. 10
1.4. Research Methodology ................................................................................................................ 10
1.5 Structure of Dissertation .............................................................................................................. 11
Chapter 2 .......................................................................................................................... 12
Global Review of Best Available Practice for Implementation of the Adaptive Management of MPAs.................................................................................................................. 12
2.1 Why Focus on Adaptive Management ........................................................................ 12
2.2 Adaptive Management ............................................................................................... 13
2.2.1 Defined Objectives ............................................................................................... 14
2.2.2 Dynamic Conservation Planning .......................................................................... 14
2.2.2 Adaptive Conservation Strategies ......................................................................... 14
2.2.3 Systematic Monitoring ......................................................................................... 15
2.2.4 Evaluation of Progress towards Objectives .......................................................... 16
2.2.5 Flexible Management Structure .......................................................................... 16
2.2.6. Locally implemented and managed MPAs .......................................................... 16
2.3 Precautionary Approach ......................................................................................... 17
2.4 MPA Implementation ............................................................................................... 17

Chapter III ...................................................................................................................... 19
Current Management of Indonesia’s MPAs in Coral Triangle .......................................... 19
3.1 Overview of Coral Triangle Area’s MPA Management .............................................. 19
3.1.1 Why Review MPA Management in Indonesia’s Coral Triangle ............................ 20
3.1.2 Adaptive Management in Indonesia’s Coral Triangle ........................................... 20
3.2 Objectives ............................................................................................................... 21
3.2.1 Overview of Practices ......................................................................................... 21
3.2.2 Adaptive Management in Indonesia’s System Identification ............................... 21
3.3 Methodology ............................................................................................................ 21
3.3.1 Systematic Literature Review ............................................................................. 21
3.3.2 Interviews ........................................................................................................... 22
3.3.3 GIS analysis ........................................................................................................ 22
3.4 Adaptive Management Elements Practiced in Indonesia’s CT MPAs ......................... 23
3.4.1 Defined Objectives .............................................................................................. 24
3.4.2 Dynamic Conservation Planning ......................................................................... 24
3.4.3 Adaptive Conservation Strategies ....................................................................... 25
3.4.4 Systematic Monitoring ....................................................................................... 25
3.4.5 Evaluation of Progress towards Objectives ......................................................... 25
3.4.6 Flexible Management Structure ........................................................................................................26
3.4.7 Locally implemented and managed MPAs ......................................................................................26

Chapter IV ..................................................................................................................................................27

Comparative Analysis of Marine Protected Areas in Indonesia to Global Practices ............27
4.1 Indonesia Ocean Policy .........................................................................................................................27
4.1.2 International and National Legislation and Institutional Arrangement ...........................................27
4.1.3 Integrated Coastal Management System ..........................................................................................31
4.3 Comparative Analysis of Marine Protected Areas in Indonesia to Global Practices .............31
4.3.1 Adaptive Management in Great Barrier Reef, Australia: Spatial Zoning and Marine Reserves in Great Barrier Reef (Australia) .................................................................32
4.3.2 Adaptive Management in New Zealand MPA: Robusting decision-making ...............................32
4.4 The Need for Indonesia to Develop MPAs Implementation ...............................................................35
4.5 Challenges of MPA Implementation in Indonesia .............................................................................35

Chapter V ....................................................................................................................................................37

MPA Adaptive Management in Raja Ampat: Lessons Learned and Analysis from the Calledonian Sky Accident ........................................................................................................................................37
5.1 Calledonian Sky Accident in Raja Ampat .........................................................................................37
5.2 Ecosystem Based Management through Marine Spatial Planning in MPAs Zone ..................39
5.3 SWOT Analysis and Modified IAD Analysis ..................................................................................40
5.3.1 Driving Forces ..............................................................................................................................42
5.3.2 Pressure ........................................................................................................................................42
5.3.3 State ............................................................................................................................................45
5.3.4 Capital Assets ..............................................................................................................................45
5.3.5 Action Arena ..............................................................................................................................46

Chapter 6 ...................................................................................................................................................48

Overall Conclusions and Recommendations .........................................................................................48
6.1 Overall Conclusions ............................................................................................................................48
6.2 Recommendations ...............................................................................................................................48
6.2.1 Effective and Integrated Adaptive MPA Management ..............................................................48
6.2.2 Long-Term Analysis of Ship Traffic ............................................................................................49
6.2.3 Ship Route in MPAs zone and Monitoring of Ship Traffic .........................................................49
6.2.4 Liability and Compensation of Ship Accident ...........................................................................49
Reference........................................................................................................................................... 50
Appendices...........................................................................................................................................xii
Appendix 1 - Consent Letter to Participant............................................................................................. xii
Appendix 2 - Research Questionnaire....................................................................................................... xvii
Appendix 3 – Dissertation Letter to Institutions in Indonesia ................................................................. xix
List of Figure

Figure 1. Coral Triangle Area Map (ReefBase, 2018).................................................................1
Figure 2 The Caledonian Sky after Breaking Up the Coral Reef in Raja Ampat, Indonesia (The Guardian, 2017)................................................................................................................2
Figure 3. Regulation related to MPAs management (Kusumawati and Huang, 2015). .............7
Figure 4. Threats intensities among zones in MPAs; study case in 15 Meditteranian MPAs (Zupan et al., 2018)....................................................................................................................9
Figure 6. Research Map Location .............................................................................................23
Figure 7. Maximum Limit of Liability per Tonange of Ship (IOPCF, 2010)...............................28
Figure 10. A modified IAD Framework Concept (Rudd, 2004). ..................................................40
List of Table

Table 1. Two majors factors of MPA effectiveness (Gill et al., 2017) ........................................ 3
Table 2. Coral cover in Indonesia (Source: CRIT, Coremap 2011) .................................................. 45
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
</tr>
<tr>
<td>CBD</td>
<td>Convention on Biological Diversity</td>
</tr>
<tr>
<td>Coremap</td>
<td>Coral Reef Rehabilitation and Management Program</td>
</tr>
<tr>
<td>CT</td>
<td>the Coral Triangle</td>
</tr>
<tr>
<td>CTI</td>
<td>Coral Triangle Initiative</td>
</tr>
<tr>
<td>CMM</td>
<td>Coordinating Ministry of Maritime Affairs</td>
</tr>
<tr>
<td>DPSIR</td>
<td>Driving Forces, Pressures, State, Impact and Responses</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organization of the United Nations</td>
</tr>
<tr>
<td>GEF</td>
<td>The Global Environment Facility</td>
</tr>
<tr>
<td>IAD</td>
<td>The Institutional Analysis</td>
</tr>
<tr>
<td>IUCN</td>
<td>International Union for Conservation Nature</td>
</tr>
<tr>
<td>MEF</td>
<td>Ministry of Environment and Forestry</td>
</tr>
<tr>
<td>MMAF</td>
<td>Ministry of Marine Affairs and Fisheries</td>
</tr>
<tr>
<td>IMO</td>
<td>International Maritime Organization</td>
</tr>
<tr>
<td>IMPACBP</td>
<td>International MPA Capacity Building Program</td>
</tr>
<tr>
<td>IOPCF</td>
<td>International Oil Pollution Compensation Funds</td>
</tr>
<tr>
<td>LIPI</td>
<td>Indonesian Institute of Science</td>
</tr>
<tr>
<td>MARPOL</td>
<td>International Convention for the Prevention of Pollution from Ships</td>
</tr>
<tr>
<td>MMAF</td>
<td>Ministry of Marine Affairs and Fisheries</td>
</tr>
<tr>
<td>MPA</td>
<td>Marine Protected Area</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
</tr>
<tr>
<td>OSPAR</td>
<td>The Convention for the protection of the Marine Environment of the North-East Atlantic</td>
</tr>
<tr>
<td>Pushidrosa</td>
<td>Naval Hydrographic and Oceanography Centre of the Republic of Indonesia</td>
</tr>
<tr>
<td>RFBs</td>
<td>Regional Fisheries Bodies</td>
</tr>
<tr>
<td>Satpol Air</td>
<td>Municipal Police</td>
</tr>
<tr>
<td>SWOT</td>
<td>Strengths, Weaknesses, Opportunities and Threats</td>
</tr>
<tr>
<td>TNC</td>
<td>The Nature Conservancy</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>UNCED</td>
<td>The United Nations Conference on Environment and Development</td>
</tr>
<tr>
<td>UNESCO</td>
<td>The United Nations Educational, Scientific and Cultural Organization</td>
</tr>
<tr>
<td>UNFSA</td>
<td>The United Nations Fish Stocks Agreement</td>
</tr>
<tr>
<td>WSSD</td>
<td>World Summit on Sustainable Development</td>
</tr>
<tr>
<td>VMP</td>
<td>Visitor Management Programme</td>
</tr>
</tbody>
</table>
Chapter 1
Effective Management Factors of MPAs in Coral Triangle and the Vulnerability of the MPAs

1.1 Introduction

MPA is an effective tool for managing the marine resource and sustainability of coastal areas. The aims of an MPA are to protect ecological goals such as biological diversity, habitat, and restoration.

Apart from ecological goals, an MPA also improves the livelihood of the local community, especially for food security. In terms of governance goals, an MPA is a tool for sustaining, integrating and developing effective management structures and strategies (FAO, 2011). Thus, MPAs are very important and can be found in many countries, including countries located in Coral Triangle Area of Indonesia (Figure 1).

Figure 1. Coral Triangle Area Map (ReefBase, 2018).

The Coral Triangle (CT) is a marine region covers about 6 million km². There are approximately 126 million people who live in the CT from six countries (Indonesia, Papua New Guinea, Timor-Leste, the Philippines, Malaysia and Solomon Islands). The CT is the most densely populated area of Indonesia (TNC, 2018). However, about 85% of the reefs in the CT are under
threatened from environmental and anthropogenic stressors. This percentage is actually higher than the global percentage, which is 60% (Burke et al, 2011). One of the particular threats is in the CT is maritime traffic, for example Calledonian Sky incident (MMAF, 2018).

Figure 2 The Caledonian Sky after Breaking Up the Coral Reef in Raja Ampat, Indonesia (The Guardian, 2017).

Generally, the cruise ship industry has been booming but it is also plagued by incidents of environmental pollution. Moreover, it is increasingly difficult to control the damage that is inflicted on coral reefs by cruise ships; on a global scale, the enforcement of the regulations and laws appear to be lax where these incidents are concerned (Klein, 2002).

In other hands, overfishing and destructive fishing were cited as the major threats to the CT (Burke et al, 2011). The other threats come from inland activities, watershed-based pollution, over nutrient, and endangered species exploitation.

1.2 Effectiveness Factors
According to Gill et al (2017), a number of factors influence MPA efficacy including MPA management monitoring, presence of well-defined boundaries, adequacy of enforcement and budget capacity, implementation of management plan, regulation related to MPA and most importantly, if it is legally gazette. Gill also differentiates the effectiveness into two major factors, which explained below:
Table 1. Two majors factors of MPA effectiveness (Gill et al., 2017).

<table>
<thead>
<tr>
<th>No</th>
<th>Procedural</th>
<th>Substantive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Budget capacity</td>
<td>Species or habitat condition</td>
</tr>
<tr>
<td>2</td>
<td>Staff capacity/presence</td>
<td>Status of environmental threats</td>
</tr>
<tr>
<td>3</td>
<td>Implementation of planned management activities</td>
<td>Well-being of affected communities</td>
</tr>
<tr>
<td>4</td>
<td>Degree of monitoring of management, users, and/or resource conditions</td>
<td>Degree of social conflict</td>
</tr>
<tr>
<td>5</td>
<td>Level of enforcement</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Delineation of protected area boundaries</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Appropriateness of regulations controlling use</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Level of legislative support</td>
<td></td>
</tr>
</tbody>
</table>

1.2.1 Procedural Aspects
Procedural is defined as doing something is done by official or usual way (Dictionary C, 2008). In this effectiveness factor, procedural aspect is related to the official system which is run to manage the MPA which are budget capacity, staff capacity/presence, implementation of planned management activities, degree of monitoring of managements, users, and/or resource condition, level of enforcement, degree of monitoring of managements, users, and/or resource condition, level of enforcement, delineation of protected area boundaries, appropriateness of regulations controlling use and level of legislative support (Gill et al., 2017).

Procedural aspect is the most important factor of the MPA effectiveness due to MPA monitoring, management, and finance comes from this aspect. This factor is also can be explored to synergize another factor which are substantive factor. Another reason is procedural factor’s outcome can be predicted and assumed (Gill et al., 2017).

1.2.1.1 Budget Capacity/Sufficient finance for sustainable management
Budget capacity for adaptive MPA management is needed due to some flexibility arrangement and right on target expense consideration, which must to adapt to the recent state of MPA (Cinner et al., 2012).
The expense of MPA implementation and enforcement could be the major challenge to MPA effectiveness not only in the short-term but also in the long-term outcome (Ban et al., 2011). To achieve 10% target of MPA under the Convention on Biological Diversity and SDGs, countries must get the necessary budget for it. Developed countries mostly rely on their internal budget allocation while the major budget support for developing country is via international donors (OECD, 2017). Further, developing countries have major challenges in implementation which is far from the shoreline for instance MPA in Indonesia as an archipelagic country.

Interestingly, according to Gill et al. (2017), it is about 65% of 433 MPAs surveyed around the world are inadequate of budget management. This find support how the critical management of MPA caused of this aspect.

A case study of the Raja Ampat found that there is a slow development of MPA because of the low-priced budget for “paper park” status (Brown, 2017). Sufficient budget to support marine protected area is necessary due to some important expenditure like capacity building support. It is estimated that it costs around USD $16,000 per year in one park, for instance Kofiau Park. With regards to the intact fish biomass, it cost about US $57,000 per year. By this, indirect impact is to ecological target for recovering fish biomasses (Brown, 2017).

1.2.1.2 Staff capacity/presence

The growing number of MPAs requires capacity development on staff such as facilitation training, conflict management, communication skills, interactive, and participatory training skills (Fish and Walton, 2013). In addition, Bellamy and Hill (2010) put priority on five capacity development which are: public awareness and environmental, information management and exchange, development and enforcement of policy and regulatory frameworks, strengthening organizational mandates and structure; and economic instruments and sustainable financing mechanisms. With a good staff capacity, adaptive management are highly possible to implement in MPA management. This is because prudent assessment and monitoring can be more developed well (Cinner et al., 2012).

On a global scale, the important of staff capacity forces the IUCN Protected Area Management to make an International MPA Capacity Building Program (IMPACBP) in seascape scale to increase the effectiveness of MPA implementation and cooperation among local and regional countries (Dudley 2008).
According to Gill et al (2017), it is about 91% of 433 MPAs survey around the world are inadequate of staff capacity. This aspect hinder the effectiveness of MPA management.

1.2.1.3 Implementation of Planned Management Activities
With regards to marine governance and spatial management frameworks, an MPA is a good way to accomplish them into effective policy development. However, implementation about how it has been planned should be clear and well managed. This point is, a key factor for the success of MPA is the management tool especially for adaptive management which require flexible spatial planning (Cinner et al., 2012). Then, the implementation of planned management activities should be in multi-stakeholder approach. This is to engage among them and to recognize the minimum standard of protection and management tools needed.

Furthermore, inshore and offshore MPA locations are different; local communities in inshore area are the direct users of the area and offshore location has a high probability of flexibility and more independent on natural resources. It is important to consider both differences for its successful implementation (FAO, 2011).

1.2.1.4 Degree of Monitoring of managements, users, and/or resource condition
In order to assess, feedback and evaluate the progress of MPA implementation, monitoring is an effective tool for it. In the end, the monitoring controls and achieves the output and outcome of MPA implementation. Moreover, decision-maker and managers could make a better plan and policy to what degree of monitoring could reach the objective of the establishment of an MPA (FAO, 2011).

Research of 433 surveyed shows that only around 13% of MPA areas are monitored by scientific aspects. The monitoring aspects are biological, social and management (Gill et al, 2017),

1.2.1.5 Level of Enforcement
This is related to the political will and it is a vital factor because most of the decisions are made by the politicians rather than at the legislative level. An enforcement should be flexible and adaptable for increasing the MPA management status and development (Cinner et al., 2012).

A recent study of Gill et al (2017) show that level of enforcement is one of significant factors which could be measured as a combination of stakeholders and communities supports.
1.2.1.6 Delineation of Protected Area Boundaries
In some countries, near shore areas are mostly exploited by the local communities. Confusion could be derived from unclear boundaries among MPAs, which can impact the coastal communities, especially fishermen. However, if the delineation is made clearly, fishermen can benefit from the abundance of fish, which comes from the buffer area between exploitation zone and MPA. In addition, fish migration should be well known by for the protection of the species (FAO, 2011).

Another important of delineation of protected area boundaries is conflict. Mismatch situation in delineation could trigger a conflict among stakeholder especially if there is no clear boundaries among MPAs (Chaffin, Gosnell, and Cosens, 2014).

1.2.1.7 Appropriateness of Regulations Controlling Use
Existing and innovation of regulation is the key to a successful MPA for marine conservation management. This is because of its tools to limit fishing activities and to reduce over-exploitation for marine resources by gear, effort and catches limitation.

Furthermore, stakeholders’ engagement regulation for coordination and also agencies for instance are a principle for the management. All regulations are to make sure the marine environment conservation and human activities run well which can be effective and efficient way to reach the adaptive management (Kelleher and Kenchington, 1991).

Another regulation is demarcation and/or regulation of marine/terrestrial boundaries. The well-known boundary limitation is preferable to control the use of marine resource surrounded by MPA areas such as buffer area. Meanwhile, the rest of the regulation which are appropriate but are:

1. Not permitted use area
2. Regulation of activities related to time and/or space such as seasonal closure and zoning. This is for instance in Eastern Indonesia which is related to Sasi; local marine conservation concept.
3. Permanent restrictions
Despite of this aspect, the study of Gill et al (2017) shows that effective biodiversity conservation such as MPAs prioritize staff capacity rather than regulation such as fishing regulation around MPA areas and resource use. In the study, around 69% of 433 MPA survey had appropriate regulations related to MPA management.

1.2.1.8 Level of Legislative Support

Those include the developments, management framework, and regulations of the MPA designation and implementation (Kusumawati and Huang, 2015). When the legislative support are adaptive with complex situation, adaptive management can be reached through those aspects (Chaffin, Gosnell, and Cosens, 2014).

<table>
<thead>
<tr>
<th>Type</th>
<th>WMOIP</th>
<th>WMIPA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government laws</td>
<td>1. Law No. 5 of 1990 about the Conservation of Living Resources and the Ecosystem</td>
<td>8. Law No. 31 of 2004 regarding the Fisheries Amended by Law Number 40 of 2009</td>
</tr>
<tr>
<td></td>
<td>2. Law No. 9 of 1990 about Tourism</td>
<td>9. Law No. 32 of 2004 about Regional Government</td>
</tr>
<tr>
<td></td>
<td>4. Law No. 5 of 1994 about the Ratification of the UN Convention on Biological Diversity</td>
<td>12. Government Regulation No. 60 of 2007 regarding Fisheries Resources Conservation</td>
</tr>
<tr>
<td></td>
<td>5. Law No. 6 of 1996 about Indonesian Waters</td>
<td>13. Ministerial Regulation KP No. Per.27/Men/2008 regarding Protected Area in the Coastal Zones and Small Islands</td>
</tr>
<tr>
<td></td>
<td>9. Law No. 32 of 2004 about Regional Government</td>
<td>16. Sahung Mayor Decision No. 56 in 2010 regarding Establishment of Facilitation Team of WMOIPs</td>
</tr>
<tr>
<td></td>
<td>10. Regulation of the Minister of Forestry Number 192/Menhut-II/2007 concerning Organizations and Work Flow of Technical Implementation Unit of the Natural Resources Conservation</td>
<td>17. Regulation of Minister of Marine Affairs and Fisheries No. Per.37/M/2010/2010 regarding Management and Spatial Plans of MPAs</td>
</tr>
<tr>
<td>Customary laws (prohibitions)</td>
<td>Cannot fish or take marine wildlife with bomb, compressor, trawl, or weapon.</td>
<td>Cannot fish or catch any species of coral fish.</td>
</tr>
<tr>
<td></td>
<td>Prohibition of catching coral fish and cephalopod fish.</td>
<td>Fishing by spear gun, nets and trawl.</td>
</tr>
<tr>
<td></td>
<td>Not allowed to take any marine species at night.</td>
<td>Moving and removing coral.</td>
</tr>
<tr>
<td></td>
<td>Every species of coral fish.</td>
<td>Removing shells and other marine species.</td>
</tr>
<tr>
<td></td>
<td>Fishing by spear gun, nets and trawl.</td>
<td>Conducting any marine aquaculture.</td>
</tr>
<tr>
<td></td>
<td>Moving and removing coral.</td>
<td>Walking on coral reefs.</td>
</tr>
<tr>
<td></td>
<td>Removing shells and other marine species.</td>
<td>Catching any marine wildlife that is under the protection of law.</td>
</tr>
<tr>
<td></td>
<td>Conducting any marine aquaculture.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Walking on coral reefs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Catching any marine wildlife that is under the protection of law.</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3. Regulation related to MPAs management (Kusumawati and Huang, 2015).
1.2.2 Substantive Aspects

1.2.2.1 Stakeholders Engagement

Lack of communication among stakeholders could be a distraction of MPA implementation development especially inadequate connection to local communities; particularly in such areas like Panglima Laot, Sasi, Panglima Menteng and Manee (Kusumawati and Huang, 2015). The following points are critical and must be borne into mind:

- Degree of Stakeholder Involvement in Decision Making
- Stakeholder’s Perceptions of MPAs
- Stakeholder’s Participation in MPA design
- Support of All Stakeholders
- Relative Distribution of Ecological and Social Impact Across Location, Time, and Social Groups

Better connection among stakeholder can support adaptive management well for MPA management. This aspect is included in social aspect of adaptive MPA management (Cinner et al., 2012). Furthermore, the study of MPA performance shows that stakeholder engagements are needed in order to support staff capacity as a priority (Gill et al., 2017).

1.2.2.2 Species or Habitat Condition

The intact condition of species or habitat of MPAs supports the efficacy of MPA management including the number of biomass in the MPA. These condition should be well managed and convert into a good decision-making.

1.2.2.3 Status of Environmental Threats

An MPA which is effective should be address both extractive and non-extractive anthropogenic threats. Extractive threats include all fishing activities such as recreational, artisanal and commercial, while non-extractive threats are tourism activities such as private boating and commercial boating including cruise ship, scuba-diving, and bathing. In this case, it is important to understanding anthropogenic threats in the surrounding area of MPA such as occurrence and intensity of both aspects (Zupan et al., 2018).
In Figure 4, it is apparent that all private boatings exist in fully protected and partially protected area in MPAs while non-extractive threats arise mostly in fully protected area and extractive threats are in partially protected area (Zupan et al., 2018). Interestingly, some MPA areas lead to debate due to their appropriateness location in high cumulative impact of human impact (Rodríguez-Rodríguez et al., 2015).

On the other hand, even an MPA located in a fully protected zones has threats which are mostly from non-extractive threats; while in partially protected zones, it has high rates of extractive threats. Both artisanal and recreational fishing and area out of MPA are 18 times greater compared to the threats in partially protected zones (Zupan et al., 2018).

Figure 4. Threats intensities among zones in MPAs; study case in 15 Mediterranean MPAs (Zupan et al., 2018)
1.2.2.4 Degrees of Social Conflicts

Social conflict is not only occurring in the society as a whole, but also among stakeholders for managing MPAs. This can be triggered by hierarchical way of organizing through a lack of MPA dispute settlement and administrative rules mechanism. Social conflicts can arise in different ways of governing MPAs including the area hierarchy or top-down management, egalitarianism, individualism or fatalism (Halik et al., 2018).

1.2.2.5 Well-Being of Affected Communities

The assessment of the well-being of people is to know the rate of health, psychology and education. This is categorized into two concepts which are hedonic (life satisfaction and happiness) and eudemonic (self-fulfillment and life meaning) (Dodge et al., 2012). This dimension approach is used to examine the relationship between humans and the natural environment including MPAs (Breslow et al., 2016). Thus, it is important to assess the contemporaneous social life around MPAs and also to assess the remaining knowledge gaps regarding MPA management (Zupan et al., 2018).

1.3 Objective of the Study

According to the aforementioned background, the aims of this study are to provide insight about the threat of MPAs in the CT of the Indonesia Sea and give recommendation to stakeholders regarding managing the MPA by reducing the negative impacts in the future. Furthermore, The specific goal of the study is to provide relevant information on the following topics:

- To identify some threats to the MPAs in the CT, Indonesia Sea.
- To assess the impacts of ships in relation to all of the other pressures.
- To evaluate the applicable governance and management framework towards the CT, in the Indonesia Sea.
- To provide recommendations and prioritize management responses for addressing those threats to the MPAs in the CT, Indonesia Sea.

1.4 Research Methodology

In this study, the information regarding the threat will be gathered through a peer-reviewed literature and interviews with leading experts in relevant fields. The resources for the literature review including government reports, statistical data from relevant stakeholders, bulletin,
journal, and other approved literature from experts in relevant fields. These literatures are important for this research for finding the issue related to the MPA in the CT area.

The methodology of this research combines both qualitative and quantitative data. The data from the literature will be taken as qualitative data and also data from institutional experts in marine environmental experts for instance: Ministry of Marine Affairs and Fisheries (MMAF) of Indonesia which could provide much information regarding MPAs in Indonesia; Indonesia’s Coordinating Ministry of Maritime Affairs (CMMA) which could give some data related to the shipping impact in MPA; some port located near MPA which could give data about shipping activities, The Nature Conservancy (TNC) which leads the MPA site in Berau (East Kalimantan), Conservation International which leads the MPA site in Raja Ampat (West Papua), and Nusa Penida (Bali), World Wide Fund (WWF) which leads the MPA site in Wakatobi and some local NGOs which leads the MPA site in Kapoposang (South Sulawesi), Komodo (Nusa Tenggara Barat) and Padaido Island (Papua).

Also, a field study was carried out in Raja Ampat National Marine Park and interviews were conducted involving the local people and local governments in Wakatobi, Berau, Kapoposang, Padaido Island, Komodo Island and Nusa Penida. This field study aims to get additional quantitative data.

1.5 Structure of Dissertation

Chapter 1 comprises the Introduction while Chapter 2 reviews the best available implementation for adaptive MPA management globally and the explanation of adaptive management itself. Chapter 3 assesses the Indonesia management for MPA in the CT area and examine the Indonesia MPA management. In addition, a Strength, Weakness, Opportunities and Threats (SWOT) were analysis. Chapter 4 gives and analyses of Chapters 2 and 3. A comparative analysis of the MPA in Indonesia will be done with global practices. In this regard, it can be recognized what is the need of MPA implementation and the challenges in Indonesia MPAs area. Chapter 5 focuses on one issue related to the ship groundings in the MPA in Indonesia. This chapter also provides and to identify some lessons learned from these groundings to improve future MPA management in CT. A general conclusion and recommendations will follow in Chapter 6 for MPA management in Indonesia’s City.
Chapter 2
Global Review of Best Available Practice for Implementation of the Adaptive Management of MPAs

Regarding MPA, many countries commit to support Convention on Biological Diversity (CBD) through Aichi Biodiversity Targets plan 2011-2020 for enhancing the status of biodiversity protection including coastal and MPAs at least 10% (target 11). This is adopted in 2010 in the 10th Conference of the Parties in Japan that:

“By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.’’

Furthermore, IUCN World Parks Congress 2014, which is Promise of Sydney, recommended to:

“Urgently increase the ocean area that is effectively and equitably managed in ecologically representative and well-connected systems of MPAs or other effective conservation measures by 2030; these should include strictly protected areas that amount to at least 30% of each marine habitat and address both biodiversity and ecosystem services.’’

(Reuchlin-Hugenholtz and McKenzie, 2015)

In the other hand, every country has their own problems or challenges in designing, implementing, and monitoring MPAs. As a result, each country need appropriate management including adaptive management whether the country provide it or learn from other countries.

2.1 Why Focus on Adaptive Management

According to Ban et al (2011) that there are some emerging trends in design and management for MPA especially to the area such as Coral Triangle area in Indonesia, which are the trend of MPA adaptive management. This adaptive management area is prominent and much needed for enhancing effectiveness and efficiency for managing MPAs in coral nations. Furthermore, it
is widely recognized as core element of protected area success especially in Asia Pacific (Lockwood, 2012).

2.2 Adaptive Management

![Adaptive Management Diagram](image)

Figure 5. Adaptive management as a tool of decision-making (Ministry for the Environment of New Zealand, 2016).

To develop the effectiveness and efficiency works of MPA management, governance and socio-ecological system dynamic in adaptive management should be implemented. Adaptive management means that governance can adjust to keep pace with dynamic situations (Chaffin, Gosnell, and Cosens, 2014).

Adaptive management is useful conservation strategy when there is flexibility in environmental, economic, and social aspects (Cinner et al., 2012). According to Weeks and Jupiter (2013) that the adaptive management cover planning management based on costs, threats and biological diversity consideration.

With some aspects of adaptive management mentioned in Chapter 1, several prominent issues need to be solved including staff capacity and budget management can be reduced in order to have effective management tool (Gill et al., 2017).
2.2.1 Defined Objectives
As a country who is dependent from marine natural resource such as Indonesia, defining objective in managing MPA should be considered which is a must in governance and management. This is to accommodate and sharp the local preference and objectives. Furthermore, the objective lies in matching the strategies between local scale and regional scale objectives.

In local context, MPA planning and implementation should reflect the values and concern focus for community and household level such as well-being and livelihood. Next, in the regional context, the planning and implementation should reflect the national or regional concern such as fisheries or biodiversity for some stakeholders (governments, NGOs or aid organizations) (Ban et al., 2011).

However, it should be needed that regional plans to be modified in order to adapt with local context. Manager or planner also provides incentives to the local scale, if there is an extensive plan or change. This must be integrated each other through objectives and perspectives to identify the suitable MPAs management action (Ban et al., 2011).

2.2.2 Dynamic Conservation Planning
MPA management increasingly focuses on marine ecology pattern. The MPA management will be for improved by a dynamic conservation planning by understanding all the pattern of marine ecology. The pattern is comprised marine animal movement/migratory and physical pattern of sea surface such as temperature or even chlorophyll (Ban et al., 2011). Dynamic conservation also improve the resilience of the marine ecology such as coral reefs (Gamet et al., 2009).

2.2.2 Adaptive Conservation Strategies
Strategies of adaptive conservation would change accordingly when adaptation is needed and challenge arise (Ban, et al., 2011). There are some categories of these strategies, which related to the resilience principle. They are size, shape, risk spreading, critical area, ecosystem-based management, connectivity, and ecosystem function maintenance. Adaptive conservation strategies ensure and support those categories into network design for resilient of MPA network design. In this strategy, integration between customary management strategies and contemporary management strategies can also be adaptive strategies, which make a MPA
management more responsive. Another positive effect of this is the management can provide a systematic monitoring (Weeks and Jupiter, 2013).

2.2.3 Systematic Monitoring
Effective adaptive management can be conceptualized well through planning, implementation and evaluation (Plummer, 2009). The monitoring covers biological and ecological, socio-economic aspects. Furthermore, according to Christie and White (2007) that three major influences the successful key of MPA management factors socio-economic, sociopolitical, and historical of the local site of MPA itself.

2.2.3.1 Biological and Ecological Context
Protection to marine habitat through MPAs has positive impact as a biological response of MPAs which are to sustain the fish population, to preserve genetic diversity and habitat.

In fish population, the effect on biological responses of MPA is biomass, density and size of animals within the location of MPAs. Compare to some area of MPAs, there are big difference between the number of proportional fish especially for limited fish mobility in MPAs rather than outside of the MPAs.

Sustainable population could be reached by developing more MPAs. This is because the area let animal such as fishes to spawn and make the area as nursery ground for them. MPAs secure the eggs and larvae immediately after reproduction process. Another issue of a case that there is no MPAs is by-catch species which is not targeted. MPA could be suitable place to reduce the fishing effort of by-catch species to sustain their population.

2.2.3.4 Socio-economic Aspect
Marine resource users are the most affected by MPAs, which could be in positive or in negative way for socio-economic. There some factors which determine the effect (financial, migration, opportunities, ecosystem service, and even culture) which are the planning, designing and implementation of all the users and how to adapt.

MPAs could affect all different stakeholder groups in different way. The successful of MPA implementation could be determined by how they adapt with the MPA designation and process such as management including spatial planning in short-term and long-term use and rules, and regulations or policy.
2.2.4 Evaluation of Progress towards Objectives
Adaptive management remains spatial planning, for instance adaptive maritime spatial planning (MSP). This adaptive management is to monitor and to evaluate the management of marine and maritime resources in temporal management in order to gain the appropriate decision-making and to develop and spatial planning effectiveness. Understanding the objectives of MPA designation and implementation is an adaptive approach to keep the progress in track and the evaluation should be made for meeting the management objectives, forecasting the outcome, making alternative management, and monitor the management through flexible management implementation (Douvere and Ehler, 2011).

2.2.5 Flexible Management Structure
An adaptive management of natural resource are better when the structure are more adaptable with the current situation and the current needs. Furthermore, adaptive management structure is responsive to all related MPA information both local, national and international (Weeks and Jupiter, 2013). To foster this management structure, it should expedite and facilitate social learning about how the MPA system should be managed. In this matter, NGOs have a core position to give information and integrate with them (Armitage et al. 2009).

2.2.6. Locally implemented and managed MPAs.
It is stated in the UN Convention on Biological Diversity related to the objective of land, water and living resources management which are a matter to societal issues among economic, societal needs and cultural that:

“Indigenous peoples and other local communities living on the land are important stakeholders and their rights and interests should be recognized. Both cultural and biological diversity are central components of the ecosystem approach, and management should take this into account. Societal choices should be expressed as clearly as possible. Ecosystems should be managed for their intrinsic values and the tangible or intangible benefits for humans, in a fair and equitable way” (CBD, 2004).

This means that MPA management as a part of marine resource management should involve undoubtedly the community. Another point is the participation and perspective of communities in planning is needed to have a better plan. Moreover, the stakeholder who directly gets the impact is community (Chatillon, 2017).
One of the recommended of adaptive management is written related to customary law which is more respectful to local communities and more flexible in governance. In many place, customary law is a core of natural resource management (Clarke and Jupiter, 2010). Furthermore, customary law collaborates harvesting period including the periodical time and it combines with the implementation and designation of MPA through ecological function (Jupiter and Egli, 2011).

In this approach, some countries also implement aptly term namely Locally Managed Marine Areas (LMMAs) combines local awareness need to take action and collaborate with community strength in traditional knowledge and governance (Govan, 2009).

2.3 Precautionary Approach
Various marine resource uncertainty impede the efficacy of customary governance and MPA is presented as the only prudent approach to protect the marine habitat. Next, uncertainty of some aspects should be considered. Precautionary approach for MPA adaptive management is the way of managing the MPA caused by the absence of scientific certainty. This must be taken when there are some threats including the irreversible harm to the marine environment based on available information. As a result, adaptive management can be developed and measured.

2.4 MPA Implementation
There are several success stories of systematic implementation of MPA, which can be effective, adequate and representative of the marine habitat. Some countries develop and implement MPAs in order to increase the number and effectiveness of no-take zone, adaptive and integrated management especially developed countries (Marinesque et al, 2012). The factor of effective implementation of MPA is mostly caused by the level dependent of society on marine resources. In MPA implementation, decision-makers maximize the amount of protection rather than smaller area. This principle is to minimize the edge effects from buffering area, which can be affected by surrounding activities. An MPA area represent all marine habitats, at least a minimum type and physical of the habitat. To ensure the implementation, objective of the MPA intend to be clear based on reliability and comprehensiveness of available data. At the end, the MPA implementation not only for increasing complementary benefit for people’s values and uses but also to achieve biophysical operational principle to review the zoning area of MPA (Fernandes et al., 2005). Furthermore, a MPA management framework is suggested by
Fernandes et al (2005) that broad management frameworks in all levels of protection are adaptively managed and implemented.
Chapter III
Current Management of Indonesia’s MPAs in Coral Triangle

3.1 Overview of Coral Triangle Area’s MPA Management

Coral triangle is the world epicenter of marine biodiversity covering an area between the Indian and Pacific oceans. This triangle located in trophies region including Indonesia, Papua New Guinea, Timor-Leste, the Philippines, Malaysia and Solomon Islands. This area covers 1.6% of the ocean, 76% of coral species and 37% of coral reef fish species in this planet, the largest area of mangrove forest in the world. Many of coastal communities rely on this marine resources and give them significant advantages such as income, culture, food, and natural protection from the severe weather (ADB, 2014).

Managing Coral Triangle (CT) area as regional marine protected area which include the country of Indonesia, Malaysia, Philippines, Timor Leste, and Papua Nugini called Coral Triangle Initiative (CTI) is very challenging. Even though regional systematic conservation planning have been implemented in order to provide adequate approach for effectiveness in managing the MPA, the MPA implementation process include integration across the region (Mills et al, 2010).

Furthermore, CTI also identifies local-scale conservation around the region. In Indonesia itself, there are several local practice for the action, for instance Mane’e, Sasi, Awig-Awig, Panglima Menteng and Panglima Laot. This fisher folks should be involved massively for every prioritization exercise.

According to the Ministry of Marine Affairs and Fisheries (MMAF) (2013) in Coremap II, the MPAs in Indonesia Sea is 15,784,129.52 Ha which are 11,089,181.97 Ha initiated by Ministry of Forestry and 5,581,381.76 Ha initiated by MMAF. Those MPA consist of marine national park, marine tourism park, wildlife conservation, marine conservation and local marine protected area. Indonesian governments are committed to enlarge the MPAs to 20 million Ha in 2020 by taking 6.5 percent of its territorial waters. Then they must expand the MPA area by 4 million in 2010 (Setyawati, 2014).

There is a still lack instruments and procedures to protect the Marine Protected Areas of the Coral Triangle. Some countries including Indonesia are struggling to measure the
disadvantages of some threats. The new threat could be from ship, which has been mentioned which causes both biodiversity losses such as coral reef and collateral damages.

3.1.1 Why Review MPA Management in Indonesia’s Coral Triangle

Threats to marine environment in Coral Triangle area become growing year by year from coastal to the offshore area. This threats come mostly from a growing coastal population depending on marine resources whether for artisanal fishermen or for commercial purposes. Those issue and impacts require an appropriate management. One of the solution to protect the marine environment is MPA designation in Indonesia since 1970s (Charter, Soemoedinoto and White, 2010).

However, there are many issues arise in managing this rich marine biodiversity. One of the issues is ship grounding which cause huge impact to the marine environment. The recent case is Calledonian Sky in Raja Ampat. Furthermore, large MPA area of Indonesia, for instance, has been large around 19 million Ha and will reach 20 million Ha in 2020 (MMAF, 2018).

By this, it is important to review MPA management in Indonesia’s Coral Triangle. As a result, a good progress can be achieved through better implementation, evaluation and monitoring can improve the marine resources in CT (Charter, Soemoedinoto and White, 2010). Some question may appear such as how well the MPA implementation in Indonesia’s CT, how far the MPA meets objectives or conservation goals and what are adaptive management in Indonesia.

Additionally, for the long-term success of marine conservation in CT, those MPA area must be well-designed, effective and efficient MPA management in broad terms and no-take areas enforcement in sufficient size. Those aspects are also needed to be reviewed for MPA management (White et al., 2014).

3.1.2 Adaptive Management in Indonesia’s Coral Triangle

In order to reach MPA management efficacy, Indonesia tries to implement several factor for better adaptive management, which are adaptive planning (well designed and effective MPA management), monitoring, evaluation, and responses-feedback system, and integration of socio-economic. Adaptive management processes in Indonesia cover balance biophysical and social planning (White et al., 2014).
Interestingly, Indonesia has had the concept MPA concept since before World War II. Local communities complied and committed to all customary law as verbal rules. There are several kinds of the law which are Sasi, Panglima Laot, Sasi, Panglima Menteng and Manee (Kusumawati and Huang, 2015). This is one of the element of adaptive management which reach the national target collaborate with the local practice management.

3.2 Objectives
According to the review and current issues in Coral Triangle area management, the aims of this chapter are to provide insight about the threat of MPAs in the CT of Indonesia Sea regarding managing the MPA by reducing the negative impact in the future. Furthermore, The specific goal of this is to provide relevant information on the following topics:

- To identify and review the MPA management practices in Indonesia’s Coral Triangle
- To understand the adaptive management which is carried out of Indonesia
- To asses the significant of ship impact in relation to all of the other pressures.
- To evaluate the applicable governance and management framework towards Coral Triangle Area in Indonesia Sea.
- To provide recommendations and prioritize management responses for addressing those threats to the MPAs in the CT, Indonesia Sea.

3.2.1 Overview of Practices
3.2.2 Adaptive Management in Indonesia’s System Identification

3.3 Methodology
Methodology of this research combines systematic literature review as deskwork and interview as fieldwork, which was conducted in Indonesia. By this, research data is expected to be more complete rather than focus to only one part whether only of systematic literature review or only interview.

3.3.1 Systematic Literature Review
The literature review is dealing with some issues related to adaptive MPA management and the problem solving information. Resources were based on the World Maritime University Library, library databases such as alumni dissertations of WMU and some other science websites, and in-class lecture files. Furthermore, web-based resources mainly relating to the Coral Triangle Initiative official website and other related information in managing Indonesia’s Coral Triangle
were incorporated as the part of different analyses. Next, literature review is to develop the answer of research question.

According to the questionnaires, interviews, and findings related to the threats, challenges and opportunities to MPA in Indonesia’s Coral Triangle area, the expected outcomes provide the following benefits for the future adaptive management in CT especially in Indonesia sea which are to provide best recommendation of MPA management in Indonesia and adaptable responses for addressing threats to the MPA in the CT, Indonesia Sea.

3.3.2 Interviews
Interview was conducted by direct interview by filling out the questionnaire by and recorded by electronic tools such as recorder to save the audio data, and also by email for questionnaire. This interview was carried out by author to the key person in charge to the issues of Caledonian Sky and MPA management of Indonesia’s Coral Triangle area. This interview was verified to interview actors by giving a formal letter for all related institution. The institutions are Indonesia Ministry of Marine Affairs and Fisheries, Indonesia Coordinating Ministry of Maritime Affairs, Indonesia Ministry of Environment and Forestry and Indonesia Ministry of Transportation. Furthermore, in some cases, the interviewed actors sent some prominent data such as report and meeting outcome of the related case. These document enable this research for completing the interviews by having the data from the file. The limit of the research has been mention in previous, which the interview process is mostly to the key person in quality not in quantity.

3.3.3 GIS analysis
For further clarification of ship grounding location, this research collaborates some data from several resources such as Ministry of Transportation, Coordinating Ministry of Maritime Affairs and Ministry of Marine Affairs and Fisheries. Coordinate of Caledonian Sky coordinate (00° 30,992’ LS dan 130° 40,283’ BT), which is verified in the map that it is located in Dampier Strait, Meosmanswar District, Papua Barat using Qgis (a free and open source GIS application).
3.4 Adaptive Management Elements Practiced in Indonesia’s CT MPAs

Indonesia, as an archipelagic (13,464 km²) and populated country (254,454,778 people) has its own challenge to manage the MPA in the country. One of the reason is most of the people live in coastal area which highly possible to affect the marine environment. In coral triangle area, Indonesia has 19,868 km² and 31.2 % of them are coral reef within the CT area.

Indonesia tries to implement several factor for better through adaptive planning, monitoring, evaluation, integration of socio-economic, and responses-feedback system for managing the MPA. Adaptive management processes in Indonesia include balance biophysical and social planning (White et al., 2014).
3.4.1 Defined Objectives
MPAs was designed in Coral Triangle area with several form sanctuaries, Local Managed Marine Areas (LMMAs), national park, no-take marine reserves and others) in order to support sustainable fisheries, protect well-defined areas containing endangered species and habitat, support and protect cultural values and other socio-economic goals. As the largest MPA area in Coral Triangle area, Indonesia has its own MPA model even though in the same area of CT with other countries from large MPAs zoned to LMMAs. However, all the managements from the CT’s countries should be consistent with the management and conservation objectives of CT. Indonesia, for instance, follow the guidance of CT MPA implementation by include no-take zone and consider the whole conservation aspect and factors both in the short term and in the long term goals (White et al., 2014).

One of the step of Indonesia is the part of Coral Triangle Initiative country member. This initiative has regional plan of action, which is Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security (CTI-CFF) which are:

1. Designating the seascape as a priority and effectively managed
2. Applying other Marine Resources Management and Ecosystem Approach to Management of Fisheries (EAFM) fully applied
3. Establishing and effectively managing MPA
4. Achieve Measurement of Climate Change Adaptation (CCA)
5. Improving the Status of Threatened Species (TS)

(CTI-CFF, 2017).

3.4.2 Dynamic Conservation Planning
MPA management will be for improved by a dynamic conservation planning by understanding all the pattern of marine ecology. The pattern is comprised marine animal movement/migratory and physical pattern of sea surface such as temperature or even chlorophyll (Ban et al., 2011). Dynamic conservation also improve the resilience of the marine ecology such as coral reefs (Gamet et al., 2009).
3.4.3 Adaptive Conservation Strategies
There are several issues arising in CTI management which area marine debris/litter, and marine pollution. By the strategy of Indonesia conservation, several lessons learning show by the CTI management:

- Behavioural Change
- Reducing land-based leakage
- Reducing sea-based leakage
- Law enforcement
- Funding Mechanism
- Institutional Empowerment

3.4.4 Systematic Monitoring
Several monitoring systems are carried out in order to develop MPA management in Indonesia such as biological, ecological, and socio-economic monitoring.

Biological monitoring is to determine and assess the MPA management progress related to the benthic structure such as invertebrate, algal communities and coral. Biological monitoring method is also for coral reef health and management effectiveness assessment. Additionally, this monitoring is to evaluate the MPA zoning plan objective and to provide adaptive management. This method use Point Intercept Transect (PIT) with a combination of long swims and belt transects. The method records life forms of the marine ecosystem such as coral at each site (Wilson and Green, 2009).

Other monitoring systems are also provided such Line Intercept Transect (LIT), semi-quantitative monitoring (manta tow and community based methods). Those method can be utilized depend on the situation, for instance manta tow and community based for broad scale surveys (Wilson and Green, 2009). However, there are other reef method assessment which so diverse to conduct it.

3.4.5 Evaluation of Progress towards Objectives
Evaluation of MPA management is carried out by several stakeholders in Indonesia including NGO, government and donors. This is to move toward the objective of MPA itself such as biological impact and human impact. MPA management strategies in Indonesia remain positive
impact not only for the marine biodiversity but also to social aspect such as reducing poverty (Gurney et al., 2014).

3.4.6 Flexible Management Structure
MPAs are generally designated to achieve conservation and/or management goals. In management structure, it should be flexible for adapting the current situation and align with local people for instance. Indonesia has a flexible management structure especially to align with local customary law (Kusumawati and Huang, 2015).

Flexible management structure indicators have three components which are biophysical, social, and governance indicator. In regards of this, adaptive management is required to have flexible framework and tools to manage MPAs from measuring outcomes to bring inputs (Bennett and Dearden, 2014).

3.4.7 Locally implemented and managed MPAs
In Indonesia, there are several locally management and implementation in managing MPAs Sasi, Panglima Laot, Sasi, Panglima Menteng and Manee (Kusumawati and Huang, 2015). In Indonesia’s CT, resident of Raja Ampat, for instance, have been practicing their customary law called Sasi. This is continue from generation to generation for managing local marine resources. According to Boli et al (2014) that this conservation management is obviously help to protect and sustain marine biodiversity in the Eastern of Indonesia. This method should be incorporate with modern conservation management to achieve MPA management goals.
Chapter IV
Comparative Analysis of Marine Protected Areas in Indonesia to Global Practices

This chapter provides some information about Indonesia MPA management related to many aspects including national and international policy and compares the MPA effectiveness globally to Indonesia.

4.1 Indonesia Ocean Policy
Interestingly, Indonesia has a plan of law enforcement related to the MPA management in Coral Triangle. Indonesia launched Presidential Decree No.16 of 2017 on Indonesia Ocean Policy in February 2017 (CTI-CFF, 2017). The vision of Indonesia in this ocean policy is to be a Global Maritime Fulcrum which proposing to become a sovereign, advanced, independent strong maritime nation that is able to provide positive contribution for peace and security of the region as well to the world in accordance with its national interests (CMMA, 2018). It is not only for socio-economic development but also sustainable development for marine resources (CMMA, 2018).

4.1.2 International and National Legislation and Institutional Arrangement
4.1.2.1 International Instruments to Support MPAs
a. The United Nations (UN)
Through United Nations Convention on the Law of the Sea of 10 December 1982 (UNCLOS) in article 192 of the part XII “Protection and Preservation of the Marine Environment” article 192 states that “States have the obligation to protect and preserve the marine environment. Furthermore, in section 2, cooperation on a global or regional basis are needed in order to integrate with international rules including practices, standards and rules (UN, 2018).

b. The 1992 Civil Liability Convention
In this convention, there is supplementary convention, which is the 1992 Fund Convention. The CLC convention rules strictly of the liability for pollution damage caused by ship especially oil spill while the latter convention govern the fund of ship accident. This include when ship accident happens, the 1992 fund can compensate when the limit of ship owner’s liability is exceeded under the convention. Then, when the owner is exempt and financially incapable to the liability. Next, when the insurance has no sufficient financial to pay the claim which is valid
compensation. The 1992 fund comes from tax which is contributed of member state of the 1992 Fund with some criteria (IOPCF, 2010).

![Figure 7. Maximum Limit of Liability per Tonange of Ship (IOPCF, 2010).](image)

In the situation where an incident occurs after 1 November 2003, the maximum amount of compensation which could be paid by the 1992 Fund is SDR 203 million. Before the date the maximum is SDR 135 million.

c. Convention on Biological Diversity (CBD)

This convention has strategic plan on biodiversity, which is Aichi Targets. One of the target committed by many government around the world is 10% of marine and coastal area by 2020. By thus, the MPAs area should be extended as the core indicator to achieve the target 11 (L Thomas, 2014). Analysis of the World Database on Protected Area for 2017 calculated that the Ocean was protected about 20 million km$^2$ or 6.96% (Protected Planet, 2017).
There are some international instrument which is relevant to MPAs. Those instrument and agreement to support SDGs development, which is initiated by United Nations, which are

**Hard law:**

4. Convention on Biological Diversity (CBD)
6. The Convention on Wetlands of International Importance (the Ramsar Convention)
7. Regional instruments: binding resolutions from regional fishery bodies (RFBs) and regional seas conventions.
9. IMO and its associated instruments

**Soft law:**

1. Code of Conduct for Responsible Fisheries (CCRF) and related IPOAs and other instruments (FAO)
3. Declaration of the International Conference on Responsible Fishing (Declaration of Cancún), 1992
4. World Summit on Sustainable Development (WSSD) and its Plan of Implementation (WSSD-POI) (United Nations), 2002
According to Young (2007), there are some indicators of good legislation and legislative processes for MPAs

1. Clear and direct legal authority/mandate;
2. Support or acceptance by relevant community and stakeholder groups;
3. Clear provisions or understandings regarding integration with the current framework or delimitation between various potentially applicable legal and administrative systems;
4. Nature of the legal mandate of each provision or instrument within the framework (binding, non-binding, mandatory, voluntary, etc.);
5. Linkage to policy objectives – role in their achievement;
6. Role and mechanisms by which scientific analysis and monitoring is integrated as an essential tool for systematic validation of MPA effectiveness in achieving those objectives;
7. Capacity (human, financial and practical) to deliver the actions and outcomes necessary to make that connection (i.e. to enforce the law or support other kinds of mandates); and
8. Reasonable financial expectations with regard to logistical matters.

4.1.2.2 National Instruments to Support MPAs
To reach the objectives, Indonesia align with the international commitments

1. SDG 14 (2015)
   a. Target 14.1
   By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution.
   b. Target 14.2
   By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans.

3. Regional Action Plan on Marine Litters

Several considerations of national regulation and aspects related to shipping grounding accident and marine environmental protection on MPA.
1. Amendment to law No. 31 year 2004 concerning fishery in conjunction with Law of the Republic of Indonesia Number 45, 2009 for fisheries: 

Article 7 (2) 
"Any person performing business and/or activities on fishery management must obey the provisions meant in paragraph (1) on: 
(i). Prevention of pollution and damages to fish resources and its environment; 
(k). Conservation water zones; 

2. Law of the Republic of Indonesia Number 27, year 2007 in conjunction with Law of the Republic of Indonesia Number 1, 2014 on management of coastal areas and small islands fishing Article (35) equipment, method and other activities which broke the coral reef ecosystem. 

3. Law of the Republic of Indonesia Number 32, year 2009 on Environmental Protection and Management Article 40 
(3) In the case of any change In business and/or activity, personnel in charge of the business and/or activity shall be obliged to renew environmental permit. 

4. Global Epicentrum of marine Biodiversity 
5. Tourism destination 
6. Decree of Ministry of Marine of Marine Affairs and Fisheries Number 36 year 2014 concerning designation of Raja Ampat Island Conservation Zone whic is limited utilization for food security and tourism. 

7. Special characteristic and unique of the MPA 
8. Lab Analysis Result related to the survey 

4.1.3 Integrated Coastal Management System 
In integrated coastal management system, there are several approaches for this which are ecosystem based management approach consist of several kind of management such as Community-based Co-management, Right-based Fisheries Management (RFM), Regional-Based Fisheries Management (RBFM), Ecosystem Fisheries Based Management (EFBM), Integrated Coastal Management (ICM).
4.3 Comparative Analysis of Marine Protected Areas in Indonesia to Global Practices

4.3.1 Adaptive Management in Great Barrier Reef, Australia: Spatial Zoning and Marine Reserves in Great Barrier Reef (Australia)

One of the large-scale networks of marine reserves in the world is Great Barrier Reef providing a global significant role model for MPA effectiveness. Regarding the effectiveness, GBR succeed to implement spatial planning and analysis. Spatial zoning becomes an adaptive management to face data-poor situation of best-practice conservation principles such as seafed biodiversity or dugong situation (McCook et al., 2010).

Additionally, marine reserves support many benefits regarding socio-economic, for instance tourism value, and marine protection. The presence of crown-of-thorns starfish is the major problem in GBR. However, no-take zone shows less frequent in no-take zone. Furthermore, the expand of marine reserve in GBR helps to reduce the impact of climate change and it is more cost-effective approach for managing the MPA in GBR (McCook et al., 2010).

Interestingly, Great Barrier Reef had been designated as Particularly Sea Sensitive Areas (PSSA) since 1990 by International Maritime Organization and it had been extended to Torres Strait in 2005. The designation is to protect marine ecology, culture, socio-economic, and scientific attributes from maritime activities especially international shipping (IMO, 2018).

Overall, appropriate management, environmental condition and integrated policy responses are the key of adaptive management in GBR, Australia while PSSA designation as a leading way to protect the MPA from international shipping (McCook et al., 2010).

4.3.2 Adaptive Management in New Zealand MPA: Robusting decision-making

Uncertainties about many activities surround MPA in New Zealand forces them to build and recognised well decision-making. New Zealand learns how adaptive management contribute to face uncertainty, which can robust decision-making for iterative process. This management was a effective tool for the Environment Protection Authority (EPA) which consent authority for it. EPA can accept or even can reject an application related to adaptive management. It can be granted when the propose concept supports sustainable management of the marine resources.

Effective management is gained through monitoring system and adaptive management practice, which have been derived, by learning and knowledge. The management should succeed short-
term and long-term outcome especially for MPA (Ministry for the Environment of New Zealand, 2016).

4.3.3 Global Adaptive Management for MPA near Maritime Activities
Related to the ship destruction, regulatory instrument for this is MARPOL for policy instrument for marine biodiversity and sustainable use by shipping and the economic instrument is payments for ecosystem services. Furthermore, MPA financing mechanism through taxes and fines, for instance the 1995 Barnier Act in France determines a tax on maritime passenger ships. The ships, which travel around MPA, should be charged for taxes (OECD, 2017).

There are several instruments for shipping activities for MPA

a. The Merchant Shipping Act and Merchant Shipping and Maritime Security Act 1997
b. IMO Particularly Sensitive Sea Areas
c. The Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007
d. Marine spatial planning
(Scottish Association for Marine Science, 2010)

4.3.4 Visitors Management Analysis in Mediterranean Region MPAs
Realizing the value and the importance of marine resource forces Mediterranean countries to help together in order to reduce anthropogenic impact to the marine environment. It reflects their consistency for protecting the biodiversity in several instigations such as the Natura 2000 network, the Protocol of the Barcelona Convention on Specially Protected Area (1995), and the Global Environment Facility (GEF).

Turning tourism as a threat to the marine ecosystem in Mediterranean countries put those countries into struggle to achieve sustainable development. However, Mediterranean countries initiate to build sustainable development, which is not only for ecological benefit but also for culture and social benefit by some methods.

One of the methods developed is visitor management analysis for marine protected areas. This action is to make sure visitors to get the value of heritage interpretation, knowledge, recreation, information, sustainable tourism and conservation. Furthermore, the package includes safety guarantee.
In the marine protected area management, there are some factors, which are considered by the authoritative stakeholder which are:

1. Human
   a. Quality attention of visitors whether they are from the region or international visitors.
   It is important to assess the visitor quality attention for better MPA management. This is to evaluate the appropriate management for visitor in the future.
   b. Community participation and voluntary activities
   Community involvement including local communities is much recommended for all human aspects to enhance MPAs management quality. Furthermore, providing professional staff and materials needed are factors of this development.
   In voluntary aspect, visitor’s attitudes and behaviour are required to support conservation of ecosystem by cleaning up litter, evaluate their impact to the environment, preserve ethnographical, historical and artistic interest, and willing to collaborate with local people.
   c. Visitor Management Programmee (VMP) provides firm guideline including facilities, services and activities of visitors.
   d. Environment education programmee, safety programme and even volunteer programme

Ecological Environment/Ecosystem
Area which is affected by visitors and intervention level of the MPA whether the area is immediate or regional environment must be classified how far the intervention both visitors and authority.

2. Carrying Capacity

There are a lot of kind could gain by visitors to the marine environment such as impact on vegetation, physical environment and landscape

3. Diagnosis Mapping

Several aspect to diagnose spatial planning in MPA
   a. Spatial planning to see the pattern of visitor’s activities to carrying capacity and fragility of the marine environment.
   b. Zone Affected and Capacity
c. Management Zone in MPAs

d. Analysis of Supply and Demand Visitors

In this supply analysis, the diagnosis chooses the suitable equipment and activities to visitors. In demand, all visitors should provide personal information related to their capacity interpretation to the marine environment.

e. Predictable Impact

4. Integrated Management in Neighbouring Countries and Management Model

Consideration to neighbouring countries should be listed in management. A suitable management model should involve many stakeholders such as government, local people, entrepreneurs and public administration) (López Ornat, 2006)

4.4 The Need for Indonesia to Develop MPAs Implementation

According to Berdej and Armitage (2016) that Indonesia has still lack of marine protected area conservation fit. However there are several opportunities to develop the MPA conservation fit by three factors:

1. Conservation should be aligned with the local (cultures, practices, values and institutions)
2. Adaptive management or approaches are the reflection of different views and knowledge adaptation
3. Jurisdictional and geographical boundaries are one of the key issues of conservation.

4.5 Challenges of MPA Implementation in Indonesia

There are several challenges MPA implementation in Indonesia which are:

- Different institution has different objectives in managing MPA
  There are several ministry which design and develop MPA area in Indonesia which area Ministry of Marine Affairs and Fisheries, Ministry of Environment and Forestry and Local Government in different provinces. However, many of them have different objectives and perspectives in managing MPA of Indonesia’s CT.

- There are a lot of protected area that have not been measured and assessed appropriately.

- The marine habitat in Lombok is vulnerable due to the ship international route
• Disintegrated regulation regarding MPA
• There are no many traffic shipping lines in Indonesia especially in sensitive area.
Chapter V
MPA Adaptive Management in Raja Ampat: Lessons Learned and Analysis from the Calledonian Sky Accident

5.1 Calledonian Sky Accident in Raja Ampat
A cruise ship named Calledonian Sky operated by British tourist agent ran aground on coral reef near Kri Island, Wararema, Raja Ampat District, Indonesia in 4 March 2017 causing massive impact to the coral reef ecosystem (CMAF, 2017). The grounding ship accident put Indonesian Government to the Vessel unamicably situation. This condition forces Indonesia to prove the damages by doing joint-survey.

![Figure 8. Joint-survey documentation in shipping grounding location, Dampier Strait.](image)

5.2.1 Initial Prevention Process
The accident was verified by several institutions that are Coordination Ministry of Maritime Affairs (CMMA), Ministry of Marine Affairs and Fisheries (MMAF), local governments, Papua University, and municipal police (Satpol air) of Raja Ampat. After the verification, a meeting was held with SPICA in 15 March 2017.

5.2.2 Further Process by Doing Joint Survey
The survey was conducted in both parties between Indonesian Government [CMMA, MMAF, Ministry of Environment and Forestry, Naval Hydrographic and Oceanography Centre of the Republic of Indonesia (Pushidrosal), Municipal Government of Raja Ampat, Municipal Police, Papua University, Indonesian Institute of Science (LIPI), and Ocean and Coastal Research Center of Bogor Agricultural University (PKSPL-IPB)], and SPICA Services (Executive Claim of SPICA and CBS Team of Indonesia University).

According to the survey in 22 March 2017 with Underwater Photo Transect, the result showed that the total area of survey was 22,060 m² and breaking coral reef area was 18,880 m² (total break: 3,270 m² and grounding ship area: 5,612 m²). This proposal was submitted in 13 April 2017 after 5 times meeting process between both parties.

In the other hand, SPICA service party did not agree with the joint-survey result and coral reef assessment methodology using Transect methodology conducted in 17-22 March 2018. There are several reasons of the issue which area the breaking area was so large, the survey timing was not sufficient enough, SPICA Services did not provide adequate expert for the survey, which were junior, and under pressure, and the survey methodology.

However, both parties actually had agreed this previously. Then, in 22 May 2017, SPICA Service required to do a survey more for the coral reef breaking by Fishbone methodology which is not only survey technique but also actual damage assessment to individual structure which is affected. According to the SPICA Services, the methodology which had been implemented to the assessment based on law applicable to local reef management programs in parts of the USA which should be applied in a distinct territory and did not represent international practice. The claim of Indonesia was assessed by SPICA service upportionate to the amount of coral reef structure damage. The party also claimed that not all the reef structure part were totally healthy which could be affected by other causes such as sea temperature. In this situation, SPICA also asked for independent expert analysis. SPICA seem focus on liability reduction which was actually possible in Indonesian Law because the recognition of ship owner’s right to limit liability (environmental protection and management) which is regulated under Article 88 of Law No 32 of 2009. SPICA also suggested not to proceed this case to the court by ensure the ship owner to work along to Indonesian Government in order to find solution (CMAF, 2017).
After four months of the accident, both parties between Indonesia government and SPICA service had not get an agreement by a formal letter in 20 May 2017. Indonesia kept the initial survey result was valid because the survey was valid and binding. Several meeting had also been done but there was no indication of the will of SPICA service to solve the issue. Because of the uncooperative effort, Inter-ministry of Indonesia decided to go to the court proceeding in order to settle the dispute. Nonetheless, the effort was in national level. (CMAF, 2017).

The intention brought Indonesia against three institutions, which were the Vessel (the “Owners”); ITOFT, the P&I Club and SPICA Services to find a commercial solution of the case.

Figure 9. Ship grounding impact documentation to coral reef ecosystem in Dampier Strait.

5.2.3 Alternative Settlement

There are two alternatives for the dispute settlement which are by court of by dealing. Both alternative has their own benefits and unbeneﬁts which must be considered by Indonesian Government and SPICA services. In court process, the length time of the process would be so long, survey again would be possible. However, the result of the process will not be a problem in the future.

5.2 Ecosystem Based Management through Marine Spatial Planning in MPAs Zone

To analyze the Calledonian Sky, IAD framework is preferable because it is not only cover DPSIR or SWOT concept but also develop the framework for better policy experiment (Rudd, 2004). In this modified IAD framework, the analysis will focus on coral reef degradation and mangrove deforestation mostly affected by anthropogenic activities.
5.3 SWOT Analysis and Modified IAD Analysis

<table>
<thead>
<tr>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Maritime Fulcrum brings Indonesia Ocean Policy to better development. It is not only for socio-economic development but also sustainable development for marine resources through Marine Protected Area program for 10% in 2020 (CMMA, 2018).</td>
</tr>
<tr>
<td>Strong policy Instrument in Indonesia related to MPA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of integration among ministries related to MPA Management.</td>
</tr>
<tr>
<td>Lack of Implementation of exiting policy or regulation</td>
</tr>
<tr>
<td>Lack of governance and management related to marine biological protection both in national jurisdiction and areas beyond national jurisdiction (Gill et al, 2017)</td>
</tr>
<tr>
<td>The absence of PSSA in Indonesia sea</td>
</tr>
</tbody>
</table>
and the absence of long term analysis of ship traffic.

Ship route in MPAs zone and monitoring of ship traffic

Lack of power in liability and compensation of ship accident

Opportunities

Indonesia commit to support Aichi Biodiversity Targets plan 2011-2020 for enhancing the status of biodiversity protection including coastal and marine areas at least 10% (target 11). It is 19 million Ha in 2018 and will reach 20 million Ha in 2020 (MMAF, 2018).

There are several adaptive management for marine biological protection in Indonesia including customary law related to MPA (White et al., 2014) such as Sasi, Panglima Laot, Sasi, Panglima Menteng and Manee (Kusumawati and Huang, 2015)

Threats

Illegal, Unregulated and Unreported Fishing (IUU Fishing) and overfishing (Burke et al, 2011).

Several solutions should be proposed which can be implemented by all sectors through providing a framework analysis, which is Institutional Analysis and Development (IAD) framework. Compare to other analysis, IAD is a preferable option to understand more complexity of MPA management.
5.3.1 Driving Forces

Drivers of lack MPA management in Indonesia’s CT are human population growth, economic growth, tourism, food security and globalization. Human population growth affects the high demand of living space and food (including protein of fish) while assimilative capacity of the ocean is not enough for the population. In other hands, society needs prosperous life. All of them are related to anthropogenic impact.

This impact is caused by high number of people live in coastal area. The way of human life near ocean related to human behaviour reflected by migration to coastal area because several benefits of living in coastal environment. First, one major reason is wellnesses (physical, cultural, mental, social, and spiritual aspect). Ocean landscape is attractable and more relaxing for human life benefits including therapy. Next, relation between human and natural, which could improve better health and wellbeing for people especially ocean for fresh air. Third, coastal wellness contributes to human life. Fourth, economic aspect is the bigger aspect why many people migrate to the near ocean including tourism, transportation (shipping), aquaculture (Obatitor, 2014).

High population in coastal area contributes to decrease the coral reef in Indonesia by producing much marine litter to the ocean. Coral reefs are covered by plastic for instance and it makes the zooxanthellae, which provide food for coral through the coral’s tissue cannot make photosynthesis process (Hidayat, 2005).

5.3.2 Pressure

5.3.2.1 Ship Grounding and the Absence of Ship Line.

Ship grounding could be happen in many place such a country like in Indonesia due to many shallow water and coral reef. Regarding the trigger, ship grounding is potentially caused by navigational error and bad weather. Moreover, marine ecosystem (coral reef and seabed ecosystem) have the negative impact of this which can be potentially affected by fuel and also anti-fouling paint of a ship accident (Yusuf, 2014).

Furthermore, this issue is triggered by the absence of ship line in around MPA area especially near tourism areas, which can be accessed by cruise ship. Indonesia does not have a clear route for ship line especially for tourism purposes (CMMAF, 2018).
5.3.2.2 Coral Mining
Many artisanal fishermen mine coral reefs to provide much money due to insufficient support of fishing activities by selling that limestone to the industry. Furthermore, some of them also use the stone for building materials for their houses (Hidayat, 2005).

5.3.2.3 Illegal, Unreported and Unregulated (IUU Fishing)
IUU fishing is a major threat to marine ecosystem. It is not only threat the marine ecosystem but also decrease fish production. Regarding the loss of economic, Indonesia has loosed US$ 20 billion per year due to IUU Fishing activities (Sutardi, 2015).

This condition forces artisanal fishermen to capture fish in the offshore area, which is far away from coastal area. One of the biggest problem is destructive fishing which become major challenge in Indonesia’s CT. Another problem caused by IUU fishing to the local fishers is trawl fishing which make the gear as an alternative to catch fish more (Sutardi, 2015).

There are two major destructive fishing practices in Indonesia, which are poison fishing (cyanide) and blasting fishing (Burke et al., 2011). Severe problem in tropical countries and developing countries is destructive fishing method (Javaid et al, 2017). Based on UNEP, 25% of global fisheries are fallen down due to destructive fishing practice (Shakouri et al, 2010). There are several methods of destructive fishing which are blasting/dynamite fishing, cyanide use and illegal net, which affect marine ecosystem including coral reefs (Belton and Hilsted, 2014).

Destructive fishing practices are one of the biggest problems in Indonesia. The practice is defined in two categories; poison fishing (cyanide) for grouper and blasting fishing for snapper are the major destructive fishing practices in Indonesia (Burke et al., 2011).

Cyanide fishing is popular destructive fishing method not only in Indonesia but also in South East Asia. This is because the high demand of marine ornamental fish and seafood. Cyanide fishing cause vulnerable of coral reef because of polip destruction. In term of extreme fishing practice, it is not only kill fish and marine habitat in the blasting fishing around 15 meters of sea bottom, but also it could kill the fishermen their selves (Giuliani et al., 2004).
Table 2. Coral cover in Indonesia (Source: CRIT, Coremap 2011).

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of Stations</th>
<th>Excellent (%)</th>
<th>Good (%)</th>
<th>Fair (%)</th>
<th>Poor (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>West</td>
<td>479</td>
<td>5.64</td>
<td>28.81</td>
<td>34.03</td>
<td>31.52</td>
</tr>
<tr>
<td>Middle</td>
<td>292</td>
<td>5.82</td>
<td>30.14</td>
<td>44.18</td>
<td>20.55</td>
</tr>
<tr>
<td>East</td>
<td>305</td>
<td>5.25</td>
<td>20.98</td>
<td>34.43</td>
<td>39.34</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1,076</td>
<td>5.58</td>
<td>26.95</td>
<td>36.90</td>
<td>30.76</td>
</tr>
</tbody>
</table>

Notes:
- Data collected from 1,076 observation stations across Indonesian waters.
- Excellent: 75%–100% live coral cover.
- Fair: 25%–49% live coral cover.
- Poor/Bad: 0%–24% live coral cover.

In this LMEs 38 including Coral Triangle Area, 15% of the reef is under very high threat, 27% is high threat. It is predicted that the critical level of coral reef will increase from 34% in 2030 to 45% in 2050, which the threats come from warming and acidification (IOC-UNESCO, 2015).

30 % of Indonesia sea stock is in overexploited or collapsed status and more than a half of the stock is fully exploited. One of the collapse causes is destructive fishing including bottom gear type, which increased from 14% in 1950s to 35 in 1980. Then, it continues to fluctuate from 16% to 20% in the recent year (IOC-UNESCO, 2015).

5.3.4.2 Marine Debris
The fastest-growing threats for marine life are marine debris. Marine debris has impact to the environment which are entanglement and ingestion, habitat destruction, introduction and spread of alien species, transport of chemical, socioeconomics, tourism and commercial fishing (Pham et al., 2014). Indonesian sea is the third highest marine debris after China and India. It is estimated 400 times than lowest value of other LMEs. There are three proxy sources of litter which are coastal population, shipping density and urbanization (IOC-UNESCO and UNEP, 2015). The greater contributors of marine debris are plastic (micro-plastic is less than 4.75 mm/km² and macro-plastic is more than 4.75 which means this LME is in highest plastic rate concentration).

5.3.4.3 Staff Capacity and Budget Management
Based on data that this research found that Calledonian Sky accident case has not been solved due to the lack of governance and management of Indonesia which do not provide a clear policy or regulation about ship grounding liability and compensation (MMAF, 2018).
In the other hand, budget management is a lack of MPA management in Raja Ampat, Indonesia. The MPA has not a sufficient enough to support all monitoring and management to Raja Ampat MPAs (MMAF, 2018).

5.3.3 State
There are some states of coral degradation in Indonesia, which are bleaching, ocean acidification, climate change, eutrophication, dead zone and decline of endangered species in coral reef ecosystem.

5.3.4 Capital Assets
5.3.4.1 Natural Capital
Economic development could contribute better aspects of maritime, marine, and fisheries sector in Indonesia. In detail, the country is the largest economy in South-East Asia and one of the world's 10th largest economy (member of G-20 and purchasing power parity) with 5.016 % of GDP growth in 2016 (World Bank, 2017). By this presidential era of Jokowi, the national vision is maritime fulcrum for better development.

Regarding natural capital of coral reef, economic value of coral reef in Indonesia is $15 per ha per year. In total, the potential economic value of coral reef in Indonesia is US$1.6 billion per ha per year for Indonesia.

5.3.4.2 Manufactured Capital
There are 44 laboratories under MMAF coordination (MMAF, 2018), fishing vessels are approximately 590,000 vessels (Stobutzki, 2013).

5.3.4.3 Human Capital
In 2015, Indonesia population was 257,564,000 people which is 60% of them living in the coastal area. Productive age people (aged 15 to 64) is 67.1% (Destatis, 2017). From the population, there are 6,011,000 fishermen (FAO, 2016).

According to Agency for Marine and Fisheries Research and Human Resources, Ministry of Marine Affairs and Fisheries Indonesia that there are 540 experts with 48 specialists working under MMAF for marine and fisheries in Indonesia (MMAF, 2018).

5.3.4.4 Social Capital
Local people in Indonesia have traditional approach for marine environment such as *Awig-Awig* in Lombok, *Sasi* in Moluccas and Papua, and *Mane’e* in North Sulawesi and *Panglima Laot* in Aceh.

However, one of the big problem in Indonesia is corruption. In 2016, Indonesia corruption index is 37 which is lower than Russia and higher than India. Sources of corruption come from judicial system, police, public services, land administration, tax administration, customs administration, public procurement.

5.3.5 Action Arena

5.3.5.2 Participants

Collaboration among stakeholders are needed in order to minimize coral reef degradation. All politicians in each municipality in Indonesia should work integrated with centre government, scientists, entrepreurs, and NGOs.

Interestingly, according to Charities Aid Foundation (2017), Indonesia is the second largest as generous people in the world. One of the voluntary activities for coral reef protection is Indonesia Coral Reef Action Network (I-CAN), a collaboration of person and institution to care and protect coral reef in Indonesia for sustainable development. The organization has member approximately 500 people. Several activities of the organization are coral transplantation and reef check.

5.3.5.3 Action/Activities (Responses)

Government start to make ship line and to control the traffic around the marine protected area. The number of ship increase year by year which affect the ship traffic and this is are highly possible with ship accident. Indonesia government should make long-term analysis of ship traffic to reduce potential accident caused by ship especially ship grounding such as Calledonian Sky in Raja Ampat.

For other challenges, some responses could be carried out for reducing the impact to coral reef ecosystem which are ocean literacy campaign, sustainable agriculture and aquaculture using Ecosystem Approach for Fisheries Management (EAFM), multi-stakeholder participation including maritime industry involvement needed to develop environmental practice effort reducing marine debris (Mobilik, 2016). Interestingly, there are several traditions of local
communities in eastern of Indonesia to protect marine environment, which can sustain the marine ecosystem.

In governance, liability and compensation mechanism has been done by government though collaboration among MMAF, CMMA, Ministry of Transportation, and Ministry of Environment and Forestry. However, this cannot be achieve properly.

Furthermore, some NGOs including WWF, the Nature Conservancy, Blue Forest and Destructive Fishing Watch (DFW) Indonesia carry out community development by providing diversification option to the local communities which could give several alternative for livelihood.

5.3.5.4 Technology

Coral reef transplantation and biorock technology play key role in order to restore coral reef degradation in Indonesia after ship grounding accident in Raja Ampat, Indonesia. Furthermore, biorock technology using a low electrical voltage can grow coral reef faster than natural process in the ocean and this innovation also has cost-effective method for coastal protection (Goreau and Prong, 2017). This technology could excellence the recovering of coral reefs.

5.3.6 Outcome

Impacts of better management especially adaptive management could increase the better marine life and have good impact to human especially local society.

There are several impact which could affects natural capital; marine ecosystem in Raja Ampat, Papua could recover, manufactured capital; tourism income could be in normal situation and produce capital to society, human capital; it support staff capacity by giving a skill to manage and provide better spatial planning such as ship route around MPA areas and it has adaptive MPA management, social capital; local customary can be trusted and applied and people prosper can be reached, financial capital;

By this IAD, one of the outcomes that can be reached of the stakeholder is proposing of some MPAs to IMO in order to convert them into PSSA areas.
Chapter 6
Overall Conclusions and Recommendations

6.1 Overall Conclusions
Indonesia is committed to achieving the Aichi Biodiversity 10% Targets Plan 2011-2020 for enhancing the status of biodiversity protection including coastal and marine areas. It is approximately 9 million Ha in 2018 and will reach 20 million Ha in 2020 (MMAF, 2018). Furthermore, Global Maritime Fulcrum will improve the Indonesia Ocean Policy not only for socio-economic development but also for the sustainable development of its MPA Program by 2020.

However, the lack of integration among ministries related to adaptive MPA management, implementation of exiting policy or regulation, governance and management related to marine biological protection both in national jurisdiction and areas beyond national jurisdiction, may reduce the effective management of MPAs in Indonesia. Then, IUU Fishing and overfishing also exacerbate the situation of MPA in the CT. The latest accident of Calledonian Sky cruise ship should call a big intention and a warning to stakeholders to solve this problem soonest.

6.2 Recommendations
According to research, which has been carried out, there are several inputs for the management of MPAs in the CT of Indonesia, which are as follows:

6.2.1 Effective and Integrated Adaptive MPA Management
Due to the diversity of people and the unpredictable situation including weather and climate change, Indonesia’s CT area needs effective and integrated adaptive management among its stakeholders. This is to necessary to develop the effectiveness and efficiency of MPA management and promote good governance especially to engage with the local-scale conservation where communities complied and committed to all customary law as verbal rules.

By adaptive management, Indonesia can reduce the issue of ship grounding, IUU fishing, marine debris and coral mining. Furthermore, in this adaptive management, there are two important aspects, which are staff capacity and budget management.
6.2.2 Long-Term Analysis of Ship Traffic
The number of cruise ships arriving in the CT is increasing annually. This booming industry will increase maritime traffic and increase the possibility of more marine accidents that can impact the MPA. The Government of Indonesia should make long-term analyses of ship traffic to reduce the threat of groundings like what occurred with the Calledonian Sky in Raja Ampat.

6.2.3 Ship Route in MPAs zone and Monitoring of Ship Traffic
The Indonesia government should provide ship route especially for tourism purposes in MPAs zone. Furthermore, it is also needed to monitor the maritime traffic in the area.

6.2.4 Liability and Compensation of Ship Accident
Indonesia needs to improve its system of governance relating to handling large maritime incidents and implement systems to handle them effectively. Thus, mechanisms concerning liability and compensation for marine accidents such as groundings are preferred to mitigate the next marine accident in this sensitive area.

6.2.5 Particularly Sensitive Sea Area (PSSA) designation
The Government of Indonesia with the approval of the IMO should propose that the CT area be declared as a Particularly Sea Sensitive Areas (PSSA). This designation is necessary to protect the marine ecology, culture, socio-economic, and scientific attributes from maritime activities like international shipping (IMO, 2018).
Reference


Govan, H. (2009). Status and potential of locally-managed marine areas in the Pacific Island Region: meeting nature conservation and sustainable livelihood targets through widespread implementation of LMMAs.


Appendices

Appendix 1 - Consent Letter to Participant

Dear Participant,

Thank you for agreeing to participate in this research survey questionnaire. The information provided by you in this interview will be used for research purposes and the results will form part of a Master’s dissertation, which will be published online and made available to the public. Your personal information will not be published.

Anonymised research data will be archived on a secure virtual drive linked to a World Maritime University email address in order to make data available to other researchers in line with current data sharing practices.

Yours,

Baso Hamdani
Ocean Sustainability Governance and Management (OSGM)

Fiskehamnsgatan 1, 211 18

Email: w1701278@wmu.se

Mobile: +46737427263

Malmö, Sweden
Consent by Participant

I consent to my personal data, as outlined in the accompanying information sheet, being used for this study and other research. I understand that all personal data relating to volunteers is held and processed in the strictest confidence.

Name of Participant: ________________________________

Signature: ________________________________

Date: ________________________________

Signature of Parent/Legal Guardian if applicable: ________________________________

City and Country of Consent: ________________________________
Project Title: Threats, Challenges and Opportunities to Marine Protected Areas in the Coral Triangle Area: a Case Study of Indonesia Sea

Researcher:
Baso Hamdani
Student, MSc Maritime Affairs
World Maritime University
211 57 Malmö, Sweden
E-mail: w1701278@wmu.se

Please Tick Box

1. I confirm that I have read and understand the information sheet for the above study and have had the opportunity to ask questions.

2. I consent to my personal data, as outlined in the accompanying information sheet, being used for this study and other research. I understand that all personal data relating to volunteers is held and processed in the strictest confidence and that should a need arise for the inclusion of any personal details in the research, express consent for such inclusion will be obtained from me in advance.

3. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving reason.

4. I agree to take part in the above study.
Tick the statements if appropriate

5. I agree to the interview / consultation being audio recorded

6. I agree to the interview / consultation being video recorded.

7. All data collected will be deleted upon completion of the research in a month after graduation 1 December 2018.
Appendix 2 - Research Questionnaire

Interview Questions

Topic : “Threats, Challenges and Opportunities to Marine Protected Areas in the Coral Triangle Area: a Case Study of Indonesia Sea”

Researcher : Baso Hamdani

Interview will be carried out via google form and direct interview in selected areas according to the research proposal.

First page could be identity question and the next page will be in different question for different stakeholder as mentioned below:

**Non-Government Organization (WWF, CI, TNC, DFW, Blue Forest)**

What is your role in protecting MPA in Indonesia?

What is the specific habitats affected by anthropogenic activities in your local MPA area?

The best recommendation to overcome the identified impediments?

What is the challenge to enforce Marine Protected Area in Indonesia?

What are the strengths and weaknesses of the existing Marine Protected Area Monitoring in Indonesia?

How you overcome the problem?

What are the threats and opportunities of the existing Marine Protected Monitoring Area in Indonesia?

What are stakeholders (government, NGO, scientist, local communities) can do for protecting the area?

What is your recommendation for better MPA implementation?

What are your responses to cruise ship impact in 2017 and what changes could be made?

**Local Government (Municipality, MMAF, CMMA, ME, MF)**

What is your role in protecting MPA in Indonesia?

How the local government protect the MPA?

How the local government respons to the Calledonian Sky case?

To what extent the follow up lobby of Coordinating Ministry of Maritime in IMO?

Who does and how?

Is it the monitoring fit-for-purpose for addressing the threats of MPA?
What are the threats of MPA in Indonesia?
What is the particular pressures of MPA in your local area?
What is the specific habitats affected by anthropogenic activities in your local MPA area?
The best recommendation to overcome the identified impediments?
The best method more robust the MPA?

**Local Communities (Raja Ampat).**
What is the change of MPA state in the last decade?
What is the impact of Cruise Ship activity in the MPA area?
How the local communities respond to changes?
Is there any traditional culture to protect the MPA and how?
What is the specific habitats affected by anthropogenic activities in your local MPA area?
The best recommendation to overcome the identified impediments?
Appendix 3 – Dissertation Letter to Institutions in Indonesia

MARINE PROTECTED AREA MANAGEMENT INTERVIEW AND QUESTIONNAIRE

To: Ministry of Marine Affairs and Fisheries
Cq Agency for Marine and Fisheries Research and Human Resources Development, MMAF.

I am currently a Master’s student at the World Maritime University (WMU) in Malmö, Sweden. WMU is a university of the International Maritime Organization, which is a specialised agency of the United Nations.

My studies at WMU is focused on Ocean Sustainability, Governance and Management. My dissertation is “Threats, Challenges and Opportunities to Marine Protected Areas in the Coral Triangle Area: A Case Study of Indonesia Sea”.

The objective of Marine Protected area is for analyzing and identify the performance of the MPAs in the CT, Indonesia Sea. In detail, those are to identify some threats and challenge to the MPAs in the CT, Indonesia Sea, to assess how significant ship impact in relation to all of the other pressures, to evaluate the applicable governance and management framework towards Coral Triangle Area in Indonesia Sea and to provide recommendations and prioritize management responses for addressing those threats to the MPAs in the CT, Indonesia Sea.

The questionnaire to be administered is one which has been developed by the researcher. The questionnaire is based on management factors of MPA effectiveness. The results of the questionnaire therefore provide data for providing solution for better MPA management which could be recommended to the stakeholders in Indonesia.

I therefore request that I be allowed to administer the questionnaire to staff of Ministry of Marine Affairs and Fisheries and related agencies in some areas in Indonesia such as Papua Barat, Kalimantan Timur, Sulawesi Selatan and Nusa Tenggara Barat.

All personal information gathered will be treated with the strictest of confidentiality practices.

Please feel free to contact me should you have any questions.
Baso Hamdani  
MSc Ocean Sustainability Governance and Management  
Email: w1701278@wmu.se  
Mobile: +46737427263  
Postal Address: Disponentgatan 6, Malmö 21157, Malmo, Sweden

Dr. Mary S. Wisz  
Associate Professor, Marine Science  
World Maritime University (WMU)  
Email: msw@wmu.se  
Mobile: +45 3018 3157  
Postal Address: P.O. Box 500, SE 20124, Malmö, Sweden