ASSESSING ENVIRONMENTAL IMPACT THROUGH DPSIR FRAMEWORK AND ENVIRONMENTAL JUSTICE LENSES:A CASE STUDY OF INLAND CAPTURE FISHERIES IN MAHAKAM RIVER

Mrs. Etik Sulistiowati Ningsih

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Environment, Development and Sustainability
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การประเมินผลกระทบสิ่งแวดล้อมโดยใช้กรอบแนวคิด DPSIR ร่วมกับมุมมอง ความเป็นธรรม ทางสิ่งแวดล้อม กรณีศึกษา การประมงในแม่น้ำมะหะกำม์

นางเอติก ซูลิสติโอวาติ นิงซี

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรดุษฎีบัณฑิต
สาขาวิชาสิ่งแวดล้อม การพัฒนา และความยั่งยืน สหสาขาวิชาสิ่งแวดล้อม การพัฒนาและความยั่งยืน
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Thesis Title	ASSESSING ENVIRONMENTAL IMPACT THROUGH DPSIR FRAMEWORK AND ENVIRONMENTAL JUSTICE LENSES:A CASE STUDY OF INLAND CAPTURE FISHERIES IN MAHAKAM RIVER
By	Mrs. Etik Sulistiowati Ningsih
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Thesis Advisor	Padermsak Jarayabhand

Accepted by the GRADUATE SCHOOL, Chulalongkorn University in Partial Fulfillment of the Requirement for the Doctor of Philosophy

..... Dean of the GRADUATE SCHOOL
(DAWAN WIWATTANADATE)

DISSERTATION COMMITTEE

..... Chairman
(DAWAN WIWATTANADATE)

..... Thesis Advisor
(Padermsak Jarayabhand)

..... Examiner
(SUTHIRAT KITTIPONGVISES)

..... Examiner
(Carl Middleton)

..... External Examiner
(Yanuar Sumarlan)

เอดิก ซูลิสติโอวาติ นิงซี : การประเมินผลกระทบสิ่งแวดล้อมโดยใช้กรอบแนวคิด DPSIR ร่วมกับมุมมองความเป็นธรรม ทางสิ่งแวดล้อม กรณีศึกษา การประมงในแม่น้ำมะหะกำม์. (ASSESSING ENVIRONMENTAL IMPACT THROUGH DPSIR FRAMEWORK AND ENVIRONMENTAL JUSTICE LENSES:A CASE STUDY OF INLAND CAPTURE FISHERIES IN MAHAKAM RIVER) อ.ที่ปรึกษาหลัก : เผดิมศักดิ์ จารยะพันธุ์

บทคัดย่อ

การจับสัตว์น้ำจืดจากแหล่งน้ำธรรมชาติมีส่วนอย่างมากต่อการบรรลุเป้าหมายของการพัฒนาอย่างยั่งยืน แต่การการจับสัตว์น้ำจืดจากแหล่งน้ำธรรมชาติส่วนใหญ่นั้นมักถูกจัดการอย่างไม่มีประสิทธิภาพหรือถึงกับไม่มีการจัดการเลย การจับสัตว์น้ำจืดจากแหล่งน้ำธรรมชาติมักประสบกับการเผชิญหน้ากับโครงการอุตสาหกรรมขนาดใหญ่อยู่บ่อยครั้ง ในพื้นที่แม่น้ำมหาคัมตอนกลาง มีโครงการอุตสาหกรรมขนาดใหญ่ที่เข้ามาหาประโยชน์จากทรัพยากรธรรมชาติในพื้นที่ คือ อุตสาหกรรมปาล์มน้ำมันและเหมืองถ่านหิน ทั้งการผลิตปาล์มน้ำมัน เหมืองถ่านหิน และประชากรต่างก็เพิ่มขึ้นอย่างมากในช่วงสิบปีที่ผ่านมาซึ่งตรงข้ามกับดัชนีชี้วัดคุณภาพน้ำในแม่น้ำที่ลดลงทุกปี อย่างไรก็ตามแม้การศึกษาที่ผ่านมาจะชี้ให้เห็นว่า จำนวนปลาที่จับได้ในแม่น้ำลดลงแต่สถิติทางการประมงกับแสดงข้อมูลที่ตรงกันข้าม คือ จากข้อมูลของภาครัฐนั้นแสดงให้เห็นว่ามีจำนวนปลาที่จับได้เพิ่มขึ้น แต่การเพิ่มขึ้นของการทำการประมงนั้นก็สอดคล้องก็แปรผันตรงกับการเพิ่มขึ้นของอุปกรณ์จับปลา การออกจับปลา และเรือจับปลา นั่นหมายถึงการเพิ่มขึ้นของจำนวนปลาที่จับได้ไม่ได้สะท้อนภาพของผลผลิตหรือจำนวนปลาที่แท้จริง เมื่อพิจารณาจากปฏิสัมพันธ์ที่สลับซับซ้อนระหว่างปัจจัยภายนอกที่เกิดจากน้ำมือของมนุษย์และความขัดแย้งด้านผลประโยชน์ระหว่างรัฐบาลและชุมชนชาวประมงในเรื่องการจัดการทรัพยากรธรรมชาติ จะพบว่าสิ่งที่สำคัญอย่างมากก็คือ การระบุประเด็นและปัจจัยที่เป็นแรงขับเคลื่อนและแรงกดดันที่ทำให้การจับสัตว์น้ำจืดจากแหล่งน้ำธรรมชาติตกอยู่ในความเสี่ยงที่จะนำไปสู่ความไม่เท่าเทียมและความอยุติธรรมด้านสิ่งแวดล้อมได้

งานวิจัยนี้มีวัตถุประสงค์คือ 1) เพื่อทราบแรงขับเคลื่อน แรงกดดัน สถานะ ผลกระทบ และผลลัพธ์ (DPSIR) เกี่ยวกับการลดลงของจำนวนปลาที่จับได้ในแม่น้ำมหาคัมตอนกลาง 2) เพื่อทราบระดับของของการนำเอาความยุติธรรมด้านสิ่งแวดล้อมมาพิจารณาในระดับของกระบวนการตัดสินใจตามลำดับขั้นของ DPSIR ของการลดลงของจำนวนปลาที่จับได้ 3) เพื่อทราบระดับในการรับรู้เรื่องความอยุติธรรมด้านสิ่งแวดล้อมของชาวประมงที่ส่งผลกระทบต่อการเรียกร้องและประท้วงเพื่อความยุติธรรม พื้นที่ที่ทำการศึกษาในงานวิจัยชิ้นนี้คือ ชุมชนในเขตคาร์ตาเนการา บริเวณลุ่มแม่น้ำมหาคัมตอนกลาง ในกาลิมันตันตะวันออก ประเทศอินโดนีเซีย การสุ่มตัวอย่างใช้วิธีการสุ่มตัวอย่างแบบเฉพาะเจาะจงเพื่อนำเสนอตัวแทนจากชุมชนที่อยู่ในบริเวณบริษัทปาล์มน้ำมัน เหมืองถ่านหิน และประกอบอาชีพประมง ระเบียบวิธีวิจัยในการวิจัยนี้เป็นแบบผสมระหว่างวิธีเดลฟี การวิเคราะห์เนื้อหา และการใช้สถิติเชิงพรรณนา

ผลการศึกษาพบว่า กลุ่มผู้ให้ข้อมูลแต่ละกลุ่มมีความวิตกกังวลที่แตกต่างกันในแต่ละหัวข้อของ DPSIR แต่ผู้ให้ข้อมูลทุกกลุ่มเห็นด้วยเกี่ยวกับหัวข้อต่อไปนี้ควร รัฐบาล บัณฑิตวิทยาลัย และองค์กรพัฒนาเอกชนมีความวิตกกังวลอย่างมากใน

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ปีการศึกษา 2563 ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

6087824020 : MAJOR ENVIRONMENT, DEVELOPMENT AND SUSTAINABILITY
KEYWOR D: Environmental justice, DPSIR, inland fisheries, Mahakam River

Etik Sulistiowati Ningsih : ASSESSING ENVIRONMENTAL IMPACT THROUGH DPSIR FRAMEWORK AND ENVIRONMENTAL JUSTICE LENSES:A CASE STUDY OF INLAND CAPTURE FISHERIES IN MAHAKAM RIVER. Advisor: Padermsak Jarayabhand

Inland capture fisheries significantly contribute to the achievement of SDG, but most inland capture fisheries are poorly managed or not managed at all. Inland fishery is often facing against the big-scale industrial project. In the Middle Mahakam Area, two dominant natural resources exploited for the industrial project are palm oil and coal mining. Palm oil production, coal mining production, the human population was increasing in the last ten years, and on the opposite, the water quality index is decreasing. However, although many previous studies suggested that fish catches are declining, fisheries statistics show the opposite data. Government statistics show that fish catches are increasing. However, this increasing trend is in line with fishing gear, fishing trips, and fishing boats. It means that fish catches increasing does not reflect fish productivity or fish stock. Consider the complex interaction between external anthropogenic factors and different government and fishing community interests in natural resources management. So, it is crucial to identify the number of issues and the most driving and pressuring factor that puts inland fisheries at risk, leading to environmental inequality and injustice.

Based on this rational background, the research objectives are 1) To know the driver, pressure, state, impact, and responses in fish catch declining in the Middle Mahakam River. 2) To know to what extent is environmental justice considered in the decision-making process along the step of DPSIR of decline in fish catches. 3) To know to what extent the fisherfolk perception of environmental injustice affects justice claims or protest. The study was conducted in Middle Mahakam Area in East Kalimantan, Indonesia. Kutai Kartanegara regency was the selected study area. Village sampling determined using purposive technique sampling represent villages inside and near palm oil companies, adjacent to coal mining and aquaculture. The research method is a mixed-method between Delphi method, content analysis, and descriptive statistics.

Field of Study:	Environment, Development and Sustainability	Student's Signature .....
Academic Year:	2020	Advisor's Signature .....

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The researcher realizes that this dissertation is still far from perfection, for which the author will generously receive useful suggestions and criticisms. Hopefully, this scientific work will be useful.

Bangkok, August 2021

Etik Sulistiowati Ningsih

Etik Sulistiowati Ningsih

TABLE OF CONTENTS

Page

List of table

Page

List of figures

Page

REFERENCES

CHAPTER I

INTRODUCTION

"Once you drink Mahakam River water, you will return to Kalimantan."

"If people in other places think that flooding is a disaster, here flooding is a blessing."

"Do not feel like eating if you eat without fish."

The quote above is an example of how close the Mahakam River water quality, water level, and fish are to the indigenous culture of Kutai. However, now the situation has changed. This study explores that change happens, focusing on the environmental justice issue that accompanies that change.

1.1 The rationale of study

Inland capture fisheries significantly contribute to sustainable development, especially for SDG1, SDG2, SDG8, and SDG 9. Unfortunately, because inland capture fisheries have not been perceived as economically profitable or taxable revenue, they are defeated by more important sectors such as agriculture and energy. As a result, its contribution has often been overlooked in policy discussion and development agenda (Zhao, Molinos et al. 2019). Consequently, most inland capture fisheries are poorly managed or not managed at all. As a result, people who depend on fishing for their livelihoods are among the poorest and most vulnerable rural populations (Putri, Dharmawan et al. 2018); they are incredibly vulnerable to impacts of ill-advised development, poor labor practices, pollution, habitat loss, and climate change (Fisheries 2018).

Previous research suggested decreasing fisheries production in the MMA driven by illegal fishing methods such as small mesh size, poison, and electricity to replace traditional fishing gear (Christensen 1993). Previous research also suggested that the decrease of fisheries production in the MMA is usually linked to external factors such as the expansion of palm oil plantation and coal mining both in the upland area and swampy forest surrounding the lakes and rivers (de Jong, Ragas et al. 2015). In the Middle Mahakam Area, palm oil plantation activities are the principal driver of tropical deforestation (Figure 2). Palm oil production increase from less than 500.000 tons/year to 3.000.000 tons/year in 2011-2017. Indonesia's oil palm production rose to

48.42 million tonnes by 2020 and accounted for about 57% of global production (data 2021). In 2015, the area of location permits issued by the Government of Kutai Kartanegara for oil palm plantations as of August 2015 reached 873,397.8 hectares, and the total area of Plantation Business Permit was 552,511.4 hectares. Even though there were only 376,938 hectares in that year, the land expanded for oil palm plantations outside the allotment plantations according to the land use and spatial planning (Dharmawan, Mardiyaningsih et al. 2016).

Meanwhile, in 2014 1,443 coal companies were operating in East Kalimantan within 5.5 million ha consisting of (i) coal mining license 1,360 (94%) and (ii) mineral license 83 (6%) (Muhdar 2012). According to Jamie (2021), investment in agriculture, in general, has more of an impact on destroying forests and the resources therein. From a territorial perspective, Indonesia's oil palm contributing to the extent of 23% forestry domain (data 2021).

Palm oil is planted in the swampy area or even in the peatlands (Wijaya 2013) and riparian buffer zone in which, based on land use and spatial planning, some of its parts are categorized as a conservation area. Palm oil plantation activities such as land clearing, seeding, planting, nursing, harvesting, and processing contribute to pollution of waterways for aquatic life through pesticide and fertilizer (Agency 2018, Glinskis and Gutiérrez-Vélez 2019) and frequent flooding (Colchester, Chao et al. 2011). As well as palm oil plantation, coal mining production increase from 20 million tons/year to more than 60 million tons/year in 2010 – 2017. Coal transporting causes so many problems in the Mahakam River (Prokaltim 2018). Coals that fall from the boat and conveyor belt into the water become a source of the contaminant. Furthermore, the boat often hit fish cages belong to the fisherfolk. In the rainy season, wastewater run from sludge ponds into the river, lake, and swamp.

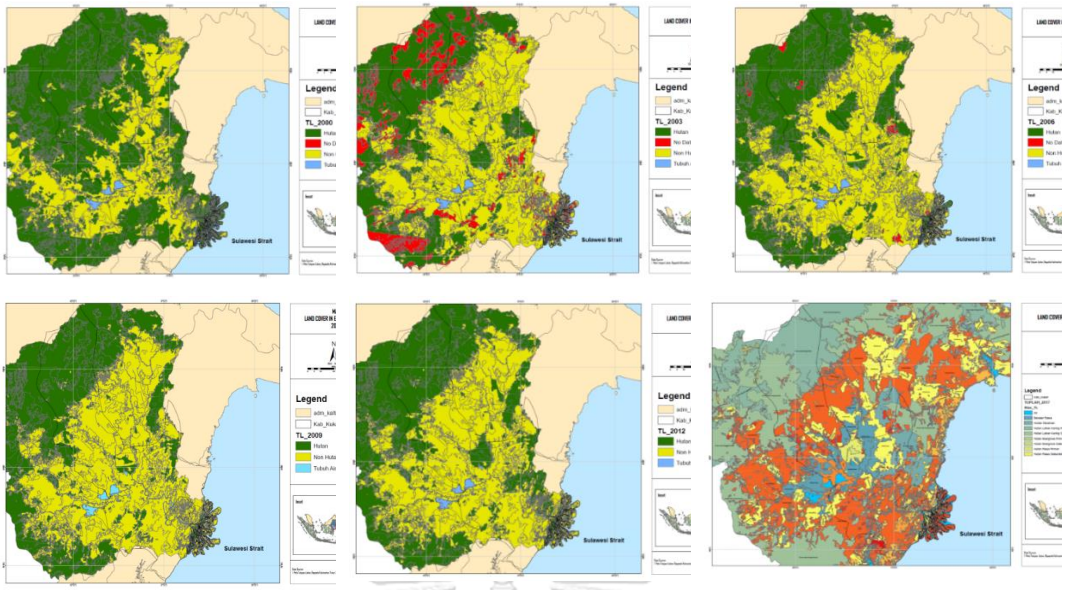


Figure 1 Land cover of East Kalimantan Province in 2000-2007
Source: Bappeda Kaltim, 2018

The trend of fisheries production decreasing in line to water contamination index decreasing but contradict the increasing trends of population, land use, and land cover changes. This phenomenon socially and economically had a significant impact on fishers' communities in the Mahakam River. They can identify water quality declining by knowing the eutrophication phenomenon. During the peak season of eutrophication, a fisherman is experiencing economic loss caused by fish mass death (Zuliarsih 1996). In the meantime, the growth of nutrient number triggered by the growing number of phosphorus and nitrates leads to weeds and water hyacinth growing fast (Lewis, Saunders et al. 2012). As an impact, fisherfolk could not reach the fishing ground since it was covered by weeds and water hyacinth (Zuliarsih 1996). The studies which Zuliarsih did in 1996 shows that fisherfolk income declines almost more than two per three parts during eutrophication periods (Zuliarsih 1996).

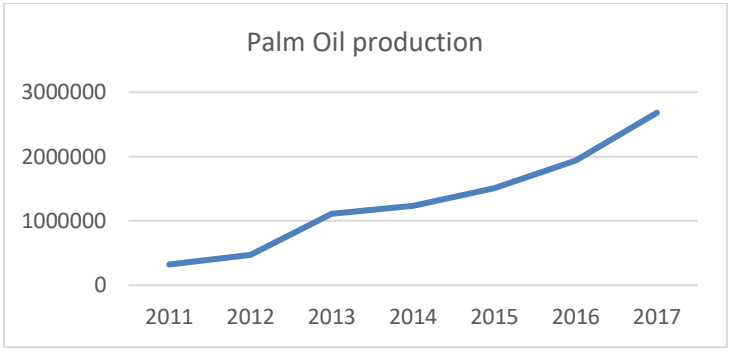


Figure 2 Palm oil production (tons) Source: Plantation Agency 2011-2017

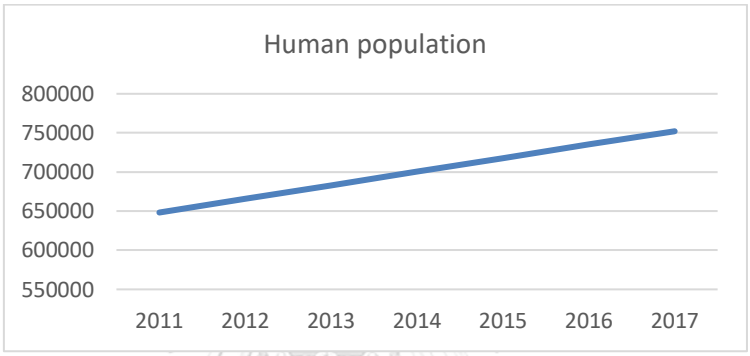


Figure 3 Kutai Kartanegara population. Source: Statistic Beraue of East Kalimantan (2018)

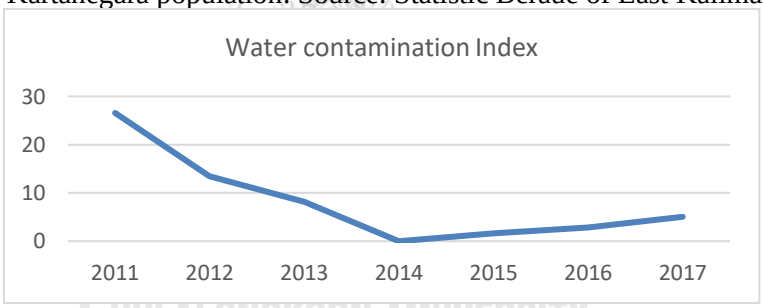


Figure 4 Water contamination index trend Source: Environmental Agency (2018)

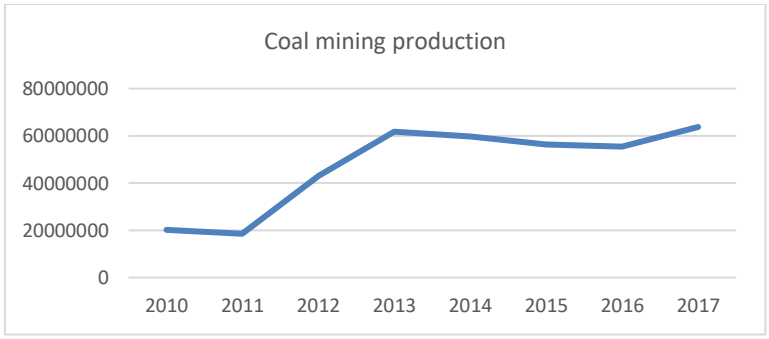


Figure 5 Coal mining production (tons) Source: Mining Agency (2018)

Water quality decreases affect the fishing community's livelihood. The previous study conducted by Yulian (2018) demonstrates that the oil palm plantation has provided prosperity for the rural household, but what happens is a long process of livelihood vulnerability and dependency toward income gained from the salary in oil palm plantation. Similarly, Wijaya (2013) also found that the inland fisherfolk community in the MMA is experiencing extreme vulnerability. Amalia (2019) found that the losses of livelihood diversity cause such vulnerability. Before palm oil expansion, the fisherfolk community does farming, logging, and cultivating rubber trees besides do fishing. Furthermore, using the analysis of livelihood strategies, Putri (2018) found that the higher economic class tends to change their main livelihood to palm oil while continue to do fishing as a livelihood adaptation strategy. In contrast, middle and lower economic classes continue to do fishing as their main livelihood while gathering non-forest products as livelihood adaptation strategies amid palm oil expansion.

However, although much previous research indicated that inland fishery in the MMA was decreasing and supported the idea of fish productivity decreasing, fisheries statistic data shows that fisheries production in Middle Mahakam Area tended to increase in 1981-2010 from 20.000 – 35.000 tons/year. Although fish catches tend to decrease since 2011-2017 from 35.000 – 33.000 tons/year, it is not significantly decreasing (Agency 2018).

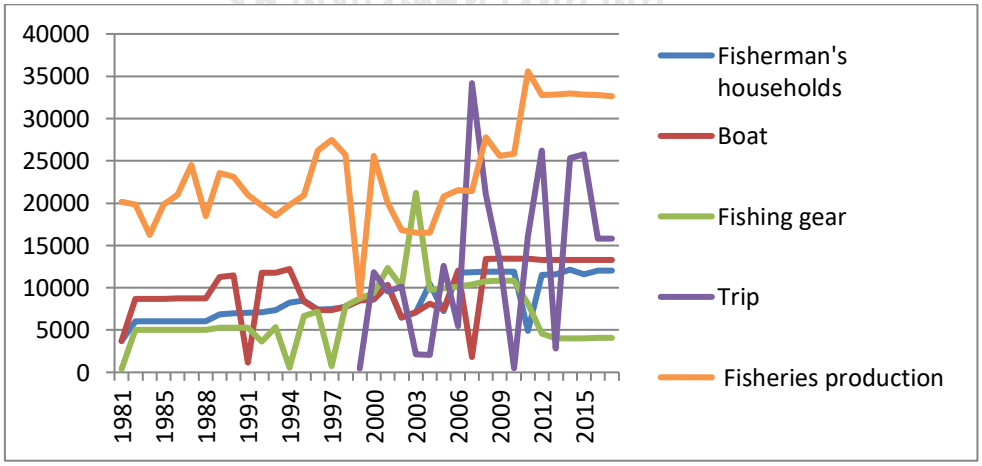


Figure 6 Inland capture fisheries statistic 1981-2018
Source: Dinas Kelautan dan Perikanan Kalimantan Timur, 2018

This contradictive data may lead to misleading fishery management. So, in favor of appropriate fishery management and consider the complex interaction

between inland capture fisheries and other interests that interwind to the economic and political system (Lynch, Cowx et al. 2017), it is highly essential to identify the number of issues and the most driving and pressuring factor that is putting inland fisher's human security at risk. By knowing this, fisheries managers and stakeholders can respond appropriately to mitigate the impact of both anthropogenic and natural drivers of environmental degradation. The prominent framework is widely used worldwide to analyze and assess the interaction among human activity, environmental issues, and development is the DPSIR framework. DPSIR is an abbreviation for Driver-Pressure-State-Impact-Responses. DPSIR considers the links between driving forces that impose pressures on an SES (Socio-Ecological System), leading to a state change in the ecosystem that affects human welfare (Berninsone, Newton et al. 2018).

While the DPSIR approach is widely used as integrated environmental management in many countries, they also use Environmental Impact Assessment (EIA) as an instrument for controlling large-scale projects that would significantly impact the environment. Suppose DPSIR aims to understand the general driver, pressure, state, and impact of anthropogenic and natural phenomena. In that case, EIA predicts the specific impact of every step of a project on the environment considering its scale, magnitude, and severity to get an environmental permit (Environment 2012). The projects must propose some responses to avoid, minimize, mitigate, and compensate for environmental impact. The framework widely used to analyze the impact of disproportionate resources distribution to particularly affected communities is the environmental justice framework (Esteves, Factor et al. 2017). According to Ozyanak and Labajos (2017), environmental injustice might happen along and the whole process of the project: (1) the state of the project, (2) it impacts and how they are managed, (3) institutional responses, and (4) community-power relations (Rodríguez-Labajos and Özkaynak 2017).

The juxtaposition of DPSIR and environmental justice in the same research frame could provide a comprehensive picture and communication tool for promoting the impact and response of environmental degradation led by general and specific activities. Additionally, it is also beneficial to lead multi-stakeholder in engaging the discourse of responding to an impact led by the big-scale industrial project. Therefore, it is easier to point out who is the polluter, who is also affected by pollutants, and thus

responsible for solving the pollutant problem. Furthermore, that discourse can include issues of power balances and the contributions of different kinds of knowledge, thus opening opportunities to include environmental justice issues for struggling the right of the affected community through legal policy such as EIA.

In the context of fisheries sustainability, a group of researchers Lynch (2017), Zhao (2019), Allison (2012) and Pomeroy (2016) argue that human right issue needs to integrate into a broader range of policies and regulatory because fishing communities suffer in a broad range of security issues both economically, socially, physically, and politically insecure. Inland fishery often faces against the big-scale industrial project (Nguyen, Vu et al. 2018), which puts fisheries into the most vulnerable sector to marginalized (Allison, Ratner et al. 2012). Therefore, environmental justice is needed to be issued to sue inland fisherfolks' rights. According to (Esteves 2017), a precondition of environmental justice prosecution is the polluter responsible for environmental degradation (Esteves, Factor et al. 2017). So, it makes sense to set environmental justice and DPSIR in the same framework. Until now, there are no empirical studies that integrate DPSIR and environmental justice in one framework. Therefore, this study is designed to fill such a gap using inland capture fisheries in the Middle Mahakam River.

1.2 Objectives and Scope of the Study

The aims of the study are:

1. To know the driver, pressure, state, impact, and responses of decline in fish catch in the Middle Mahakam River.
2. To know what extent environmental justice is considered in the decision-making process along the step of DPSIR of decline in fish catches.
3. To know what extent is the fisherfolk's perception of environmental injustice affects justice claim or protest.

1.3 Statement of the Research Questions

In this study, the research was set by the question as follows:

1. In the present condition, what the driver, pressure, state, impact, and responses of decline in fish catch in the Middle Mahakam Area?

2. To what extent is environmental justice considered in the decision-making process along the step of DPSIR of fisheries production in the Middle Mahakam Area?
3. To what extent the fisherfolk perception of environmental justice affects to justice claim or protest?

1.4 Summary: Structure of Thesis

This thesis consists of five chapters, including this chapter. In Chapter Two, we explain the literature review. Then, Chapter three explains the methodology. Chapter four explains the results and discussions. They are structured according to the research question and the emerging research findings. Finally, chapter five develops a recommendation for fisheries management based on the findings of this study.

CHAPTER II
LITERATURE REVIEW

This chapter presents the literature review used in this research. The first conceptual framework is DPSIR and the second is environmental justice. Each conceptual framework is followed by empirical research. We also refer to some literature and previous study about a claim for justice and perception of environmental justice. In the end, we elaborate theoretical framework for this research.

2.1 **DPSIR conceptual Framework**

DPSIR is a framework or a tool for understanding the interaction and cause effect-relationship between humans and the environment. It is developed for structuring and communicating policy-relevant research about the environment. The model has four steps: (1) interpretation of the drivers and pressures; (2) description of the actual State; (3) description of the impacts; and (4) assessment of the human response.

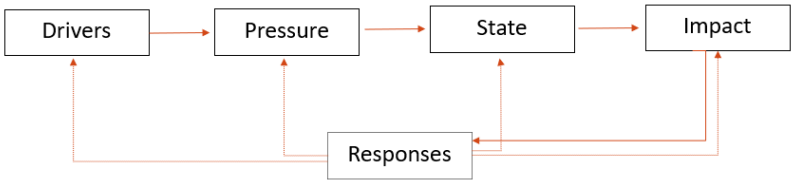


Fig 1. DPSIR framework

Figure 7 DPSIR framework
Adapted from Smeet (Smeets and Weterings 1999)

Driving forces identified as general human needs responsible for pressures on the ecosystem, and it could be an essential condition or material such as social, demographic, and economic development (Madu, Kuei et al. 2018). Drivers reflect underlying human needs and desires, which may be social, economic, or environmental developments, utilize Pressures on a particular environment (Martin, Piscopo et al. 2018). As a result of these Pressures, the State of the environment changes then leads to an Impact (social, economic, or environmental), which may lead to a societal Response—driving forces almost exclusively anthropogenic factors such

as population growth, demographic change, economic and industrial development, and climate change.

Pressures are the actual human activities that affect the ecosystem, such as excessive natural resources, environmental emissions, and land-use changes (Madu, Kuei et al. 2018). Pressures are changes in environmental parameters resulting from human activities, e.g., increasing levels of contaminants due to an increased volume of wastewater discharge as the population grew (Martin, Piscopo et al. 2018). Pressures contribute to the changes in the environment, such as fish abundance, fish health, and the eutrophication of coastal waters. Human activities that impose pressure on the socio-ecological system can be varied.

State indicators reflect the quantity and quality of biological, chemical, and physical conditions, like chemical properties in water or the abundance of biota and size of habitat (Martin, Gross-Camp et al. 2014). The state describes the condition of ecosystem components, or the quality of various environmental components affected by pressures. State changes describe the condition of ecosystem components or the quality of various environmental components affected by pressures.

Impacts related to the changes to human welfare caused by the environmental state changes include the production of ecosystem goods and services and, ultimately, human well-being (Madu, Kuei et al. 2018).

Response indicators are societal actions, like stormwater management or ecological restoration, that prevent, compensate, ameliorate, or adapt to impacts (Martin, Piscopo et al. 2018). Responses are the feedback from society or policymakers to driving forces, pressures, state changes, and impacts (Gebremedhin, Getahun et al. 2018). Within the DPSER, the responds component represents a feedback mechanism through which human activities can alter the driver, pressures, states, and ecosystem services. Individuals, private organizations, state and federal agencies, and policymakers can take these actions. Response reflects what people perceive about ecosystem services, the State of the environment, pressures, and drivers (Kelble, Loomis et al. 2013). Besides, Sun Wu et al. define responses as policy actions that are directly or indirectly triggered by the perception of impacts and attempt to prevent, eliminate, compensate, or reduce their consequences (Sun, Wu et al. 2018).

DPSIR have been widely used across discipline and various aims. For example, this model was used as a diagnostic tool for assessing the environmental problems of the estuarine beaches of the Amazon coast, as well as the identification of the cause-effect relationships of human activities and their environmental and socio-economic consequences (de Sousa-Felix, Pereira et al. 2017). Furthermore, Liu (2018) constructs an indicator system to evaluate the sustainability of marine industrial parks, which will significantly assist governments in promoting the sustainable development of marine industrial parks (Liu, Liu et al. 2018). Meanwhile, Lu (2019) used DPSIR to assess the ecological effect of the polluted urban river during the restoration in China (Lu, Xu et al. 2019).

2.2 DPSIR-related empirical research

Much DPSIR analysis revealed that anthropogenic causes and biological activity drive environmental change. Anthropogenic activity includes social, demographic, and economic development, is one of the crucial drivers led environmental degradation in the watershed, Delta, river, lake, coastal and fisheries and (Berninsone, Newton et al. 2018, Gebremedhin, Getahun et al. 2018, Madu, Kuei et al. 2018, Schönach, Nygrén et al. 2018, Volf, Atanasova et al. 2018, Nathwani, Lu et al. 2019). For example, Gebremedhin's (2018) study suggests that rapid population growth and economic transformation are the main driving force leading to fish declining in Lake Tana, Ethiopia. Besides, a review of the DPSIR framework to fisheries management by Martins (2012) revealed that per capita income and GDP produced by sector becomes a driver factor of fisheries sustainability.

The study of de Jong (2015) in the Mahakam River shows that coal mining pressuring fisheries production. Furthermore, aquaculture is associated with fisheries production decreasing in Lake Toba (Sunaryani, Harsono et al. 2018). Meanwhile, Saswattecha (2015) suggests that palm oil contributes most to the environmental impact in Thailand. The same studies have been done by Nooteboom (2010), and Yulian (2018) in the Mahakam River also suggests the same result as Saswattecha's study. The pressure of palm oil into the environment is generated from palm oil plantation activities and palm oil mills. The pressure of palm oil plantations is generated from fertilizer management, weed control, pest control, and transport of fresh fruit bunch. At the same time, the system of palm oil production generates two

kinds of waste, i.e., empty fruit bunch and palm oil mill effluent. Those two wastes are generated from fresh fruit bunch sourcing, oil extraction, use of renewable energy, and wastewater treatment (Saswattecha, Kroeze et al. 2015).

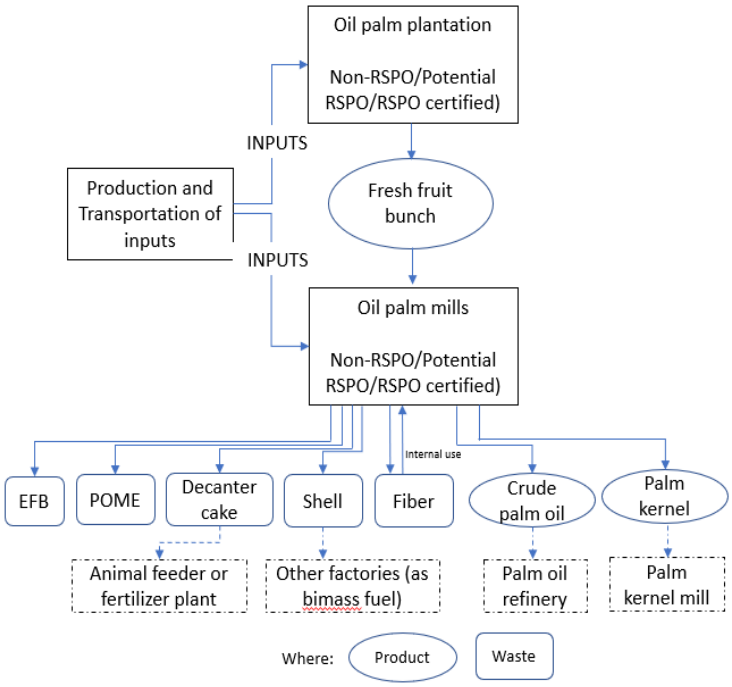


Figure 8 The system of palm oil production
Source: Saswattecha, 2015

Palm oil sludge or palm oil mill effluent is wastewater generated by processing oil palm that consists of various suspended materials (Kamyab, Din et al. 2015). Palm oil mill effluent has a very high biochemical oxygen demand (BOD) and chemical oxygen demand (COD), which is 100 times higher than municipal sewage. The effluent also contains a high concentration of organic nitrogen, phosphorus, and other nutrient contents. Palm oil mill effluent is a colloidal suspension consisting of 95–96%water, 0.6–0.7% oil, and 4–5% total solids, including 2–4% suspended solids originating from a mixture of sterilizer condensate, separator sludge, and hydro cyclone wastewater. Releasing palm oil mill effluent without sufficient treatment into aquatic environments can increase biological oxygen demand (BOD) and chemical oxygen demand (COD). Nitrogen and phosphorus are two essential pollutants in palm oil mill effluent that can severely pollute aquatic environments. According to the Department of Environment Malaysia, the level of BOD for wastewater to be released into aquatic environments must be less than 100 mg/L (Kamyab, Din et al. 2015).

An indirect impact of land use conversion into palm oil plantation combined with direct climate change impact is the transformation of hydrology pattern of flood days and dry day periods. It is demonstrated by water level fluctuation in the Mahakam Cascade lakes, associated with the Mahakam River and smaller laker. The average water level in 1989-1999, 1989-2010, and 2000-2010 was 2.34 m, 2.74 m, and 3.37 m, respectively (Mislan and Suyatna 2016). In the flood days, water dissolves fertilizer, pesticide, and herbicide, which have been applied to the palm oil plantation. Therefore, it increases the eutrophication and contamination risk potential of the water bodies.

Furthermore, eutrophication is also led by the increase of organic matter and nutrient availability that run into the water system through runoff process, infiltration, and ash deposition generated by a forest fire (de Jong, Ragas, Nooteboom, & Mursidi, 2015; Lewis, Saunders, Crumpacker, & Brendecke, 2012). Meanwhile, a dry period also has a multiplier effect that enlarges the risk of the upcoming forest fire. Furthermore, water that flows from pit land has low pH, low oxygen, low inorganic ion, and a high concentration of moist acid, leading to change watercolor to be black (de Jong et al., 2015).

In his systematic review of fisheries management, Martin (2018) demonstrates that the state of change in the aquatic or fisheries system is indicated by the State of dissolved oxygen, pH value of water, sediment condition, and temperature. In 2015, De Jong et al. conducted a time-series data comparison on 1992/1993, 1995, and 2006 water quality data, and his analysis demonstrated that BOD was the only parameter with the same pattern during those three periods. In the meanwhile, TSS, pH, and hydrogen sulfide were different significantly. He expected that topsoil opening for coal mining and draining and excavating of pit area led to increased pyrite and sulfide levels and decreased oxygen within the water. He also found that a high concentration of TSS was led by a palm oil plantation opening in one of its tributaries (de Jong et al., 2015).

According to time series data of water quality collected in Middle Mahakam from 2011 to 2017 by BLH, some parameters that do not meet the quality standard are TSS, pH, DO, BOD, COD, Pb Cu, and Cd. This finding is in line with the results of direct water quality analysis done by RASI in 2017-2018 shows that most of the river

and its tributaries in the Middle Mahakam did not meet water quality standards in terms of TSS, pH, DO, and BOD parameters. Based on water quality analysis in the laboratory, RASI also found that three Middle Mahakam River tributaries were contaminated by some of the heavy metals: Mn, Fe, Cd, and Pd. Even its numbers were four times bigger than the threshold level (RASI 2018). The more extended water quality data series collected by some researchers consistently showed water quality change in the Middle Mahakam area. The parameters that did not meet quality standards were BOD in 1992/1993, DO, BOD, nitrate, and phosphate in 1995 {(DeJong, 2015). Partially, no parameter was improved or deteriorated, but all parameters were changing. Moreover, simultaneously, by using the contamination index formula, water quality tends to decrease.

Table 1. Water quality of Middle Mahakam Area

Parameters	Indonesian water quality standard	2011	2012	2013	2014	2015	2016	2017
Temperature	25-31	28.47	28	27.41	28.033	28.79	29.57	27.73
Total Suspended Solids (TSS)	50	95	45.25	50.6	24.807	23.26	3.42	86.4
Total Dissolved Solids (TDS)	1000	27.39	31.465	21	38.467	59	65.493	30
pH	7.00 - 9.00	6.81	6.21	5.76	6.547	7.05	6.51	6.74
Dissolved Oxygen (DO)	6	5.31	6.24	5.53	6.030	4.71	3.42	5.95
Ammonia (NH3-N)	0.5	0.02	0.09	0.09	0.063	0.13	0.0864	0.06
Nitrate (NO_3-N)	10	0.59	0.993	0.63	0.305	0.257	0.737	0.22
Phosphate (PO_4-ortho)	0.2	0.09	0.01	0.03	0.011	0.03	0.01	0.02
Biological Oxygen Demand (BOD)	2	5.65	6.58	7.4	2.820	3.558	6.062	1.49
Chemical Oxygen Demand (COD)	10	22.49	124.7	39.36	9.956	6.81	15.381	5.26
Nitrit (N-NO_2)	0.06	0	0.008	0.005	0.008	0.002	0.0085	0.01
Lead (Pb)	0.03	0.01	0.078	0.053	0.010	0.019	0.0164	0.005
Copper (Cu)	0.02	0.02	0.02	0.006	0.007	0.008	0.0051	0.003
Cadmium (Cd)	0.01	0	0.01	0.012	0.000	0.004	0.0009	0.01

Source: BLH Kalimantan Timur, 2018

Those time-series data show that pH, DO, BOD, and COD always tend to be unmet water quality standards. Although the low value of DO and pH is a natural phenomenon in the swamp habitat {Indonesia, 2018 5}, however, its level is unduly sensitive to the hydrological pattern of the swamp (de Jong, Ragas, Nooteboom, & Mursidi, 2015).

Low pH values may be toxic for fish, either directly or indirectly, by mobilizing toxic metals that can lead to eutrophication. As a result, it could reduce and impair

fisheries' growth. Besides, heavy metals contamination such as Pb and Cu generated by wastewater of palm oils mills and plantations and Cd generated by coal mining exploration and transportation is highly influenced water ecosystem. Some palm oil company is indicated to flow its sludge into the swamp that would flow into the Mahakam River. Whereas Pb and Cd are associated with the coal mining company, particularly coal-burning and transporting, coal shards often fall into rivers when transported using coal barges (Indonesia, 2018). A study by Sunaryani (2018) suggests that aquaculture increasing trend in Lake Toba impact massive fish kills, fish abundance change, fish downsizing. Palm oil also contributes to the water quality decreasing in West Kalimantan and Papua (Obidzinski, Andriani et al. 2012). The decrease in water quality and sedimentation caused by palm oil and coal mining activities ultimately impact the decrease of the fish catch (Suyatna, Syahrir et al. 2017).

The decreasing trend of fish catch has a multiplier effect on human security (Funge-Smith and Bennett 2019). Human security describes the relative presence of contingencies that threaten physical and psychosocial harms affecting human dignity, livelihoods, safety, survival, and health & wellbeing in the contexts (political, economic, socio-cultural, and ecological) within which processes of human development take place. Thus, enhancing human security complements longer-term human development processes by controlling, eliminating, or mitigating these contingencies in the short term (Alkire 2003).

Human security threats are structurally rooted in societies' political, economic, technological, and socio-cultural fabric. Threats can occur at and across various levels: micro (individual/household level), mezzo (sub-national group/community/regional level), macro national/regional), or meta-macro (global level) (Alkire, 2003). According to Human Development Report 1994, human security comprises of seven human security dimensions:

1. Economic security is assured basic income that is defined as access to employment and resources.
2. *Food security* is defined as physical and economic access to food for all people.
3. *Health Security* is defined as access to medical treatment and improved health conditions.

4. Environmental security is related to living a healthy physical environment, which spared desertification, deforestation, and other environmental threats that endanger people's survival.
5. Personal security is individual security from physical violence. Threats can take several forms.
6. Community security is related to tensions between the membership of a social group due to competition over limited access to opportunities and resources.
7. Political security is related to living in a society that guarantees fundamental human rights and freedom of expression (Hussein, Gnisci et al. 2004).

In the fisheries context, the threat to food security caused by decreasing trend of fish catch indicated by the difficulty of buying fish or increase in the price of the fish (Sumaila, Guénette et al. 2000, Alkire 2003). Furthermore, according to Martin (2012), fish decreased effect in a decreased level of fish consumption and even led to exclusion and conflict (D. M. Martin, Piscopo, Chintala, Gleason, & Berry, 2018). Meanwhile, decreasing fish leads to the loss of income from fisheries, weakening social bonds among fisheries, and increasing the occurrence of harmful bacteria (Gebremedhin, Getahun, Anteneh, Bruneel, & Goethals, 2018). Besides, fish production decreasing influences rural resident's per capita net income (Hou, Zhou et al. 2014).

In responding to the fish production decreasing led by the environmental problem, the government, company, and community respond variously. The responses include implementing environmental monitoring plans, improvement actions, wastewater treatment, removal of exotic species, restoration, restocking, monitoring and control, alternative livelihood (Gebremedhin et al., 2018; D. M. Martin et al., 2018; Schönach et al., 2018).

Short term strategic program for inland capture fisheries development set by local government comprises of a) procurement of fishing equipment, b) the number of fleet vessels for catching in public waters, c) construction of a fish auction site, d) provision of facilities for repairing fishing fleets, e) aquaculture development program, f) development of fish farming in cages, g) development of fish farming in ponds, development of fish farming in tarpaulin ponds, h) monitoring and controlling fish health and fish farming environment, i) fishing technology training for fisherfolk,

j) training on fisheries product processing, k) assistance with land rights certification programs, l) program for management and development of fish conservation areas, m) improving the function of fisheries reservoir facilities and infrastructure, n) fisheries restocking in the fishing ground and o) integrated monitoring on illegal fishing (Agency 2015).

Besides, in enacting the principle of corporate social responsibilities and social justice, generally, extractive and industrial based companies in Indonesia are responsible for doing community empowerment which is usually applied either in the participatory based or incidental based program and mandatory or charity program. In particular, the company must fulfill its responsibilities to manage its impact both socially, economically, and environmentally, as predicted in its EIA planning and monitoring document. For instance, refer to the EIA document of the palm oil plantation company, i.e., PT. Asiatic Persada, Jambi, its environmental impact mitigation is the reforestation of riparian, research and development of flora and fauna, build the public facility, public extension, job vacancy socialization, public disclosure on companies' planning program.

2.3 Environmental justice conceptual framework

At first, the environmentalist movement established environmental justice, which concerns the placement of hazardous facilities (Rodríguez-Labajos and Özkaynak 2017) and goes based on the traditional distributional issue view (Bustos, Folchi et al. 2017). It mainly emphasizes the uneven distribution of environmental burdens on disadvantaged communities and addresses the claim to recognition (what kind of values and visions matter?) and participation (who is involved in the decision-making process and how?) (Walker and Bulkeley 2006, Walker 2012). Gradually, environmental justice expanded by a scientist using various academic perspectives. Now, several environmental justice topics have been studied across many fields of studies ranging from the interdependence between environmental justice, natural resource dependence, and the sociology of agriculture or natural resource-dependent industries, the environment, social injustice, and health and related asymmetries of power and control, mining and social injustice and climate impact on coastal areas (Rodríguez-Labajos and Özkaynak 2017, Clough 2018, Nurhidayah and McIlgorm 2019). Even environmental justice has an intersection with many other field studies.

Many recent studies still using three elements of justice as an approach, i.e., distributional justice, recognition justice, and procedural justice (Jenkins, McCauley et al. 2016, Aguilar-González, Navas et al. 2018, Bétrisey, Bastiaensen et al. 2018, Islam and van Staden 2018).

Distribution refers to the equitable division of positive and negative impacts of the environment between communities or individuals (Schlosberg, 2003). Distributive environmental justice concerns who bears the environmental bad (Clough, 2018) or environmental good (Movik 2014). Distributive justice refers to the perceived fairness of the amounts of compensation employees receive (McFarlin and Sweeney 1992).

In Indonesia, environmental distributive justice is ruled under many national and provincial laws and regulations, such as:

1. In the Indonesian Constitution Article 28 paragraph (1), it is stated that every person has the right to live in inner and outer prosperity, to live and get a tasty and healthy environment, and has the right to obtain health services.
2. Law No. 7/2016 on Protection and empowerment of small-scale fisher, aquaculture farmer and salt farmer, it is stated that fishers have the right to obtain business certainty through efforts to control the quality of the aquatic environment and reduce risks caused by natural disasters, disease outbreaks, the effects of climate change and pollution.
3. Law No 41/1999 Forestry Law states that:
4. Communities around the forest have the right to receive compensation because of loss of access to the surrounding forest as employment to fulfill their living needs due to the establishment of forest areas, following the applicable laws and regulations.
5. Everyone has the right to receive compensation because of the loss of rights to their land because of the establishment of forest areas following the provisions of the applicable legislation.
6. If it is known that the community suffers from pollution and forest damage in such a way that affects the lives of the community, then Government agencies or Regional Government agencies responsible for the forestry sector can act in the interests of the community.

7. East Kalimantan Provincial Regulation No. 1 of 2001 on Land use and spatial planning for East Kalimantan Province 2016-2036 states that:
    1. The purpose of provincial land use and spatial planning is to create a provincial spatial space that supports an equitable and sustainable green economy based on agriculture-related industry and is environmentally friendly. Sustainable green economy-based policy refers towards agrofuels in which the state subsidizes additional demand for palm oil (Pye 2019).
    2. Inland use and spatial planning activities, the community, has the right: Knowing the spatial plan, enjoy the added value of space because of land use and spatial planning, and obtain a proper replacement for losses arising from the implementation of development activities that are not under the spatial plan.
8. Law No 32/2009 on environment protection and management law
9. Everyone who conducts environmental pollution and damage is required to control pollution and environmental damage. It is carried out by providing information on pollution warnings and environmental damage to the community.
10. Community involvement in preparing EIA documents must be carried out based on providing transparent and complete information notified before the activity is carried out. The community involved includes affected communities, environmentalists, and all communities affected by all decisions in the EIA process.
11. The right to a good environment.
12. The right to environmental education.
13. The right to access information, access to participation, and access to justice in fulfilling the right to a good and healthy environment.
14. The right to submit a proposal and objection to the planned business and activity is expected to impact the environment.
15. The right to play a role in environmental Protection and management.
16. The right to make complaints due to alleged environmental pollution and damage.

Procedural environmental justice is the right and ability to get involved in the process of decision-making on where hazardous facilities that environmentally harm must be placed (Clough, 2018). Moreover, procedural justice is relevant to the condition when one judges the fairness of the process (Schlosberg 2003). Schlosberg

argues that procedural justice constitutes two elements, i.e., participation and recognition. Participation means that the ability of individuals or communities to engage in the process of decision making. When people judge the fairness of the process, then it is called procedural justice (Cropanzano and Byrne 2001). Procedural justice refers to the perceived fairness of the means used to determine the amounts of employees received (McFarlin & Sweeney, 1992).

The procedure means a series of systematic phases utilized to allocate and distribute the resources; thus, it can accomplish the organization's long-term goals while preserving human well-being. The fair procedure is the ones that maintaining long-term benefit, the process should be neutral, the decision-makers should prioritize the perceiver's interest, and the procedure should consider and acknowledge individual identity (Cropanzano & Byrne, 2001). Just procedures are characterized by consistency, lack of bias, accuracy, correctability, and voice during decision-making (Franche, Severin et al. 2009).

Procedural justice concerns access to the decision-making process that governs the distribution of environmental benefits and ills. Procedural justice is underpinned by access to and pressure from multi-level legal systems. Three mechanisms to achieve procedural justice are that through local knowledge mobilization. It links to indigenous people in the local communities, more critical information disclosure by government and industry in which government put public consultation at the center of environmental decision-making, and better institutional representation including business, local, national, and international governmental bodies as well as gender and ethnic minority (Jenkins et al., 2016).

Recognition is the foundation of both distributive and procedural justice. Recognition justice is that individuals must fairly represent, be free from physical threats, and offer fulfills and equal political rights (Movik 2014). According to Clough (2018), in terms of environmental justice, recognition means that all relevant stakeholders' attitudes and right to participate must be acknowledged and appreciated (Clough, 2018). Conversely, lack of recognition is the foundation of distribution injustice (Bustos, Folchi et al. 2017).

Bertrisey (2018) examines some theories of recognition, namely, according to Honneth theorizes about intersubjective recognition, Judith Butler theorizes about

recognition, subjection, and domination, and Amy Allen theorizes about recognition between recognition domination and emancipation. The first inventor of theory recognition was Habermas. Honneth criticized Habermas's theory of recognition in which is considered as linguistic, dualistic, and procedural. Subjectively, humans had three spheres of recognition, i.e., social norm, relationship, and identity. Judith Butler criticizes Honneth by offering a new perspective that norms and institutions dominate that every three subjects. Norms and power relations dominate the recognition of subjects and objects. Then Amy Allen criticized Butler that the subject's attachment to the power relationship does not automatically make the subject dominated because recognition depends on the moment; it is ambivalent and dynamic. The subject's need for recognition depends on the moment. Butler argues that recognition must be dynamic, and because everyone also needs to be recognized, recognition is a mutual thing. The view that recognition is ambivalence and dynamic enable social change or rejection. Identity formation takes place in a discursive manner that allows one to reject the narrative pinned to it with recurring discursive occurrences. The subject can build his narrative of identity as he can reject the dominant identity narrative about him.

Honneth's theory of recognition aims to reveal the condition when people's self-development autonomy is unrecognized. She developed her theory based on subjects' experiences of social suffering and struggle without considering formal discursive process and dismantling the common source of legal injustice and deriving all the norms to examine an injustice need to scrutinize the reality of social resistance or struggle. One of the social struggle's indicators over informal claims of injustice experience is the capacity of individual moral demands. Therefore, Honneth emphasized her recognition theory on the subject's capability to express an individual's misrecognition and suffering. She argues that it is tough to prevailing Habermasian proceduralism since it needs collective ability to articulate substantive critical claims through structured public discourse. However, formal discourse is challenging to organize, but inequities in social power and voice may never allow some subjects to explain their experiences in formal public forums.

2.4 Environmental justice-related empirical research

The study of Martin reported that people's perception and shared perception of justice determine people's behavior in implementing forest conservation in the particular context of Rwanda (A. Martin, Gross-Camp, Kebede, McGuire, & Munyarukaza, 2014). He found that conservation conflict with indigenous people arises over differences in perception of justice. Conservation actors underlay fair distribution based on the global payment distribution principle under utilitarian cost and benefit analysis. On the contrary, people prefer equity principles. Chomba did a similar study within the REDD project in Kenya. He found that the scale of social grievances metamorphosed into the liberation movement, in which it is led by unequal land distribution, land dispossession, and disparities in land tenure (Chomba, Kariuki et al. 2016).

In terms of distribution of environmental goods, Movik research on natural resources distribution using allocation discourses. He analyzed water allocation reform in South Africa. He found that allocating water resources in a just distribution manner to the vulnerable people who are profoundly affected by pollution from mining encompasses multiple dimensions of environmental justice in terms of human rights perspective, the right to a healthy environment, and in terms of the distribution of resources (Movik, 2014).

Many researchers report the role of procedural justice in the organizational context. The relationship between an individual's procedural justice perception and then worked performance and job satisfaction (Mossholder, Bennett et al. 1998). They found that an individual who works in branches whose justice context reflected higher procedural justice exhibited a higher level of job satisfaction. Mossholder (1998) emphasizes that fair procedure should be designed to be fair to all organization members, the interpretation, execution, and the impact of procedures at a different hierarchical level. Watson's (2010) research on how procedural justice may shape cooperation and resistance. They found that critical components of people's cooperation and behavior shaped by its perception of procedural justice include the opportunity to be heard by decision-makers and being treated with respect, politeness, and dignity, and acknowledging one's rights by the decision-maker (Watson, Angell et al. 2010). Meanwhile, even natural gas companies contribute to income increasing,

farmers in Pennsylvania lost their ability to decide their livelihood since the hydraulic fracturing company does not let them participate in the decision-making process. They are experiencing procedural injustice (Malin and DeMaster 2016).

In terms of the environmental pollution case, Shriver (2009) examined environmental health and justice perception among rural native America. For example, Ponca tribal member convinces that dust emanating from Continental Carbon Company causes respiratory problems, but they cannot validate their health claims through the institutional channel (Shriver and Webb 2009)(Shriver & Webb, 2009). A similar study was conducted by Higginbotam (2010) in Australia. He revealed that residents and civil society who protested about air pollution were marginalized through discrediting the knowledge of health risks of coal dust and power station combusting in the government and company regulation (Higginbotham, Freeman et al. 2010).

Some studies show that a lack of recognition often leads to injustice. Hill (2018) demonstrates in the study that poor environmental quality caused by pollution in America is associated with race and class. For instance, pollutant sitting decision is based on county socio-demographic composition, which leads to inequalities. In Argentina, Huasco inhabitants demand recognition because the connection between culture and environment did not acknowledge yet in the regulation (Urkidi and Walter 2011). Hulbert (2018) intensively studied recognition justice experienced by Canadian Aboriginals in gaining energy justice. He found that despite being socially marginalized, they are benefitted from two procedural legal mechanisms that facilitate recognition justice, namely environmental assessment, and the duty to consult (Hulbert and Rayner 2018). A similar study conducted by Bustos et al. (2016), who study about EIA public participation in deciding coal mining project in Chile, found that the structure of public participation in the EIA demonstrates a lack of recognition of diverse cultures, identities, economies, and values due to technical, legal or administrative shortcomings of the assessed projects. Furthermore, the study of Walker (2010) in a UK context revealed that although the environmental impact is routinely made, there is little routine assessment of distributional equalities

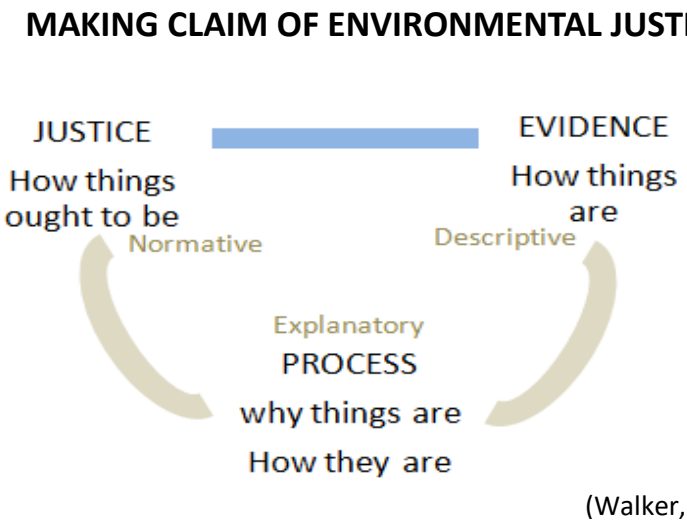
2.5 Claim for justice and Perception of environmental injustice.

According to Kahmann, Stumpf et al. (2015), the structure of justice comprises six elements: community justice, claims, judicandum, informational base, principles of justice, and instrument of justice. The community of justice relates to who is included in the justice consideration? For example, it can claim holders (the one who holds claims) and the claim addresses (those responsible for fulfilling those claims). Do claims relate to what are the legitimate claims that the claim holders hold? Juricandum relates to who or what is judged to be just or unjust. Does the informational base relate to the correct evaluative currency to use in assessing the justice of a judicandum? Principles of justice relate to which principles should guide the distribution of claims and obligations? Whereas the instrument of justice relates to which instruments should be used to satisfy the claim holders? The instrument of justice, among other things, to redistribution of certain goods, such as income or primary goods, institutional reform, or other ways of fulfilling legitimate claims (Hulbert and Rayner 2018).

Claims for justice and protests over injustice are ubiquitous in social life (Montada 2007). He argues that questions of justice and fairness can often be at the center of conflict over decisions with significant environmental consequences. Experienced or perceived injustices inflame political movements, revolutions, and wars. Perceived injustices instigate social conflicts. Incompatible goals, plans, opinions may bear the risk of conflict, but only in the case that actors violate the normative expectations of others. Perception of justice and injustice play an essential role in human behavior; it also is a powerful determinant of the emergence of justice related claims (A. Martin et al., 2014; Pesch, Correljé, Cuppen, & Taebi, 2017)

In conflicts, people claim justice for themselves or for others for whom they feel sympathy or responsibility. They react with resentment when they view the perpetrating actors as responsible and do not see a convincing justification for the norm violation. Conflicts will become manifest when the actors are blamed and do neither confess nor apologize for their misdemeanor nor excuse or justify their behavior convincingly. In manifest conflicts, the parties justify their behavior and reproach the behavior of the others (Montada, 2007). Much literature demonstrates that the extent to which stakeholders regard a management system as being just and

fair is a crucial social dimension of conflict. The most comprehensive disagreement was over what constitutes environmental harm and environmental goods and how the costs and benefits should be distributed, indicating that fundamental differences in values and perceptions underlie the intractability of this conflict (Jacobsen and Linnell 2016).



(Walker, 2010)

Figure 9 Making claim of environmental justice

According to Walker (2010), claiming environmental justice consists of justice, evidence, and process. Claim for justice is about how things ought to be. It consists of three justice elements: distributive justice, procedural justice, and justice as recognition. Claim for distributive justice related to who are the recipients of environmental justice? What is to be distributed?

Moreover, what is the principle of distribution? Whereas claim for evidence is about how things are, including where the evidence comes from and who is involved? And claim for the process is about why things are and how they are.

2.6 Elaborated Theoretical Framework

According to Lewison et al. (2016), the future research of DPSIR will be more beneficial if it considers a wide range of potential responses such as to alter rules and payoffs, to direct investments in state variables, to initiatives that might alter human values and preferences that influence consumption and production choices underlying drivers and pressures in the DPSIR framework (Baldwin, Lewison et al. 2016). Moreover, Kleble (2013) argues that DPSIR will be more beneficial to evaluate the full range of benefits and make the most well-informed decisions if it considers more

aspects such as human wellbeing, distributive justice, sustainability, ecological stewardship, and cultural and ethical values in the decision-making process.

In terms of environmental justice, Rodriguez-Labajos, and Ozyanak (2017) argue that it is important for the environmental justice approach to be integrated with other fields of studies while keeping the environmental justice approach firmly. Thus, Ozyanak and Labajos (2017) developed environmental justice framework in which environmental injustice might happen along and the whole process of the project: (1) the state of the project, (2) it impacts and how they are managed, (3) institutional responses and (4) community-power relations (Rodríguez-Labajos & Özkaynak, 2017).

In this research, we argue that integrating environmental justice with DPSIR help fishery manager to identify unrevealed social root issue namely the competing distribution environmental quality and impact along the chain of DPSIR. When DPSIR is integrated with the environmental justice framework, it looks like a dynamic of the decision-making process that involves different groups of actors, interests, sectors, and policy scale in responding to the driver, pressure, state and impact. However, there are no empirical studies that integrate DPSIR and environmental justice in one framework until now. Therefore, this study is designed to fill such a gap.

The DPSIR of this study is shown as following causal-effect relationship between anthropogenic, natural factor and fish catches declining in the Middle Mahakam River.; Driven by the global tendency to secure a stable source of energy into renewable energy due to global concern about the implication of fossil fuel on global climate change, the international policy then introducing fuel blending obligation. Adapting to the global tendency, the Indonesian government set up mandatory biofuel by expanding palm oil plantations. Responding to the national policy, East Kalimantan Province accelerates palm oil plantations, including in the Kutai Kartanegara District.

The rapid growth of coal mining extraction and palm oil expansion involved different stakeholders in the decision-making process. Therefore, before withdrawing business permits and land concession, an investor should obey some regulations, including East Kalimantan Provincial Regulation No. 1 of 2001 on Land use and

spatial planning for East Kalimantan Province 2016-2036 and Law No 32/2009 on environment protection and management. Those two regulations aim to harmonize environmental and economic development. Therefore, coal mining and palm oil business permits and land concessions are issued to fulfill the requirements of environmental impact assessment that should involve affected communities, environmentalists, and all communities affected by EIA in the decision-making process. EIA permit is issued when the pressure affected by coal mining and palm oil activities is manageable.

Nevertheless, interest, knowledge, and political contestation among decision-makers are inevitable. Thus, it is relevant to relate environmental justice in the driver chain of DPSIR. For example, do the relevant decision-making process of EIA concern the issue of the distribution of environmental good and bad? Does the relevant decision-making process engage potentially affected communities? Do the relevant decision-making process concern about the complaint mechanism of tangible impact and intangible impact? If the decision-making is made thoroughly, there should be mention about the potential impact, the predicted impact, and how to monitor and mitigate the impact.

Without consideration to environmental justice, the environmental degradation led by palm oil and coal mining pressures is inevitable, including deforestation, climate change, land use and land cover change, and aquatic ecosystem deterioration. Even the deterioration of the aquatic ecosystem is also led by fisheries activities, such as aquaculture and capture fisheries. Capture-based aquaculture, a harvest of wild fingerling assemblages from typical aquatic habitat to be grown up in the cages, and the use of gill net and beach seines with extremely small mesh sizes are destructive fishing practices.

The state of aquatic ecosystem degradation is indicated by the declining of water quality and fish production, which it has an impact on human security, especially on health security, economic security, environmental security, community security, and food security (Khondker Murshed-e-Jahan 2009, Lynch, Cooke et al. 2016, Nwaka, Isangedighi et al. 2019).

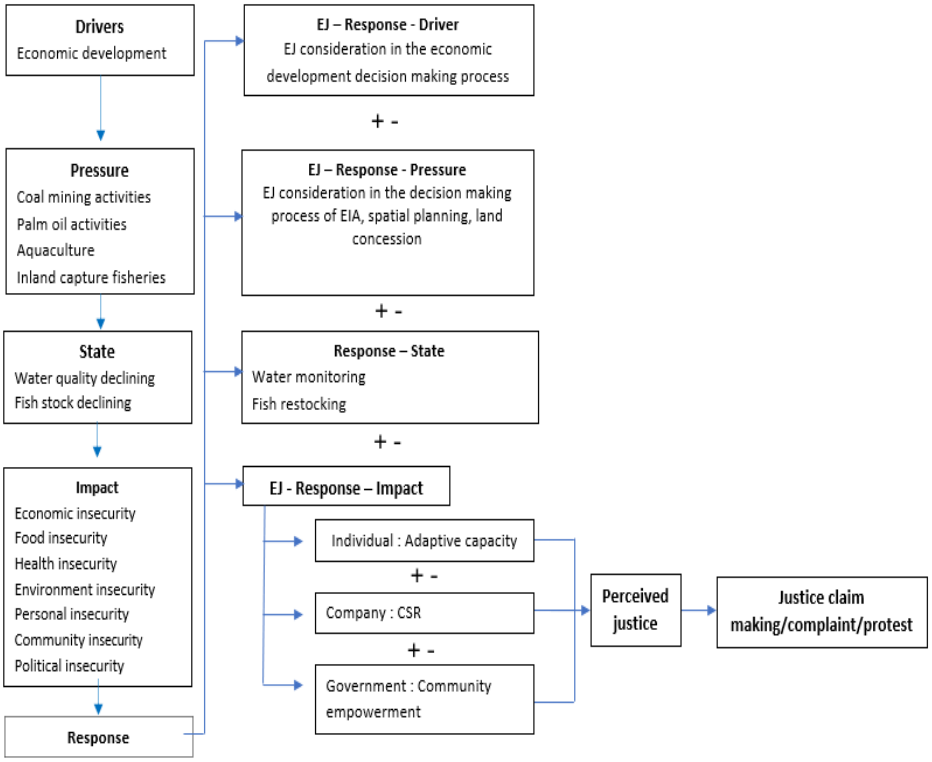


Figure 10 Elaborated theoretical framework.

This study consists of a response to the driver, pressure, state, and impact. Response to driver related to the long-term natural resources management related to economic development policy. Response to the pressure related to the mid-term natural resources management related to the land use and spatial planning, land concession, and EIA permit in the provincial to the local level. Response to the state related to the monitoring and mitigating the state of ecosystem changing and environmental degradation predicted in the EIA, in this case, is indicated by water quality and fish production declining. Whereas response to the impact relates to reducing the impact of fish production declining on human security by different relevant stakeholders including government, company and fisherfolk community as affected communities. The Degree of the impact of fish catches declining on human security is determined by the community's adaptive capacity to reduce the impact, impact mitigation by the company through corporate social responsibility (CSR), and impact mitigation by the government through community empowerment programs, including fisheries extension. Adaptive capacity is an individual response to the impact. Therefore, it is not related to the environmental justice concern. In

comparison, the effectiveness of impact mitigation by the company and government are related to the environmental justice questions such as who gets the benefit of CSR and community empowerment and who is involved in the CSR and community empowerment decision-making process.

In this research, the environmental justice relates to the driver in more detail, looking at how fisherfolk as an affected community is involved in the decision-making process related to economic development, how the fisherfolk' environmental right, i.e., the right of free from pollutants and the right to obtain livelihood considered in the driver chain. All the potential impacts as the consequences companies' activities have been identified in this process, and impact mitigation is determined. If fisherfolk are involved in this process, they can convey their interest and minimize the likelihood of impact affected to them. So, the more environmental justice is considered in the pressure chain of DPSIR, the less impact is generated by coal mining and palm oil activities, the less perceived environmental injustice, and the less likelihood of complaint/protest/injustice making a claim.

2.7 **Summary**

DPSIR is a framework for understanding the interaction and causal effect – relationship between human and environment. While environmental justice is a concept of environmental distribution. It emphasizes to the uneven distribution of environmental burden

CHAPTER III

RESEARCH METHODOLOGY

This chapter presents the methodology used in this research. First, the research site selection is described. It is followed by collecting data and informant, and data analysis method. At the end of this chapter, an explanation of the limitation of this research is provided.

3.1 Research Site Selection

The study was conducted in Middle Mahakam Area in August 2019, and it ended in August 2020. Middle Mahakam Area situated in the Kutai Barat and Kutai Kartanegara regency. Kutai Kartanegara regency is selected as the study area. Based on the map of peat hydrological unit made in 2017 (BLH 2019), all sample locations in this study are in the peat hydrological units, which is divided into five, namely the Belayan River-Kelinjau, Belayan River-Melintang, Kedang Rantau River-Sabintulung River, KHG Mahakam River-Kedang Rantau River and Sabintulung River.

Figure 11 The area of study

The district sampling was determined using purposive sampling. Muara Kaman, Kota Bangun, and Kenohan districts are considered and selected as the sample due to their representativeness of the area, in which some anthropogenic pressuring factors occur. There are some coal mining companies, palm oil companies, aquaculture activities, and fish capture activities. Muara Kaman sub-district was selected because it is an area where palm oil plantations dominate the spatial landscape. There are 16 palm oil plantations established in this Sub-district cover 121,116.3167 hectares, in which boundaries of plantation areas are cross-border village administration. The plantation area can cover several villages, or in one village, there are several companies. From those 16 oil palm companies in Muara Kaman, they spread across 31 villages, mostly (9 companies) concentrated in Sabintulung, Sedulang, and Puan Cepak village.

Table 2 Districts, villages, and fishers sampling

Districts	The number of palm oil plantation	The number of coal mining	The number of fishing household	The number of villages	Selected village samples		The number of fishing household	The number of palm oil	The number of coal mining
Muara Kaman	16 (121.116 ha)	15 (41.146 ha)	6.562	20	6	1 Liang Buaya	669	2	0
						2 Muara Kaman Ulu	979	0	2
						3 Muara Siran	855	0	2
						4 Puan Cepak	160	5	0
						5 Sabintulung	852	2	2
						6 Sedulang	537	7	0
Kota Bangun	6 (62.800 ha)	2 (5.000 ha)	877	21	2	1 Sebelimbingan	64	0	6
						2 Sangkuliman	100	0	0
Kenohan	2 (43.824 ha)	1 (4.997 ha)	1.033	9	2	1 Semayang	533	0	0
						2 Kehala Ilir	112	0	0

Village sampling was determined using purposive technique sampling. Sabintulung, Puan Cepak, Sedulang, and Liang Buaya represent village inside and near to palm oil companies. Muara Kaman, Muara Siran, and Sebelimbingan represent villages that adjacent to coal mining activities. While Sangkuliman, Semayang, and Kehala represent aquaculture villages. Fisher's respondent sampling is determined based on the technique of random sampling. The number of fisherfolks is four people in each village.

3.2 Collecting data and informant.

Regarding the complexity of this research topic, we plan to utilize the Delphi method. According to Linstone and Turoff (1975), *Delphi is a method for structuring a group communication process to effectively allow a group of individuals to deal with a complex problem*. The sort of Delphi process utilized in this study is a conventional Delphi in which a designed questionnaire is sent to a larger respondent group. The result of returned questionnaire was then summarized to be developed to a new questionnaire for the smaller respondent group. The second questionnaire aims to reevaluate its original answer based on examining the group response (Linstone and Turoff 1975). In this study, the Delphi method aims to confirm community or local knowledge to scientific knowledge. Delphi technique applied in two rounds:

1. First rounds

   In the first round, we would like to use a qualitative form. First, we define the objectives. Second, develop a written questionnaire with open-ended questions focusing on introducing a general assessment of the impacts of palm oil on inland capture fisheries through the logic of DPSIR. The purpose of the first round is to explore all possible answers of the key determinant factor of DPSIR and the perceived environmental justice from four respondent groups.

2. Second round

   1. Applied to the fisherman.

      A closed questionnaire was applied in the second round. The questionnaire was developed based on state and impact themes and categories found in the first round. The questionnaire applied to 40 fishers aims to quantify qualitative findings; therefore, the second hypothesis could be confirmed.

   2. They were applied to academia.

      After the first round, the data was provided feedback to the respondents (Nguyen, Vu et al. 2018). A closed questionnaire was applied in the second round. The second-round questionnaire was developed based on categories found in the first round. The academician panel member was invited to assess each statement on a Likert scale consist of 39

statements. We utilized semi-structured interviews or self-administer data collection to explore the logic of DPSIR to the academician panelist. It aims to confirm community or local knowledge to scientific knowledge. Each panelist completes his/her questionnaires independently from the others. The purpose of this round is to provide a first indication of the consensus or disagreement among academic panel members. For each statement, the mean rank was calculated. The number of academia involved in this round were five peoples.

The total number of informants involved in this study was 70. NGO, government, and academia respondent sampling is determined based on the key informant recommendation. The respondent is selected due to their knowledge about the aquatic resources-related issue in the Middle Mahakam Area. This research was supposed to include a company, but they were not willing to be interviewed. Finally, we conducted a content analysis of EIA documents and reports from several companies located in the research location.

Table 3 The number of respondents.

Respondent groups		Number
NGO (N=7)	Bioma	2
	Walhi	1
	Bumi	2
	Pokja 30	1
	JATAM	1
Government (N=15)	Environmental Agency of East Kalimantan	2
	Environmental Agency of Kutai Kartenegara	2
	Mineral and Natural resources Agency of East Kalimantan	1
	Land Agency of Kutai Kartanegara	1
	Plantation Agency of East Kalimantan	1
	Plantation Agency of Kutai Kartanegara	2
	Fisheries Agency of East Kalimantan	1
	Fisheries Agency of Kutai Kartanegara	3
	Regent of Kutai Kartanegara	1
	Governor of East Kalimantan	1
Academia (N=8)	Fisheries management	1
	Fisheries communicator	1
	Hydrologist	1
	Fisheries economist	1
	Fisheries researcher	1
	Sociologist	1
	Forest ecologist	1
	Dolphin specialist	1
Fisherman (N=40)	Kehala Ulu	4
	Liang Buaya	4
	Muara Kaman	4
	Muara Siran	4
	Puan Cepak	4
	Sabintulung	4
	Sebelimbingan	4
	Sedulang	4
	Semayang	4
	Pela	4
Total Respondents		70

We frame our population as total fisherfolk households who live in the Middle Mahakam Area in 5 sub-districts. According to Statistical Berau, 36,633 fisherfolk households comprise 22,457 capture fisherfolk households and 14,176 fish cages, farmers. Fisherfolk sample size determination was determined using a probability procedure called multi-stage sampling method sampling.

The data collection was conducted right before COVID-19 spreading around the world. It was begun in August 2019, and it ended in February 2020. So, the data collection was not entirely affected by COVID-19 since the Covid outbreak was announced in Indonesia in March 2020. The first in-depth interview with the fisher respondent group was conducted in a week from August 20 to 27, 2019, assisted by one research assistant. We then continue to do interviews with NGOs, government, and academia until February 2020. We then continue to transcript interview recordings. It takes around four months. Based on this transcription, we then do content analysis which takes two months. After that, we continue to do second round Delphi with academia and fisher around July 2020. Interview with academia is self-administered. The questionnaire was sent using a google form to academia. Whereas interview with fisher was not entirely affected by COVID 19 since the research site is situated in a remote area which is it is categorized as a green zone.

Table 4 Research timeframe

Data collection process	Aug	Sep	Oct	Nov	Des	Jan	Feb	Mar	Apr	May	Jun	Jul
	2019					2020						
First in-depth interview with fisher												
Interview with NGO, government, and academia												
To transcript interview recording												
To do content analysis												
Second round Delphi with academia												
Second round Delphi with fishers												

The activity of the research is conducted based on the following data collection steps:

Step 1:

The survey method is utilized to collect primary data of DPSIR and environmental justice variables from inland fisherfolk who live in the Middle Mahakam Area. The team of the researcher is going to interview the respondent by attending them in their village. Three villages have not road infrastructure, the only way to afford to this village is by boat. At the same time, the other seven villages are afforded by car. It takes four hours on average to go from one village to the other village. So, it takes seven days to complete all interviews. As the researcher attends the village, the researcher visits the village leader to ask their recommendation about fisher respondents. All village leaders in each research site were also included as respondents. To make a comforting atmosphere and ease the interviewing process, the place and the time and interview adjusted to the local custom and local language. The interview is proceeded by introducing the name of the researcher, the purpose of the interview, and ask their willingness to be involved in the research by asking them to carefully read the Letter of Consent to take part in research and sign the form. The process of the interview is done using the questionnaire. The researcher asks some questions and lets the respondent answer. If it is a closed question, the researcher will explain the choice and let the respondent choose. The process of the interview takes around one hour. At the end of the interview, the researcher will say thanks and give the souvenir to the respondent.

Step 2:

Proceeding the process of an in-depth interview with NGO, business representatives, and government authorities, the researcher will contact the respondent by phone or message to ask their willingness to be involved in the research and make an appointment about where and when they are available. The interview is conducted in the respondent office, primarily located in the provincial capital and a few in the regency capital. The Letter of consent to participate in the research will be provided on the day of the interview before the interview process and let them sign the form.

The type of question mostly is an open questionnaire designed to dip as much information as possible, so the role of the researcher is to give them catalyzer and stimulus questions. Therefore, the researcher should not straightforwardly ask them. The process of the interview takes around two hours on average. At the end of the interview, the researcher will say thanks and give the souvenir to the respondent.

Step 3:

Before the in-depth interview with academia, the researcher will contact the respondent by phone or message to ask their willingness to be involved in the research and make an appointment about where and when they are available. The Letter of consent to participate in the research will be provided on the day of the interview before the interview process and let them sign the form. The in-depth interview using the Delphi method was enacted in three rounds in which the in each round, the process of asking the willingness, the appointment, and the signing of The Letter of consent to take part in the research will be provided. At the end of the interview, the researcher will say thanks and give the souvenir to the respondent.

The researcher will ask for the respondent's permission to collect information through recording voice, taking photos and videos at the interview, and from the questionnaires. Furthermore, the researcher will destroy the information about respondents and other information after the research is completed. The duration of the research is about two years. To ease the respondent, respondents have the right not to answer the questions. This includes respondents' right to withdraw from the research project at any moment without advanced notification. Respondent's decision not to participate in or withdraw from this research project will not affect respondents in any way. The personal information will not be revealed to the public as information about an individual, but the research result will be reported as a whole image. People who will have the right to access respondents' information will be those who are involved with this research and the Research Ethics Review Committee for Research Involving Human Subjects only.

3.3 Data Analysis

In general, the research method is mixed method, it is a mix between Delphi method, content analysis and descriptive statistic.

Table 5 Research method

Research question - hypothesis	Collecting data	Respondent				Analyzing data	Unit analysis
		NGO	Academia	Fisher	Government		
RQ1-H1	Delphi-indepth interview	√	√	√	√	Content analysis	All respondent
	Delphi-survey		√			Kendall concordance	All respondent
RQ1-H2	Delphi-survey			√		Chi-square	Fishers
RQ2-H3	Indepth interview			√		Interval	Village
RQ3-H4	Indepth interview			√		Interval	Village

3.3.1 **Research question 1: In the present condition, what the driver, pressure, state, impact, and responses of decline in fish catch in the Middle Mahakam Area?**

We realize that the DPSIR framework that we used in this study is the most conventional DPSIR framework that running linearly, and the interaction between factors in each chain of DPSIR is valued and set up qualitatively. To know the effect of the driver to pressure, pressure to state, state to impact, and impact to response, we set up hypotheses one to three.

Based on this research question 1 and the discussion in the empirical literature review related to DPSIR, we hypothesize the first hypothesis that palm oil and coal mining are the main key driver and pressuring factor of water quality and fish catches declining in the Middle Mahakam Area. In the context of DPSIR, this hypothesis theoretically aims to know the key pressuring factor of fish catches declining.

H1.1: Palm oil and coal minings are the main key driver and pressure factors fish catch declining in the Middle Mahakam Area.

The data analyzed to answer the first research question and hypothesis one is the data gathered from the first and second rounds, which applied to academia.

According to Balanos-Valencia (2019), the qualitative data can be analyzed using the comparative method by categorizing the answer to the object of study by finding the similarities and differences. The categories used in this study are driver, pressure, state, impact, and pressure. We use NVivo software version 12 to process the data. After classifying the answer, we then analyze the frequency while analyzing the logic of the answer.

We propose to use a content analysis method to analyze the transcript gathered from in-depth interviews with respondents. Content analysis is a procedure of assigning categories to the portion of text (Mayring, 2014). The content analysis consists of some steps: First, determine the research question and theoretical background. Second, define the category system from the theory. Third, define the coding guideline. Fourth, work through the material. Fifth, analyze category frequencies and contingencies interpretation. Finally, based on the established research question, this research is categorized as descriptive design in which research works through the texts with a deductively formulated category system and the occurrence of those categories, in a nominal way or category frequencies (Mayring, 2014).

1. All recorded data from in-depth interviews are manually transcribed into MS. Word and then saved per file per informant.
2. Doing open coding by creating categories based on information contained in the data. The coding process provides code according to the meaning contained in words, phrases, or paragraphs that exist in the interview transcript. This stage produces 84 categories (Appendix VI).
3. Conduct thematic coding by placing open coding results based on the main theme of the study (Appendix VII).
4. Conduct analytic coding that further analyzes the open-coding results that do not follow the study's main theme. It can be a sub-category of the main theme or as a new theme (Appendix VIII).
5. Re-checking the category system with expert judgment.

   For each theme, the mean score was calculated. It provides a first indication on the consensus or disagreement among academician panel members. According to Schmidt (1997), the agreement between respondent groups can

be measured using Kendall's coefficient of concordance (*W*). The agreement of each theme is defined as very weak agreement if the coefficient is less than 0.10; weak agreement if the coefficient is 0.11-0.30; moderate agreement if the coefficient 0.31-0.50; strong agreement if the coefficient 0.51-0.70; and unusually strong agreement if the coefficient is 0.71-0.90 (Appendix IX).

6. Repeating the coding process according to the expert judgment (Appendix XI).
7. The agreement of the result of the final theme of the coding process is measured using Kendall's coefficient of concordance (*W*).
8. Finally, we conducted a content analysis of EIA documents and reports from several companies located in the research location to complement our in-depth interviews with operators of palm oil companies and coal mining companies as they were canceled.

Based on research question 1 and the discussion in the empirical literature review related to DPSIR, we also hypothesize that the more the declining of water quality, the more fish catch, the more significant the impact on human security. In the context of DPSIR, this hypothesis theoretically has two aims. Firstly, is to know the relationship between states, namely the relationship between water quality and fish catches. Secondly, is to know the effect of state to impact. Namely, the effect of fish catches declining to human security.

H1.2: *The more the declining of water quality, the more fish catches decline*

H1.3*: The more fish catches decline, the more significant the impact on human security.*

The data analyzed to answer the second hypothesis is from the first and second round data gathering, which applied to the fisherman. Key questions in the semi-structured interview are list as follows:

1) Has the water in the river ever been polluted?

2) Has the fish ever been destructed?

3) Has the fish for meals ever been decreased?

4) Has the fisheries' livelihood and monthly income ever been decreased?

5) Have you ever been experiencing health decreased?

6) Have social cohesion ever been decreased?

7) Have you ever doubted the future livelihood of the next generation?

8) Has the political channel to express opinion ever been hard to find?

9) Has the quality of the environment ever been decreased?

To prove hypothesis two, we do a chi-square test. The correlation between water quality decreasing and fish catch decreasing is supposed to be approached quantitively. However, due to limited representative data so it is answered based on people's perceptions. However, its limitation is that the respondent can manipulate the responses during the interview, or it is possible for the respondent to have false consciousness about water quality and fish catches declining because they use visual observation only.

The result shows that there is no correlation between water quality and fish catches decreasing. It is contradicting to previous literature review suggests that fish catches productivity is typically associated with water quality. The reason behind this result is because fish catch decreasing is also affected by mass fish mortality, water level changing and fishing ground reduction, in which all this factor is interrelated

3.3.2 Research question 2: To what extent is environmental justice considered in the decision-making process along the chain of Driver and pressure of fisheries production in the Middle Mahakam Area?

In this research question, we start to integrate DPSIR and environmental justice theoretical concept. We hypothesize that the decline of fish catch is led by the lack of environmental justice consideration for inland fish capture in the decision-making process along the chain of DPSIR. This hypothesis is proven both qualitatively, and its unit analysis is the village.

H1.4: Decline in the fish catch led by the lack of environmental justice consideration for inland fish capture in the decision-making process along the chain of DPSIR.

To identify environmental justice issues in DPSIR, we identify positive and negative sentiment in each code previously processed. We argue that the perceived justice is formed by people's perception of environmental degradation and its impact (negatively valued by minus value: -) and relevant stakeholder's response to reduce the state and impact (positively valued by plus value: +). The degree of environmental

degradation refers to environmental change and its impact (Chiang and Chang 2018). It is assigned negative values (-) in the assessment. When respondents perceived negatively towards human security, it is assigned negative values (-) as well. Whereas the response and adaptation to environmental degradation would be assigned positive values (+). In this study, we argue that company's and government's responses are beneficial to enhancing the community's adaptive capacity. Therefore, it is assigned as positive (+) as well. Based on this, respondent's perceived justice calculated as follow:

$f(x,y) = x - y$

- The perception of impact (x) refers to water quality, fish productivity, food security, economic security, health security, political security, community security, environmental security, and personal security.

Response to the impact (y) refers to relevant stakeholder's response to reduce the state and impact and enhance fisher adaptive capacity and resilience.

Table 6. Operational definition of respondent's sentiment to categories or themes

Categories and sub-categories	Negative sentiment	Positive sentiment
Distributive justice	Respondents' answers are categorized as negative sentiment if the respondent considers stated that they get more environmental loses than environmental benefit in the context environmental management.	Respondents' answers are categorized as positive sentiment if the respondent considers stated that they get more environmental benefit than environmental loses in the context environmental management.
Recognitive justice	Negative if decision making process does not consider fisher's right.	Positive if decision making process consider fisher's right.
Procedural justice	Negative if decision making process does not involve fisher.	Positive if decision making process involve fisher.
Palm oil, coal mining, destructive fishing practice and natural factor.	Negative if respondent state about the negative impact of palm oil, coal mining, destructive fishing practice and natural factor.	Positive if respondent state about the positive impact of Palm oil, coal mining, destructive fishing practice and natural factor.
Mass fish death phenomenon	Negative if the respondent confirms the occurrence of mass fish deaths	Positive if the respondent doesn't report the occurrence of mass fish deaths
Fish catches, water quality and water level	Negative if the respondent states a decrease in fish catches, water quality or water volume	Positive if the respondent states an increase in fish catches, water quality or water volume
Human security	Negative if the respondent states that the current fishery condition causes a decrease in economic security, health security, food security, community security, environmental security, personal security, political security.	This is positive if the respondent states that current fishery conditions do not cause a reduction in economic security, health security, food security, community security, environmental security, personal security, political security.
Responses	Negative if a fisherman respondent states that government or company has never help fisherman to reduce, compensate and adapt to environmental change and its impact.	Positive if the fisherman respondent states that government or company has help fisherman to reduce and adapt to environmental change and its impact.
Perceived justice	Negative if the respondent states that they feel disadvantaged because they are affected by activities carried out by other parties.	Positive if respondents stated that they benefited from the existence of oil palm plantations and coal mines,
Claim	Negative if the fishermen's complaints and protests do not get a response from the government or companies.	Positive if the fishermen's complaints and protests get a response from the government or company.

To identify environmental justice themes, we identify respondents' sentiment towards distribution, procedure, and recognition-related themes. The sentiment was identified through words, tones, and narration about moral reasoning behind their feeling during the interview. The sentiment itself reflect justice value such as local communities deserve to get environmental benefit than a migrant. The limitation of turning the justice judgment into a number is that it does not recognize different moral reasoning rather than merely turning it into one code. However, it can be solved using triangulation data analysis where moral reasoning can be explained.

3.3.3 Research question 3: To what extent fisherfolk perception on environmental justice affect to justice claim or protest?

Based on the literature review related to Claim for justice and Perception of environmental injustice, we hypothesize that the higher the perception of environmental justice, the fewer claims/complaints/protest. Theoretically, this research question was not derived from the environmental justice concept but natural resource management's conflict theory. Thus, quantifying perception on environmental justice does not intend to simplify the concept based on a value judgment, and it is risky to be quantified. The perception of environmental justice was obtained from content analysis of interview transcript and claims or protests and interviewed with fisher respondent group.

H5: The higher the perception of environmental justice, the fewer claim/complaints/protest

Data analyses to confirm this hypothesis was conducted through content analysis processed previously to answer research question 1. Besides, interview data gathered then analyzed using the Chi-square test.

3.4 Limitation

1. While DPSIR is a framework for analyzing the human-nature causal relationship, there should be a combination of the social science approach and natural science approach for quantifying and validating actual data. However, this research uses the social science approach only. We try to overcome that limitation by validating natural-based data through expert justification using the Delphi method.

2. This research was supposed to include a company, but the palm oil companies, and coal mining companies were not willing to be interviewed. Finally, we conducted a content analysis of EIA documents and reports from several companies located in the research location.
3. Environmental justice-related finding that is shown in the quantitative data does not intend to simplify the justice judgment, which is value-based. It is simply indicating how many times respondents mention environmental justice issues.
4. Hypothesis 2 is supposed to be approached quantitively.

3.5 Summary

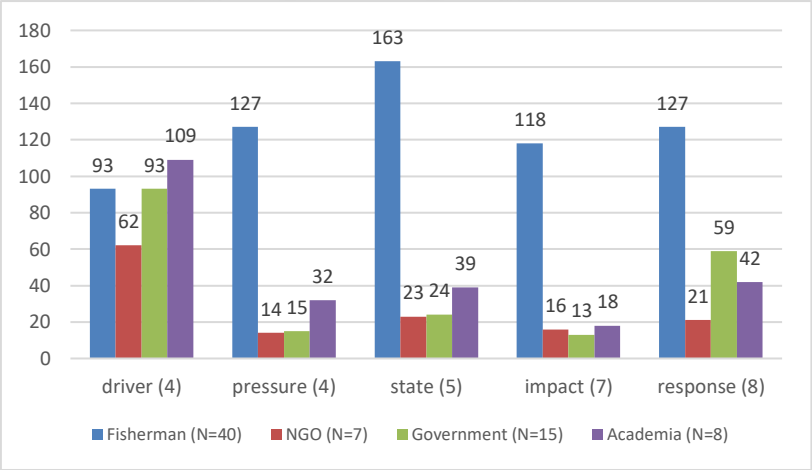
This research is conducted in the Middle Mahakam Area situated in the Kutai Kartanegara Regency in August 2119 to July 2020. This study gathering data from various respondent including NGO, Government, fisher, and academia using open questionnaire-based in-depth interview and close questionnaire-based interview. Collected data then analyze using qualitative and quantitative content analysis. And to support hypothesis confirmation, we used Chi-square statistical test.

CHAPTER IV: RESULT AND DISCUSSION

This chapter demonstrates and discusses the finding of this research. The results and discussion do not distinguish obviously to triangulate quantitative result and qualitative explanation. Each sub-heading represents research objectives. At the end of some sub-heading, we explained hypothesis confirmations.

4.1 THE PRESENT CONDITION OF THE DRIVER, PRESSURE, STATE, IMPACT, AND RESPONSES OF DECLINE IN FISH CATCH IN THE MIDDLE MAHAKAM

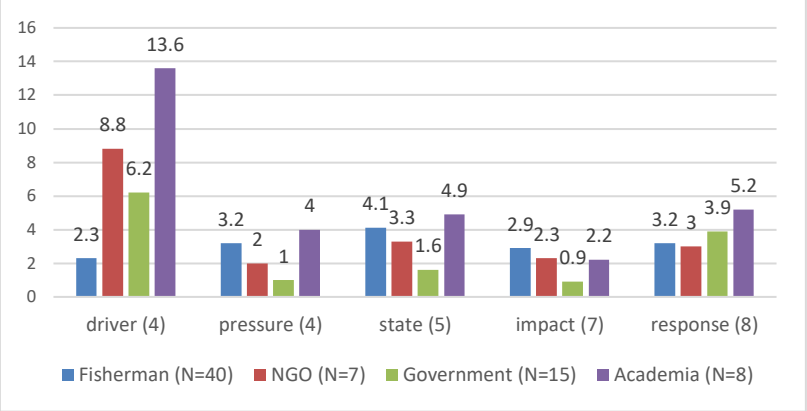
Based on the in-depth interview and coding process, we found that each respondent group has a different concern for the theme of the causal-effect relationship of fish catches declining in the MMA. Despite that, based on Kendall's coefficient of concordance, we found that respondent groups moderately agreed with the themes. Of 1208 codes from 70 interviews, this study found that respondent concern to driver, pressure, state, impact and response is 29,6%, 15.6%, 20.6%, 13.6%, and 20.6%, respectively. Moreover, fisherman's concern to all the causal-effect relationship of declining fish catches is more significant than other respondent groups except the driving factor. On the contrary, NGO, government and academia give most concern to the driving factor.



Graph 1. Aggregate codes number of DPSIR categories

Aggregately, fishers seem to be the group most concerned with all themes group, but academia mentioned most about all themes except impact themes. The different concerns of individual respondent groups can be traced based on the average codes per respondent per theme group. Each academia mentioned 13.6 times for

driver themes, four times for pressure themes, 4.9 times for state themes, 2.2 times for impact themes, and 5.2 times for response themes. Compared to the other DPSIR themes, the government respondent group mentioned more about driver themes than other themes. In opposite, the fisher respondent group most minor mention driver themes. It indicates government and fisher have a different level of knowledge, fisher mastering the firsthand information in the village level while government dominance in the decision making related to economic development.



Graph 2 Individual codes number of DPSIR categories

Although each respondent group has a different concern to each themes group, the degree of theme importance can be identified based on the percentage and the mean rank. For example, the most driver factor (47.9%) is a land concession, the most pressuring factor (36.7%) is palm oil, the environmental state that is changing is fish catches (30.5%), human security aspect impacted the most is economic security (30.8%), and the most expected response is compensation (17.3%%) for mass fish mortality.

Table 7 Themes and the number each respondent mentioned them

		Fisherman	NGO	Government	Academia	Total	Mean Rank
Driver	**Land concession** "*Land spatial planning adjusts to plantation business permits, right? Yes, it is ... Logic of overdue (NGO)* ".	55 (32.2%)	26 (15.2%)	49 (28.6%)	41 (23.9%)	171 (47.9%)	27.75
	Environmental Impact Assessment "*In fact, some of the EIA results say that oil palm, mining pollutes the environment, both land and waters. But no one stopped. Even more (Academician)* ".	28 (36.4%)	5 (6.5%)	16 (20.8%)	28 (36.4%)	77 (21.6%)	23.38
	Land use and spatial planning "*We are based on the problem, right ... the land use and spatial planning, yes, maybe in fisheries there is sometimes no such thing (Government)*."	5 (8.2%)	17 (27.9%)	15 (24.6%)	24 (39.3%)	61 (17.1%)	20.13
	Development Planning "*Now, if it is a strategic project, the environment is neglected. So how much does the sector contribute to the regional planning and expenditure budgets, how much is the budget allocated to the related agencies, is it reciprocal? (Academia)".*	5 (10.4%)	14 (29.2%)	13 (27.1%)	16 (33.3%)	48 (13.4%)	19.38
Pressure	**Palm oil** "*Now there is no swamp, our river has been closed by the company to become a ditch, even the lakes have been built into embankments, planted with oil palm, when it is planted there is fertilizer, there is poison if it rains into the ditch, the trenches fall into the river (Fisher)".*	45 (65.2%)	5 (7.2%)	7 (10.1%)	12 (17.4%)	69 (36.7%)	21.88
	Fishing *"Because of stun and destructive fishing gear…ouch…let alone catch big fish, just catch small fish. the mesh is like gauze. In the past, the webs were wide. Now smaller (Fisher)* ".	35 (71.4%)	3 (8.3%)	4 (8.2%)	7 (14.3%)	49 (26.0%)	15.88
	Seasonal factor "*If this goes up one week then recedes one week then recedes again one month then the fish can reproduce (Fisher)*".	35 (89.7%)	2 (5.1%)	0 (0%)	2 (5.1%)	39 (20.7%)	11.13
	Coal mining *"Coal has been 3 years. the boat fan kick hit the riverbank. now there are no more trees by the river. After all, he scratched from below. So, the ground drops (Fisher)".*	12 (38.7%)	4 (12.9%)	4 (12.9%)	11 (35.5%)	31 (16.5%)	14.13

Table 8 Themes and the number each respondent mentioned them (Continue)

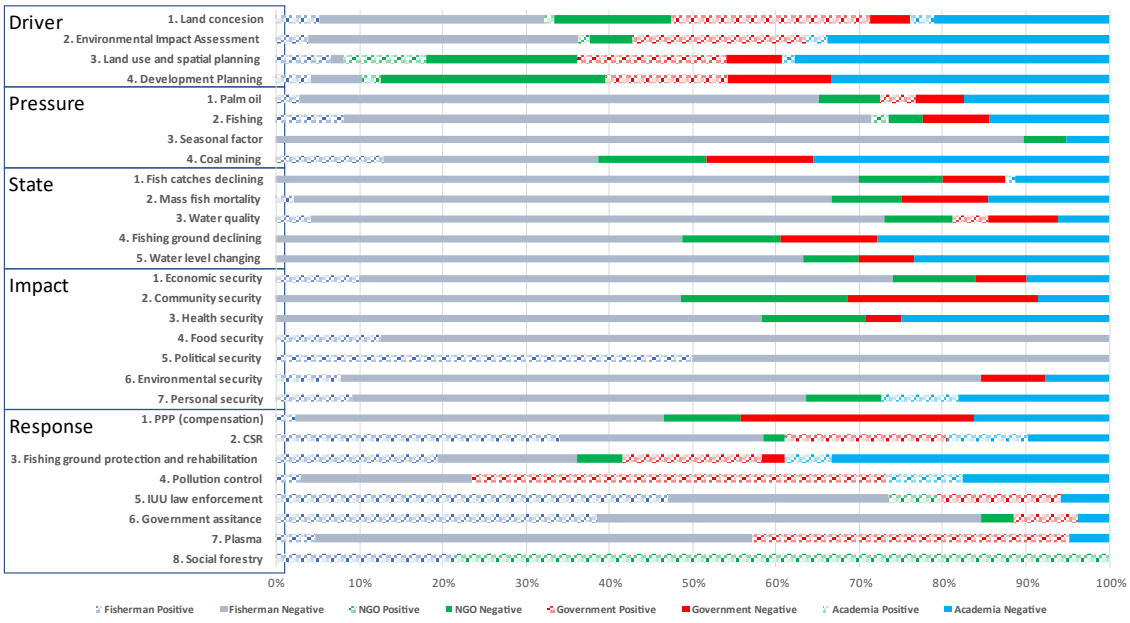
DPSIR		Fisherman	NGO	Government	Academia	Total	Mean Rank
State	**Fish catches declining** *"Every year, the business of fishermen continues to decline (Fisher).*	56 (70%)	8 (10%)	6 (7.5%)	10 (12.5%)	80 (32.1%)	22.13
	Mass fish mortality *"The waste from the palm oil mill flows here and eventually the fish die floating (Fisher)".*	32 (66.7%)	4 (8.3%)	5 (10.4%)	7 (14.6%)	48 (19.3%)	16.75
	Water quality *"Evidence that the quality of rivers, lakes and swamps has decreased can be seen from indicators that the Mahakam River is no longer a good connectivity for biota migration due to pollution. (Academician) ".*	35 (72.9%)	4 (8.3%)	6 (12.5%)	3 (6.25%)	48 (19.7%)	16.63
	Fishing ground declining *"Previously, the place where we looked for fish was in swamps, but now it has changed its function to become an oil palm plantation (Fisher)".*	21 (48.8%)	5 (11.6%)	5 (11.6%)	12 (27.9%)	43 (17.2%)	18.25
	Water level changing *"It's different, the flood used to be here, now it's not anymore. Just a flood in the lake. It won't be long".*	19 (63.3%)	2 (6.7%)	2 (6.7%)	7 (23.3%)	30 (12%)	12.13
Impact	**Economic security** *"Just to survive, no longer can get more. Usually they can get more (Fisher)*	37 (74%)	5 (10%)	3 (6%)	5 (10%)	50 (30.5%)	16.88
	Community security *"Now we appear to be at war. This fisherman war with electro fishing (Fisher) ".*	17 (48.6%)	7 (20%)	8 (22.8%)	3 (8.5%)	35 (21.3%)	16.88
	Health security *"The water is polluted too, they all vomit and defecate because of fish poisoning (Academician) ".*	14 (58.3%)	3 (12.5%)	1 (4.2%)	6 (25%)	24 (14.6%)	10.75
	Food security *"Not even sell it, ma'am, we hard to catch a fish for food, right now (Fisher)"*	16 (100%)	0 (0%)	0 (0%)	0 (0%)	16 (9.7%)	4.88
	Political security *"Fisheries issues are often raised and discussed at the village office. Moreover, there was a reprimand from another village because there was naughty, right, we also invited them, we invited community leaders to minimize the problem (Fisher)"*	16 (100%)	0 (0%)	0 (0%)	0 (0%)	16 (9.7%)	4.88
	Personal security *"In my generation, the children of fishermen like to dive in the sea, it is fun, the beaches are cooler ... they want big money from companies (NGOs)".*	7 (70%)	1 (10%)	0 (0%)	3 (20%)	10 (6.1%)	5.5
	Environmental security *"If you want to prove environmental change, drink water down there*	11 (84.6%)	0 (0%)	1 (7.7%)	1 (7.7%)	13 (7.9%)	5.13

Table 9 Themes and the number each respondent mentioned them (Continue)

DPSIR		Fisherman	NGO	Government	Academia	Total	Mean Rank
Response	**PPP (Compensation)** *"Like yesterday, many fish died but the company did not provide fish seed assistance. nothing at all (Fisher)".*	20 (46.5%)	4 (9.3%)	12 (27.9%)	7 (16.3%)	43 (17.3%)	17.50
	CSR *"In terms of CSR regulations, mining is clear. There was a decision by the Minister of Energy. Well, if it is not clear palm oil. So, what obligations do these people have to the environment? Not yet (Academician)".*	24 (58.5%)	1 (2.4%)	8 (19.5%)	8 (19.5%)	41 (16.5%)	16.00
	Fish restocking "*There is no effort to conserve species or conserve areas, nothing… So, it continues to be drained regardless of the level of exploitation. The concept of a reservation that has ever been rolled out doesn't work (Academician)*".	13 (36.1%)	2 (5.5%)	7 (19.4%)	14 (38.9%)	36 (14.4%)	15.50
	Pollution control "*Who is the representative of the community who has sufficient knowledge about environmental management, so the control is weak, right?* (Academician)".	8 (23.5%)	0 (0%)	17 (50%)	9 (26.5%)	34 (14.4%)	13.5
	Fishing law enforcement "H*ow many meetings have there been in fisheries, we can't handle it either. Indeed, many have been arrested, but the officers have already been warned. they will come back later. (Fisher)*".	25 (73.5%)	2 (5.9%)	5 (14.7%)	2 (5.9%)	34 (13.6%)	12.88
	Government assistance *"People from the fisheries office prefer to provide fishing gear here (Fisher)".*	22 (84.6%)	1 (3.8%)	2 (7.7%)	1 (3.8%)	26 (10.4%)	9.38
	Plasma *"Our plasma is hopeless, the impact of oil palm runs to us, we want to work hard (Fisher)".*	12 (57.1%)	0	8 (38.1%)	1 (4.7%)	21 (8.4%)	9.13
	Social forestry *We are assisted in the formation of village forest management, our production forest has around 2000 hectares, right? So, the plan we took was that the plan was managed by the village, so until now they have been assisting us (Fisher).*	3 (21.4%)	11 (78.6%)	0 (0%)	0 (0%)	14 (5.6%)	7.75

Test statistics: Kendall's Coefficient Concordance .530; Chi square 57.280; df 27; Asymp. Sig .001

Besides having different concerns about each theme, each respondent also tends to have different sentiments. Fisherman tends to have sentiment negative towards all of the themes except for some response themes. Conversely, government tends to have positive towards themes in the driver and response categories. While NGOs and academia tend to have negative sentiment to all of the themes. Positive or negative sentiment indicate agreement or disagreement, positive or negative perception, and satisfaction or dissatisfaction to the distribution of resources (Daigle, Loomis, & Ditton, 1996; Loomis & Ditton, 1993).



Graph 3 Respondents positive and negative sentiment to each theme.

4.1.1. Driver

Based on an in-depth interview, most respondents linked the main driving factor of fish catch declining with economic development, which is excessively based on natural resources extraction. At the same time, there is a lack of in-depth consideration of environmental justice on integrated development planning, land use and spatial planning, land concession, and environmental permit (environmental impact assessment). From four decision-making processes, land concession contributes 47.9%, EIA contributes 21.6%, land use and spatial planning contribute 17.1%, and development planning contributes 13.4%. According to government respondent group, all those decision-making processes decided consistently with

regulation and through public participation, but fisher, NGO and academia has contradiction point of view.

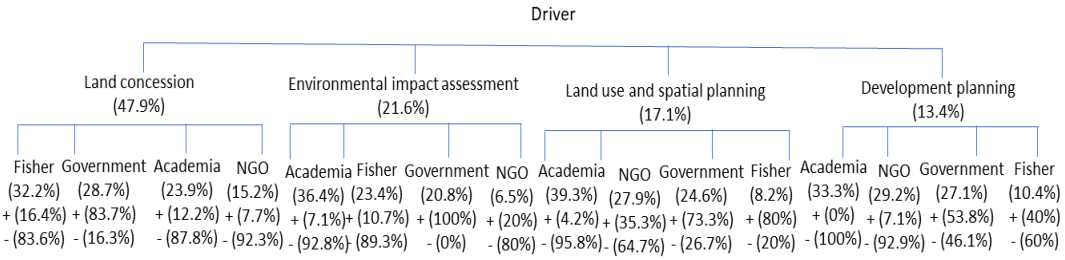


Figure 12 The percentage of fish catches declining driving factors.

An NGO negatively stated, "*There are all the EIA reviews made by the company even though 50% are not implemented. EIA was created as a reference for predicting the future. However, it is not like that, and the EIA is for us the EIA is the same as a permit document to damage the environment*". As well as NGO, academia negatively stated "*Our land use and spatial planning has never been accompanied by a study on carrying capacity, right? Look. However, the spatial planning itself, the phase before we decide whether it is exploited or not, the determination of an area or where there is a particular resource, has never been carried out based on an integrative study of the carrying capacity of the environment.*". In addition, all these decision-making processes also involve very little of the affected community. Of the ten research villages, only one fisherman spoke positively about his village's involvement in spatial decision-making, land concessions, and village development planning.

One fisherman spoke about fishermen's involvement in the EIA positively, while the other two stated negatively. "*At the same time, the permits were for EIA…it was only for validation, there were many lies there. What is prohibited by EIA is only a formality. The company does not carry it out... Anyway, Ms. I participated in the EIA, the EIA meeting ratification for these mines. I said I once said I was in front of the agencies. It was all a lie*". However, the government has a very different view from the other three groups of respondents. The government believes that all decisions are made procedurally, involving the community and for development purposes. For example, a government stated, "*Well, that is later if he sees that there are areas where fish sources are included, he will also be included. See the focus of the activity. If there are many fishing areas, the fisheries service will also be called*

because they are worried about the effects of pesticides, right?" another government stated, "*Yes, when compiling it, surely all the stakeholders involved are involved, until the community is involved. Yes, the community and community leaders, we must hold a public consultation. Well, it must be called whatever it is in there, we will find out*". Another government stated, "That is *why in managing natural resources the permit was yes. There are positive impacts, and there are negative impacts. It is there, in the initial ground mapping, it looks like that*". The government's domination in decision-making appears from the mastery of themes on spatial planning, land concession, EIA, and vice versa. Fishers have very little control over these topics, which indirectly illustrates the lack of involvement of fishers.

In Indonesia, environmental policy on strategic environmental assessment, EIA, land use, and spatial planning are part of efforts to prevent pollution and damage. Strategic environmental assessment is a series of systematic, comprehensive, and participatory analyses to ensure that sustainable development principles have become the basis and are integrated into the development of an area, policies, plans, and programs. Then, an EIA study must complement every activity plan that is estimated to have a significant impact on the environment.

4.1.1.a. Land Concession

Fishers argue that the current Government ease land concession for foreign investment, even if it is harmful to living space. Permits of some mining and oil palm companies were also not revoked even though these companies violated the EIA and polluted the environment and were proven to violate the regulation. The community's legitimacy process for granting land permits is often confused with the process for granting environmental permits because it is done concomitantly. Hence, fisher did not receive in-depth consideration of their claims on land and complaint on environmental impact because it is assumed that fisher has contributed to the environmental damage by approving the entry of companies into their territories. Environmental permits should only be granted if there are no land disputes, and the community has informed potential impacts. Thus, it is against free, informed consent principles. NGO argues that the logic behind land concession is continuity, permission given first, and then the company resolves the land acquisition case itself.

Thus, the community is confronted with the company. The community's rejection on the mine's presence would be criminalized because it is considered as rejecting development. People have no choice to refuse. Well, because consultation and public involvement regarding determining the allocation of space did not occur, then finally, there was an injustice in distributing space. "*For space planners, space means money*" (NGO respondent). Not disclosing the information on land use and spatial planning and land concessions eliminates the people's right to retain the allotment of fishing ground (*distributive justice*), which ultimately disenfranchises fishers to get protection for their fishing work.

For instance, palm oil and coal mining are still a favorite sector in East Kalimantan and continue to be exploited to meet development funding needs, although there is a large body of knowledge about the environmental impact of palm oil and coal mining. The Government is encouraging large-scale investment in agriculture and energy, as indicated by Indonesia's oil palm production that rose to 48.42 million tonnes by 2020 and accounted for about 57% of global production (Indonesian statistics, 2020; ourworldindata, 2021). In 2015, the area of location permits issued by the Government of Kutai Kartanegara for oil palm plantations as of August 2015 reached 873,397.8 hectares, and the total area of Plantation Business Permit (IUP) was 552,511.4 hectares. Even though there were only 376,938 hectares in that year, the land expanded for oil palm plantations outside the allotment plantations according to the land use and spatial planning (Dharmawan et al. 2016).

Meanwhile, in 2014 1,443 coal companies were operating in East Kalimantan within 5.5 million ha consisting of (i) coal mining license 1,360 (94%) and (ii) mineral license 83 (6%) (Muhdar and Nasir, 2012). The massive granting of licenses is inseparable from the provincial and district government elites, who believe coal is explored to increase regional income and finance development (Yuwana et al., 2012). However, the value of the loss in granting a lease-to-use forest permit for plantations and mines is not proportional because the Government has not calculated the cost of environmental recovery. Therefore, that government mindset can be considered negligent in maintaining the function of forests for the benefit of environmental protection as a buffer for the continuity of current and future generations (Soedarso, 2015).

According to Jamie (2021), investment in agriculture, in general, has more of an impact on destroying forests and the resources therein. From a territorial perspective, Indonesia's oil palm contributing to the extent of 23% forestry domain (ourworldindata, 2021). Oil palm also plays a significant role in territorial distribution disputes (Levang, Riva, & Orth, 2016). Oil palm-related activities and infrastructure prohibit local communities' livelihood, including local fishing communities. The welfare characteristics of the freshwater fishing village, a large proportion of communities, are under poor living conditions, and basic infrastructure is generally lacking (Santika, 2019). The move from freshwater fishing towards oil palm monoculture had an impact on village economic welfare. However, for the village that had chosen to embrace the palm oil sector, the socioecological debt accrued markedly higher than that village that had chosen to remain in the fishing sector. The benefit from increased economic welfare reduces dramatically after 9-11 years of transition, while a decrease in socioecological welfare becomes more pronounced.

Big scale bias is the countries' priorities policy for the big-scale industrial project while marginalizing small scale. Suppose investment in big-scale industrial projects is used as a locomotive for economic development by the Government. In that case, this contradicts been found by scholars who conclude that investment in big-scale industrial projects often creates 'enclaves' and exacerbates inequality rather than expanding economic and development benefits for the local economy (Mark Hirons, 2020). The economic losses resulting from the loss of ecosystem services in lakes and wetlands, including reducing pollution, fisheries, and flood control between 1997-2001 using global value, were up to $ 4.3-20.2 trillion (Costanza, 1989).

The causes of large scale land acquisition 1) in terms of target countries are the availability of land, weak Government, weak governance, and the absence of land protection rights at the local level, 2) from a public policy perspective: national priority to improve food and energy security by supporting investment and transnational incentives as well as the existence of international agreements, 3) at the international level large scale land acquisitions are associated with globalization and deregulation of the neoliberal land market, geopolitical changes and relationships with the economy, differences in accumulation and disposition mechanisms and changes in

land control conditions, and 4) the existence of the global energy transition and the need for alternative energy sources (Dell'Angelo, J et al., 2017).

4.1.1.b. EIA

The NGOs and some of academia's respondent groups argue that EIA predictability is not convincing. EIA has lacked detail and neglects the potential impact to an affected fishing community, and it cannot be enabled as a preventive tool. As mentioned by an academic respondent, "*The need for water for palm oil affects the volume of water in rivers, swamps, but we rarely calculate that.*" Community involvement in the preparation of EIA is very lacking. Public consultation is also not carried out in a participatory manner. Even if someone is invited, usually at the sub-district level, the sub-district head is considered a representation of the community, or if there is a representative from the village, it is only the customary head. The public consultation was only a formality. In practice, during public consultations, the public was only informed about the positive side of investment and new licenses. The company said that the company's activities did not have a negative impact. The essence of public consultation should be the dialogue about potential impacts and impact management plans. The dialogue did not occur because the government had prepared the management plan. So, public consultation is a means of socializing management plans that the government has prepared. The public has the right to know the results of the study contained in the EIA document so that they have a solid basis for refusing the presence of the company.

Fisheries must be considered in the EIA. There must be a baseline or the initial conditions before the industry operated. However, EIA only compares the initial and final conditions. The potential impact has not been predicted correctly because the baseline is not equipped with adequate data. The baseline has no complete socioeconomic data, so the socioeconomic impact cannot be predicted accurately. There is no initial data on the profession of fishers and final data on fishers, so they cannot predict who the actual beneficiaries and beneficiaries are. For example, EIA cannot predict positive or negative impact economic recipients between inside and outside land concession areas.

Additionally, in every document of EIA on coal and palm oil, it is stated that coal mining activities and palm oil plantation will affect water quality and aquatic ecosystem, but the government cannot stop or not issuing permits for that activity due to investment. As mentioned by an academic respondent, *"Some research results say that oil palm, mining pollutes the environment, both land, and water. However, there is no stopping it."*

The EIA implementation was assessed and responded differently by each group of respondents. In essence, respondents who have a positive sentiment view that:

1. The EIA implementation has been carried out under existing regulations, meaning that substantially or procedurally, the EIA stage has been carried out correctly so that it is unlikely that these activities violate environmental regulations and cause environmental damage. The environmental licensing process is carried out openly. The government usually conducts socialization by inviting communities around the prospective company location, and it can be people from several villages that are expected to be affected for advice and input. The company carries out the entire EIA process from the start of the public consultation on location permits. The company also carries out the preparation of EIA and environmental monitoring.
2. Villagers also actively participate in environmental monitoring by monitoring wells and

In the meantime, respondents who have negative sentiment argue that:

1. EIA must have supplemented all exploration activities, but the facts indicate that substantially, the potential impacts are not considered in depth by the EIA consultants. Besides, because the team does not understand the potential impact, the team is also pragmatic. It is because their interests have mixed with the interests of officials.
2. The government is also pragmatic. The government seems does not understand the existing practice because instead of being preventive, the government instead embraces the continuity by not carefully anticipating and preventing impacts but allowing impacts to occur and then finding a way out by making a former exploration land as a tourist attraction or a center for freshwater fish farming, for example.

4.1.1.c. Development Planning

As is widely understood, development is a change to a better condition. The government encourages job creation and reduces unemployment by opening investment in the palm oil and coal mining sector. Compared to those sectors, capture fisheries have been under attention and under-taken care of development planning because this sector does not directly produce local government revenue. Moreover, the fisheries sector cannot be taxed because it is managed by small fishermen whose orientation is subsistence. Institutionally, the functions of the Fisheries Agency are limited to being only technical institutions responsible for increasing regional income.

Development Planning Forum is only a formality and a tool to legitimize the State Budget. It is relevant with Fuady's findings (2012) that development planning was initiated from villages and sub-districts level, but when it arrived at the district level, the proposal was juxtaposed with the program proposal made by the district Local Government Working Unit. In principle, proposals from villages like proposals from the district Local Government Working Unit would not be approved, and the government did not transparently inform which village proposals were approved and included in the State Budget plan document. Furthermore, it demonstrated that community participation in the district Development Planning Forum is relatively low except for villages that get advocacy from NGOs.

The fisheries sector is not given much attention in the development process based on several facts: a) The designation of a space allotment and granting permits and concessions in the Middle Mahakam region have never been based on cost and benefit analysis. The government does not have data about fishermen's livelihood and how many fishers were affected by the project. The government does not want to bother. b) Although fishers are potentially affected, fishers are not procedurally involved in planning a project. c) There is no conservation effort to equip inland fishery with zoning distribution.

4.1.1.d. Land use and spatial planning

As well as development planning, the preparation of the land use and spatial planning is considered partial and has never been accompanied by a study of environmental carrying capacity. Land suitability is also not well assessed, so the

impact is not well anticipated. The current land use and spatial planning are more concerned with economic interests than land type habitat, living space, or space for animals to find food. Many areas designated as non-forest areas are forests, and their biodiversity is still quite good (Myers, Intarini, Sirait, & Maryudi, 2017). Wetland is considered empty land and idle resources and should not be suitable for the plantation, but it is used for plantation. Its function does not see in the ecological environment and the overall ecosystem.

The implementation of public consultations in land use and spatial planning is considered low. The preparation of the land use and spatial planning is dominated by companies with very close relations with politics. During the first public consultation, participants were dominated by the company and government and a small number of civil societies. The land use and spatial planning regulation stated that everyone has a right to know the land use and spatial planning document because the land use and spatial planning document is a public document. However, implementing that regulation raises a negative sentiment since it is closed and difficult to access by the public. Some respondent argues that the spatial product is confidential but cannot be accessed even by academicians. It can be accessed only by a limited circle to maintain confidentiality and reduce the potential for abuse.

In the East Kalimantan province planning, protected areas consist of protected forests, areas that protect the area underneath, local protected areas, nature reserves, nature conservation, cultural reserves, natural disaster-prone areas, and geological protected areas. The protected area lay on2,283,360 hectares—plantations classified in the Agricultural Cultivation Area. The Cultivation Area in East Kalimantan has an area of approximately 3,681,657 hectares. During the preparation of the province, land use, and spatial planning, swamps (there is peatland within) contested by the Agriculture Office (for lowland rice), the Fisheries Service, and Ministry of Public Work and Housing (for settlements), which finally divided. The Forest Service then permitted to open plantations on peatlands. The cultivation of oil palm plantations on peatlands is permitted because technically, the cultivation of oil palms on peatlands can carry out optimally.

4.1.2. Pressure

The land concession increasing the pressuring factor of fish catches declining. Four kinds of pressure affect the present situation of inland fisheries based on four different groups of respondents: palm oil, fishing, seasonal factor, and coal mining. From total pressuring factors, palm oil, fishing, seasonal factors, and coal mining contribute 36.7%, 26%, 20.7%, and 16.5%, respectively. The data shows that all of the respondent groups give more concern to anthropogenic factors than natural factors except fishers, who are much aware of the seasonal factor as pressuring factor (89.7%). However, compared to other respondent groups concern with anthropogenic factors, fisher concern is the biggest. Fisher was sentiment negatively towards palm oil, fishing, and seasonal factor, and coal mining. This negative sentiment demonstrates the negative perception of palm oil, fishing, seasonal factors, and coal mining on the environment. However, the government has positive sentiment towards the impact of palm oil except for the fisheries agency. Government positive sentiment towards palm oil means indicate palm oil is not pressuring factor of fish resources decreasing.

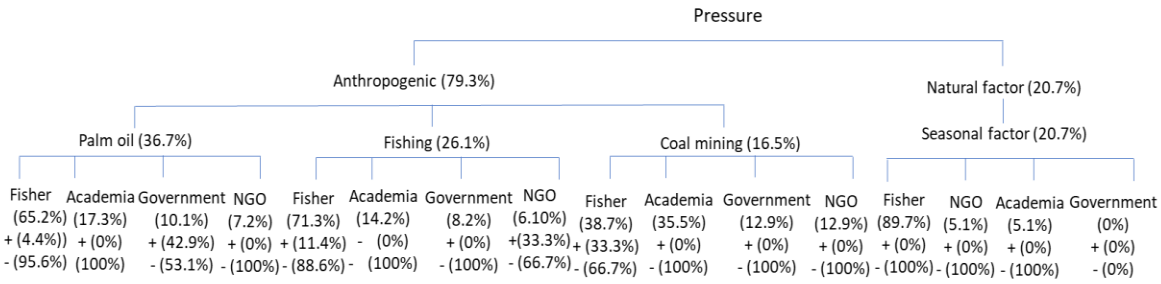


Figure 13 The percentage of fish catches declining pressuring factors.

Four kinds of pressure affect the present situation of inland fisheries based on four different groups of respondents, i.e., palm oil, coal mining, destructive fishing practice, and seasonal factor. Fisher, NGO, and academia are much concerned about the impact of palm oil. Most of them think negatively about the impact of palm oil. A fisher stated, "*Yesterday, in the Kehala or the body Yesterday, the palm oil waste was broken, right, after the fish in the cages died. Yes, what kind of water is that. If you go to cages, as I said earlier, it is pollution, right?"* An NGO makes a comparison between palm oil and coal mining impact, and she stated, "*If there is a shortage of fish, maybe it is from human activity. However, if we look, for example, if we look at*

the example of the Kedang Paung River, there are already coal lifting activities, but there are still many fishermen. Then they were disturbed by the coal passing through it, but there is still much potential there. Now when we open palm oil, we immediately see changes in the local area that have moved away from the area because the fish are directly affected by the changes in the water, which may have been opened initially using pesticides or fertilizer pesticides, all kinds of things that make the fish there less adaptable. Well, then after that, maybe the initial phase, yes, the area due to the spawning cannot be used for spawning. So, it immediately wastes fishery resources, so we see it drastically, you know."

The impact of oil palm is more significant than the impact of fish electrocution on fish mortality. A fisher stated, "*Stun. The impact is not that big. It is not that much, right, instead of the waste. The impact of that waste is genuinely extraordinary*. Their knowledge is supported by all the EIA documents of oil palm plantations mention that land clearing activities, preparation of nurseries, preparation of oil palm plantations, construction of road networks, application of fertilizers, herbicides, and pesticides, used oil waste FFB workshop operations, and transportation will have essential impacts on the environment. Canal construction is expected to cause negative impacts, as well. Canalization causes surface runoff disruption, runoff, erosion, sedimentation, and water quality degradation, which also impacts aquatic biota and ultimately impacts public health.

Nevertheless, the government has a different opinion, the government stated about the impact of palm oil on water quality and quantity of wetland "*All plants need water and not all plants dry up the water, even during the dry season he releases water slowly…I said that the river has a forest where the fish are gone. In East Kutai, there are still many company gardens used for catfish cultivation in catfish cages. Water quality does not really matter there, and an oil palm cultivation is needed*". However, although coal mining, palm oil, and destructive fishing have different levels of destruction individually, their combined and accumulative effects doubled when it met the seasonal factor's impact.

Academia stated, "*Yes, there are complications. Between the decay of plants, the decomposition before, then what comes down after this runoff, is palm oil. Well, that. Yes, it accumulates. If it was poisoned earlier, it was on a small scale. The small*

rivers were poisoned with a hiss. It is just a little bit, and it is different. If this is a Mahakam River, then eutrophication occurs. That is right, if it is dead, not dead, everything gasps, the fish cannot breathe, so they rise to the top."

Each village had different primary pressure. Puan Cepak and Kehala Ulu are the most villages facing palm oil plantation pressured. Puan Cepak village is surrounded by three extensive palm oil plantations, so most of the fishing ground had been converted to be plantation. Both Puan Cepak and Kehala Ulu are situated in the middle stream of tributary, so this village receives accumulated water pollution from the upper plantation. In the meantime, a village that received most pressure from coal mining crossed by coal transporting. The village that is received the most pressure from destructive fishing is the village that had a lake as a fish spawning ground. Furthermore, most villages face the same natural factor pressure except Kehala Ulu that affected the most. In total, Muara Kaman, Sebelimbingan, and Kehala Ulu village get the most pressured from all kinds of pressures.

4.1.2.a Palm oil

Palm oils contribute the most pressuring factors (36.7%) of fish catches declining. Two possible impacts of palm oil plantation to the fish catch decreasing were pollution and sedimentation. The potential pollution source of palm oil plantations is likely due to the bleaching process of chemicals, fertilizers, and pesticides. They were fertilizing and suctioning by using very intensive chemicals in plantations, leaving chemical particles that cause the water to become slippery and foamy. Palm oil plantations certainly cause pollution because palm oil does not have a tamping pool hole. From the research conducted by Walhi, palm oil plantations do not directly affect fish camps, but their impacts are categorized as pollution.

The other potential impact of palm oil is likely to arise from the establishment of a land application system, as well. The utilization of liquid palm waste for a fertilizer channeled through canals, which also serves to control surface water at the plantation site, is called a Land Application. Palm waste is palm oil mill effluent. Palm oil mill effluent, which is liquid waste containing COD around 10,000-30,000 mg / lt it smells terrible. Wastewater quality indicated by smelly palm oil mill effluent in settling ponds. If the water in the settling pond smells from 10-50 meters, the water quality is still low and cannot release into the waters. The smell of wastewater comes from the

many bacteria Nitrosomonas aero bacteria that trigger nitrification so that BOD and COD are far above the quality standard. Nitrosomonas bacteria are sensitive to pH changes. At wastewater treatment pond 1, the smell of sewage has smelled from 100 meters. However, the palm oil mill effluent, which has been processed, contains around 1000 mg / lt of COD, which means the water quality has met the quality standard. The BOD must be between 1500-3500, and it will certainly not pollute the environment. That is what channeled to the channel for land applications. Unfortunately, with integrated canals that are interconnected, the land application is challenging to control if extreme tides occur.

The presence of oil palm also impacts the deterioration of river water quality because the water management system applied changes natural flow into an open-close channel system to maintain surface water levels so that oil palm roots and air humidity in the plantation are always maintained and to neutralize water acidity. Unfortunately, the canal system is endangering fish because pesticides and drugs widely applied on plantations are likely to flow into these canals during the rainy season, even though the canal is associated with the river.

According to respondents from government groups, pollution from palm oil is not too much, at most from the processing industry. At the same time, the potential impact of fertilization and spraying is almost non-existent. Although many palm oil plantations in Central Mahakam, their presence does not cause pollution because the government closely monitors their activities. If they commit a violation, the operation will stop. If they are currently still operating, it means they have not committed violations. There has never been any pollution in the Middle Mahakam, only minor pollution caused by the low pH of water released from the settling pond, and District Environmental Agency has warned the company about it. At the same time, the potential impact of palm oil mill effluent is insignificant because it has been closely monitored. One of which is through the minimum distance regulation of canals with river borders, which is a minimum of 50 meters, the optimal utilization rules for waste so that no waste is left (zero waste). The land application will not be applied to sandy soil. Supervision of land applications is carried out strictly if there are unwanted incidents that mean beyond human will.

Although there are two different opinions, all the EIA documents for oil palm plantations sampled in this study mention that palm oil activities will have essential impacts on the environment.

Table 10. Potential impact predicted in the EIA documents.

Companies	Activities	Potential negative impact	Environmental management plan
PT. Bara Tabang	Land clearing, topsoil stripping, mining, processing, and transportation of coal and workshop.	1) reduce surface water quality due to increased turbidity, TSS, TDS, BOD, COD, Mn, sulfate and Fe, 2) increasing acid mine drainage, 3) increasing B3 waste, 4) the decrease in pH triggered by pyrite mineral rock that is dissolved in water as a result of mining and crushing activities, 5) Topsoil stripping, mining, and crushing activities increase in TSS, and 6) The potential erosion due to land clearing and topsoil stripping activities.	1) making drainage channels to localize run-off, erosion, and sedimentation, 2) making settling ponds, 3) installing the chamfer or coal splitter container under the conveyor belt, and 4) reclamation and revegetation. To prevent the flow of coal washing into rivers, coal washing channels must be made at least 10% lower than the river border height.
	Transportation	a. Fishing ground losses b. Riverbank erosion c. Damage water quality d. Sedimentation. e. Disrupt the dolphin habitat. Even the dolphin shifted its route to avoid the pontoon.	1) Mapping the Kedang Kepala river channel, 2) Controling sediment, 3) Cliff reinforcement, 4) Monitoring barge traffic, 5) Scouting barge, 6) Controlling dust both in the conveyor area and when the barge moves, 7) Relocating cages and latrine over the river, 8) mooring barge location arrangements, 9) Conducting reservoir studies, 10) reservoir recovery actions, 11) Conducting environmental education, 12) protecting dolphins and their habitats.
PT. KAM, PT. ABK, PT. ABK, PT. AEK, PT. ATK.	Land clearing activities, preparation of nurseries, preparation of oil palm plantations, construction of plantation road networks, construction of mooring docks, construction of canals, application of fertilizers, herbicides and pesticides, workshop operations, transportation, canal construction.	Natural surface runoff disruption, runoff, erosion, sedimentation, and water quality degradation, which also means an impact on aquatic biota.	To avoid erosion and sedimentation downstream of the river, land that has just been cleared and has not yet planted must be preserved using ground cover crops, namely legumes. After entering the fertilization period, fertilization must also follow the specified method such as applying types of pesticides that are readily biodegradable and applying fertilizers effectively and efficiently. To control erosion and sedimentation, companies will carry out sediment management by localizing runoffs, providing alum, making land clearing traps, making sediment traps, caring for drainage canals, and caring for natural vegetation in buffer zones.
	Fresh fruit bunch processing into crude palm oil and palm kernel oil, wastewater treatment, composting empty fruit bunches, and reservoir construction	Water quality degradation.	Management actions taken to reduce water quality degradation are building sewerage pipelines based on the type and source. Solid waste be handled well by processing it into compost and as boiler fuel.

Most plantations are located in wetlands, which have to build canals to regulate water in the garden. Plantations like this also add canal construction as activities that are expected to cause negative impacts. The negative impact that will cause is natural surface runoff disruption, runoff, erosion, sedimentation, and water quality degradation, which also means an impact on aquatic biota and ultimately impact public health. Besides, oil palm plantations located in swampy areas on the banks of rivers whose land is of entisol, inseptisol, and histosol must make a canal. The canal regulates the groundwater level so that the gardens are not flooded during high tides, drain fertilizer, and in one sample company also uses canals as a fresh fruit bunch transport route. Canal construction has the potential to reduce surface water quality.

The main activity carried out in the factory is processing fresh fruit bunch into crude palm oil and palm kernel oil. The treatment produces various types of waste, namely solid, liquid, and gas waste. Types of liquid waste are palm oil mill effluent originating from the processing of fresh fruit bunch, liquid waste from factory washing and cooling of boiler ash, leachate waste resulting from the accumulation of empty and fiber long beds, and kernel washing waste. All types of waste have an impact on water quality degradation. Therefore, management actions to reduce water quality degradation are building sewerage pipelines based on the type and source.

All EIA documents of oil palm companies also noted that fresh fruit bunch processing, wastewater treatment, composting empty fruit bunches, and reservoir construction are expected to have negative impacts. Waste generated from the processing of crude palm oil and palm kernel oil is solid, gas, and liquid waste. Solid waste in the form of fresh fruit bunches, fibers, and mud from wastewater treatment pond. Based on the EIA document PT. KAM, total solid waste generated from each ton of fresh fruit bunch, is 55.4%. With a factory capacity of 90 tons/hour and work 20 hours per day, the resulting solid waste is 975 tons/day. So far, solid waste can be handled well by processing it into compost and as boiler fuel.

Furthermore, based on the EIA document, land clearing activities, nursery preparation, preparation of oil palm plantations, construction of mooring docks, and construction of garden road networks lead to sedimentation, especially in wetland plantations. In addition, they must dismantle peat to build water level control canals. Activities to demolish peatlands for oil palm cause damage to peat structures.

However, government group respondents think that the expansion of oil palm plantations on peatlands is wrong. Land clearing is carried out with due regard to the principles of conservation, and therefore during the dry season, water comes out from the cleft peat gaps. For example, to avoid erosion and sedimentation downstream of the river, land that has just been cleared and has not yet been planted must be preserved using ground cover crops, namely legumes. Then after entering the fertilization period, fertilization must also follow the specified method that only fertilizes the disc.

Sediment loads increased in the rivers located in the PT. KAM plantation areas include the Seguntung watershed, Kedang Kanan Sub-watershed, Sabintulung Sub-watershed, Sedulang Ulu Sub-watershed, and Sedulang ilir Sub-watershed. All those water rivers are flowing to the Kedang Rantau River where five of research site is situated. The Seguntung watershed water discharges are 11.51 m3 / sec, Kedang Kanan Sub-watershed water discharges are 4.57 m3 / sec, Sabintulung Sub-watershed water discharges are 33.11 m3 / sec, Sedulang Ulu Sub-watershed water discharges are 29.83 m3 / sec, and Sedulang ilir Sub-watershed water discharges are 19.77 m3 / sec. As a result, the estimated sediment load of each Sub-Watersheds will increase to 53.70 tons/day, 24.48 tons/day, 246.04 tons/day, 144.33 tons/day, and 81.98 tons/day, respectively. To control erosion and sedimentation, PT. KAM will carry out sediment management by localizing runoffs, providing alum, making land clearing traps, making sediment traps, caring for drainage canals, and caring for natural vegetation in buffer zones along riverbanks along 50-100 m on the left and right of the river.

Based on the EIA document of PT. KPM of the Kedang Kepala River, the Balui River, and the Nuing River each had sediment load 2,388.78 m3 / sec, 19.92 m3 / sec, and 16.22 m3 / sec, respectively. Besides, the location of oil palm plantations is in the swamp area on the banks of the Kedang Kepala river, where 85% of the land is dominated by tropohermnist and tropofibrist soils with entisol, inseptisol, and histosol soils, canal construction must be carried out by PT. KPM. The canal functions to regulate the groundwater level so that the garden is not flooded at high tide. Construction of canals also needs to be done to create a fresh fruit bunch transport line. The transportation of fresh fruit bunch by land is challenging to do in PT. KPM because of the location of the plantation located in an area that is lower than sea level.

As part of transportation by water, PT. KPM also built a mooring dock on the banks of the Kedang Kepala River, which serves to unload the fresh fruit bunch and the main entrance to the location of the plantation. Canal construction has the potential to reduce surface water quality.

To reduce the negative potentials above, PT. KPM plans to control erosion by localizing runoffs, providing alum, making land clearing traps, making sediment traps, maintaining drainage canal networks, and caring for natural vegetation in the buffer zone in the Kedang Kepala river border along the 50-100 m on the left and right rivers, applying types of pesticides that are readily biodegradable and applying fertilizers effectively and efficiently.

4.1.2.b Fishing

The second biggest anthropogenic factor is coming from fishing itself (26.1%). Destructive fishing practices impact the decline in the diversity of fish species, which can be an ecological indicator of overexploitation. One of the academic respondent's states that overfishing is related to the number of catches. Destructive fishing is related to fishing methods and equipment. Local fishers initially carried out the use of destructive fishing with various modifications of tools and methods. The illegal fishing tools commonly used by fishermen in Central Mahakam are chemical matter, small-eyed nets, and weed clumps. All illegal fishing tools and methods have the same characteristics and abilities, which can catch many fish quickly, but each tool has a different scale of impact. Toxins and chemical matter have a direct impact on the reduction of fish and have a long-term impact and an indirect impact, which is the breaking of the food chain. Small fish and vertebrates, which are food for small fish, die from poison and chemical matter. Even the fish eggs in the swamps cannot develop and regenerate. Even if fish can, the size is smaller than average, even though it is an adult, but it is not standard. For example, his head is big, but his body is small.

Figure 14 Small mess size fishing gear

The impact of the chemical matter is not as extensive when compared to poisons. However, the use of chemical matter is hazardous to all types of fish and false dead size. The exact impact is the depletion of fish seeds from nature. Fish that die of poisoning have red-eye characteristics. A small-eyed net is also no safer than other illegal tools if combined with traditional fishing methods called *mendanau*. *Mendanau* is a fish-catching method by collecting weeds into a kind of lake at a certain point. It expected the best fish gathered under the lake in which a net trap was given. With this method, all sizes of fish are caught.

The impacts of the use of destructive fishing include the loss of several species of fish such as papuyu (*Anabas testudneus*), (*Leptobarbus hoeveni*), dan Biawan (*Helostoma temmincki*). In comparison, the almost extinct fish are local catfish (*Clarias batrachus*) and baung fish (*Mystus*). Socially there is an anomaly in the fishing community; on the one hand, they say fisheries are a source of livelihood, but on the other hand, they use destructive fishing methods. The habit of using chemical matter and poison is difficult to change because fishers assume that they are forced to use illegal tools to meet market demand.

Respondents stated that fishers who use destructive fishing equipment must be from neighboring villages, especially fishers from villages that do not have forests—

for example, the forest of Liang Village. In several villages, namely Jempang, Tanjung Jone, and Pulau Lanting, the use of chemical matter began to decrease because the fish were no longer available. Fish poisoners are local people, massively people poison to small streams too. Destructive fishing catches in traditional fishing areas also enter fisheries conservation areas or reservoirs that are fish spawning grounds. In that place, the fingerling assemblages are easily caught.

Migrants from South Kalimantan initially founded some fishing villages in Central Mahakam. After decades of living in these villages, the fishermen maintain kinship with their families in Banjar, both through natural kinship and trade relations. Most fish products from Central Mahakam are sold to South Kalimantan through traders from South Kalimantan. The popularity of the Middle Mahakam as a center for freshwater production and the strong kinship between the Banjar tribes is an attractive factor for the arrival of seasonal fishers from South Kalimantan. They stayed in the Middle Mahakam for several days by hitching a ride in the family home to get the maximum results.

Seasonal fishers have realized the potential for conflict over what they do, so they have armed themselves with sharp weapons. In some places, they confront local fishers. In addition, destructive seasonal fishers conspire with local fishers by concealing the identity and purpose of the arrival of seasonal illegal fishers by saying that the purpose of their arrival is only family visits. Besides having the potential for conflict, the arrival certainly increases the number of fishers indirectly and reduces the lake's carrying capacity in supporting the number of local fishers.

As a unitary state, the government is aware that the government has no right to prohibit Indonesian citizens from moving places and looking for income. However, on the other hand, the government must protect the rights of local citizens. Responding to this, the government made rules about certificates of entry, namely certificates for residents who make short trips issued by the local government. Besides, temporary migrants must also respect the applicable local rules. In some cases, the government forces the seasonal fishermen to return to their home areas without compromise.

4.1.2.c Natural factor

The productivity of the river, lake, and swamp is also significantly affected by the seasonal factor, which is associated with the pattern of flux and reflux (20.7%). There are types of ups and downs of flux and reflux in the Middle Mahakam Area:

1. The water tides and recedes quickly. The color of the water is usually white. Mass fish death usually occurs when the water tides.
2. The water tides and recedes slowly. The color of the water is usually black, and the water flow is stable. Fishers call this sort of water the so-called living water. In this period, the fisher can catch the fish quickly.

Research conducted by Mislan (2016) also found that in the upper reaches of the Mahakam River, flooding occurred with a short period of 1-2 weeks and repeated. In the middle part of the Mahakam, changes in water level tend to be slow, but floods occur over a long period of 1-4 months. The flood peak in Kota Bangun occurred nine days after the flood peak in the upper Mahakam. Fourteen days later, there was a flood peak at Muara Kaman.

Flux-reflux systems are related to rainy and drought seasons that will affect natural factors such as temperature and turbidity and the fish type and affect human behavior. Typically, during heavy rains, mining and oil palm actors dump their tailings into the river. Not to mention, flux and reflux are also related to the upwelling phenomenon. Upwelling is rising water from the bottom of a lake or river because the surface water temperature is more relaxed than the river temperature at the bottom. Under conditions of high and continuous rainfall, the entire surface of the water is low so that the mass of water below it rises to the top, which carries toxic compounds, so that the fish have difficulty breathing because of the minimal oxygen concentration that causes the fish to die. NH4 is formed when dissolved oxygen is low. The impact of water quality is seen on the first day after rain, the second day, and so on no later than a week after the first rain. It depends on the dominant combination of bad water.

Table 11 Relationship between flood and waste periods

The first flood 1-2 weeks	Waste that accumulates in the swamps comes out	Many fish in the creeks died
Flood Week 3 – 2 months	Waste was carried to the Mahakam River	A lot of fish breeding in the swamp
Flooding continues for more than 3 months	Waste from a tributary cannot come out because the Mahakam water is full. Water retained in creeks, lakes and swamps. The height of the water surface is increasing and expanding.	The numbers of fish are increasing but spreading everywhere.

The relationship between water level and dominant fish species:

1. In the flooding season, when the water level is not too high, the water flowing out from the peat. In this period, fish species quickly found are black species such as gabus (*Channa striata*), catfish (*Clarias batrachus*), and eel (*Monopterus albus*).
2. When the water level increase to the higher level, the lake and swamp are associated with Mahakam River water. Local people called it as high flood season. In this period, whitefish species migrate from the Mahakam River to other water bodies. Fishers quickly catch this kind of species.
3. When the water level increases to the highest level of flooding, the peat water comes out. The fishing community acknowledges this period as a gift because fish is abundant. In this period, fish species that live in the peat were quickly caught, such as gabus (*Channa striata*), catfish (*Clarias batrachus*), and eel (*Monopterus albus*).

The dynamic between flux-reflux system and ecosystem characteristics generates seasonal eutrophication. Eutrophication occurs because water that is not well decomposed is held upstream during the dry season and downstream during the rainy season. Local people call it bangar water. The water usually contains zero dissolved oxygen, low pH, high nitrates, and high SO2. Therefore, it is destructive and poisonous. Usually, it occurs from January - April. However, now the eutrophication cycle is changing according to climate change.

The difference in the scale of the impact of eutrophication is that fish poison is partial and localized, which is only in small rivers. In contrast, the eutrophication impact scale is widespread and comprehensive from the start of swamps, lakes, and rivers. In terms of time, fish poisons usually shown in the dry season. Thus,

deteriorating water quality during the rainy season starts due to the combined effect of runoff and eutrophication. Eutrophication only occurs in system notary waters, which have a closed population where the flow of water from the mainland carries fertilizer, water hyacinth, and all pollutants into these waters, such as lakes. Eutrophication causes an increase in the population of water hyacinth and tuber, which then reduces the amount of oxygen and living space for fish. Finally, the fish unable to breathe, faint, and eventually, die.

The process of eutrophication starts during the dry season, where aquatic plants begin to grow. When the lake or swamp is dry, the clump multiply. It only takes 1-1.5 months clumps to cover the lake and swamp. After the rainy season comes, these plants sink and decompose. If the water is not swift, eutrophication occurs for up to a month. After that, the clump is stuck in the lake and swamp or the middle of the river. In which it becomes the meeting point between the water flow from upstream and tide flow downstream. This process causes the swamp and lake water to turn black.

Eutrophication indeed is a natural phenomenon. However, the combined effect of eutrophication, upwelling, and accumulated pollutants is significant to the fisheries. This combined effect occurs on a vast scale because the swamps and the lake reach millions of hectares. Therefore, rivers passed by eutrophicated water are not suitable for cultivating freshwater fish in cages such as carp and tilapia. It is different from what happened in the past, when eutrophication is a purely natural phenomenon. Then, there had never been a mass death of fish, the fish just faint, and water was also safe for human consumption. However, it is different right now.

Besides, the combined effect between natural factors and anthropogenic factors triggers the gill disease phenomenon. Gill disease appears when the water is unstable, and tides occur quickly and repeatedly. It usually occurs a week after high tide, accompanied by heavy rain. Combined with pollution impact, water quality will continue to decline, and the inactive bacteria will become active. The active bacteria had now become a disease. In these conditions, the fish virus spreads rapidly. The fish become slimy and so survive, and some die. The virus attacks fish of all ages. Fingerlings and adult fish have started to be attacked by a virus. The pattern of the spread of the virus is unique. The virus does not attack simultaneously in all cages but attacks cage by cage. It takes one day to spend one box of fish.

The development of the virus associated with:

1. Water temperature. Viruses develop rapidly in cold temperatures.
2. Fish species. Fish that are susceptible to viruses are goldfish, while tilapia tends to be resistant.
3. Cage material. Fish cultivated in cages made of wood tend to be more resistant to disease than those raised in gauze cages.

Virus prefers to attack aquaculture fish. Some famous villages for their aquacultures, such as Kehala Ulu, Sebelimbingan, Muara Siran, Semayang, and Sangkuliman, experiencing the loss due to virus attacks. In the past, Sebelimbingan villagers had cultivated carp (*Monopterus albus*) and tilapia (*Oreochromis*) in the cages. Since the mass death of fish, carp (*Monopterus albus*) and tilapia (*Oreochromis*) have become susceptible to viruses. Therefore, farmers now prefer to maintain red snakehead fish (*Channa micropellets*), which are more resistant to viruses and changes in water quality. The public does not dare to associate the phenomenon with company activities. Even though at that time, the aquaculture fisher saw a very drastic change in water quality. However, the aquaculture fisher prefers to consider the phenomenon caused by a combination of natural factors and virus attacks.

4.1.2.d Coal mining

Coal mining contributed 16.5 % to fisheries' resources declining. Coal mining contribution to the fisheries resources declining is the smallest than other pressuring factors because coal mining impact on fisheries resources is indirect except water transportation. There are three possible impacts of coal mining on the fish catch decreasing: pollution, sedimentation, and water transportation. Pollution and sedimentation are indirect because the mining location is upstream dry land and far away from the research site; of the ten villages sampled as research samples, two villages passed by coal transport, namely Muara Siran Village and Sebelimbingan Village. Muara Siran is not so affected by coal waste because the mining location is far upstream from the river, and their primary fishing location is in the lake and swampy area. However, the traffic of the pontoon annoying some fishermen who used to use the river as their fishing ground to find catfish during the rainy season. Now, they compete with the pontoon. The pontoon defeats them, so instead of doing

fishing, they prefer to trap the pontoon. If their fishing gear is damaged due to being hit by a pontoon, they can get compensation from the company.

The more positive insight about coal mining comes from academia, which states that coal does not cause siltation because the Mahakam River has been used for all kinds of activities—first used as wood transportation. Since all ships passed the river, especially now that there are coal and palm oil, the burden of the river has become even more massive. However, all rivers everywhere are like that. Even though the water is getting muddy, it does not mean the quality has dropped because it always does, and it will come back to be good.

4.1.2.e Hypothesis confirmation

Based on the above findings, it is concluded that H1.1 is rejected. Palm oil is the main key pressuring factor of water quality and decline in fish catch in the Middle Mahakam Area, but coal mining is not the primary key pressuring.

4.1.3. State

All the pressuring factors accumulate change to fishery resources, including fish, water, and land. Fishery resources changed the most (51.4%), followed by water resources (31.7%) and land (17.2%). The contribution of fish catches decreasing, water quality, mass fish mortality, and fishing ground reduction to the change of fishery state were 32.1%, 19.7%, 19.3%, 17.2%, and 12%, respectively. From all respondent groups, the fisher is the most group concern but sentiment negatively to these themes and followed by academia while government and NGO have the most minor concern.

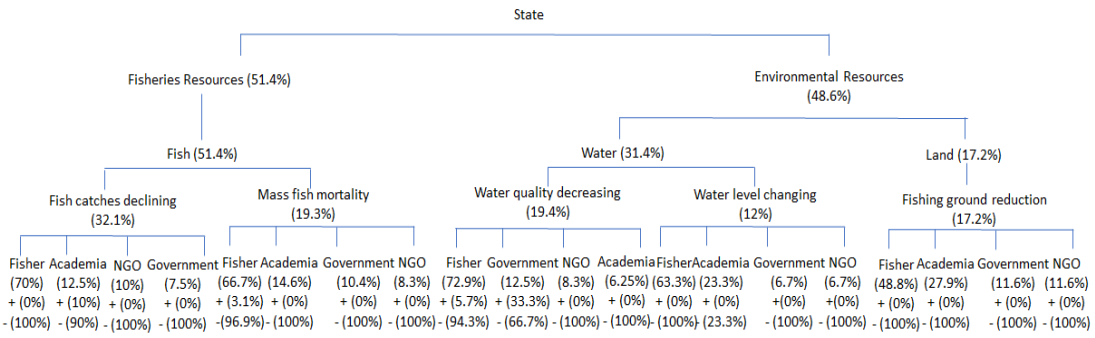


Figure 15. The percentage of the change of fish and environmental resources

A fisher stated, "*If the water condition is already polluted ... that is why they say they are very, very worried about it when the tide is big, especially in a season like this, the water is not possible to consume".* When the water is polluted, then fish are dying. Another fisher stated, "*How many thousand are all gone, sis, fish cages… all the whole Sabintulung, all died, you have leftovers".* However, fishing ground reduces drastically when water levels decline because of seasonal factors and land-use change. A fisher stated, "*Narrow, the steking2an broke ma'am. Thousands, so we cannot get through. If the road is high up if there is a big flood, how can we pass it".* Consequently, nowadays, fishing is not selective, all types and all sizes of fish caught, the number is small and continues to decline, the price is high, the drought is much different, the swamps dry out, the buyers do not have many fish, it is not easy to find fish, use more and more types of fishing gear. Shrimp, bentilap, lais, stringine, betutu, salap, biawan, papuyu, sepat, pentet, lepok are getting scarce. A fisher stated, "*Every year the fishermen's business continues to decline if here it cannot keep on increasing, it continues to decline, so it is hard for us to be fishermen now."*

4.1.3.a. fish catches decrease.

Nowadays, fishing is not selective, all types and all sizes of fish caught, the number is small and continues to decline, the price is high, the drought is much different, the swamps dry out, the buyers do not have many fish, it is not easy to find fish, use more and more types of fishing gear. Fish that are getting scarce are shrimp (*Macrobrachium malayanum*), bentilap, lais (*Lais hexanema*), stringine, betutu, salap, biawan *Helostoma temminckii*), papuyu (*Anabas testudineus*), sepat (*Trichogaster pectoralis*), pentet (*Clarias batrachus*), lepok (*Kriptopterus limpok*).

In general, fishing catches fluctuations are divided into seasonal and annual fluctuations. Tides strongly influence seasonal fluctuations. While annual fluctuations are influenced by accumulative factors, including long-term weather changes. In the past, catches in the rainy season up to 37 times much more than catches in the dry season. Now, catches in the rainy season fall to 20 times more than catches in the dry season.

Meanwhile, long-term annual fluctuations, the catch of the dry season lessen to four times. In contrast, the catch of the past rainy season with the present fell 22

times. In summary, based on information collected from fishers, there had been a trend of decreasing fish catch in Central Mahakam. Not only in Central Mahakam, but the downward trend in catches has also occurred in all communities along the Mahakam River in the last ten years (prokal.co. 2006). The results of this study are like the research conducted by Joe Simamora (2017). The sampling locations are Sangkuliman Village and Tunjungan Village. He showed that during the last 20 years, the catch fell by ten times, namely 75 kg (1996), 30 kg (2006), 7 kg (2015) (Simamora, Arnesto et al. 2017)

Table 12 Comparison of fish catches between rainy and dry season

Village	Past dry season	Recent dry season	Past rainy season	Recent rainy season
Liang Buaya	12 million/day	3 million/month	100-200 kg/day	30-100 kg/day
Muara Kaman	3 kg/day	1 kg/day	-	20-100 kg/day
Muara Siran	6-7 kg/day	0 kg/day	60-70 kg/day	20 kg/day
Puan Cepak	30-40 kg/day	10 kg/day	100 kg/day	50 kg/day
Sabintulung	15 kg/day	5 kg/day	50 kg/day	10-30 kg/day
Sebelimbingan	40 kg/day	4 kg/day	80 kg/day	20-30 kg/day
Sedulang	-	5-15 kg/day	-	50-100 kg/day
Semayang	50 kg/day	1-2 kg/day	12-15 million/month	4-5 million/month
Pela	20 kg/day	2-4 kg/day	100-150 kg/day	50-75 kg/day
Kehala Ulu	Rp. 50.000 – 60.000/day	Rp. 30.000/day	10-15kg/day or 170.000-225.000/day	7-15 kg/day or 120.000-225.000/day

All villages experience fish catches decreasing except Muara Siran. In the last two years, Muara Siran has had excess fish. Fish is so abundant that fishers cannot take it, which then causes the price of fish to fall. The condition of fisheries in Muara Siran is different from other villages because Muara Siran has a relatively protected forest and a lake protected by the village. Of all the fishing villages, the villages that experienced the most declines in catches did not have lakes or swamps. They rely on the river as their catchment area. The following is a comparison of catches in the villages studied:

Indicator of the decline in fish population seen from several facts:

1. Based on PT. KAM in 2008, several types of fish in the small rivers located in the plantation location are the Baluy river, Sawak river, Setekel river, Loa Nuing River are catfish (*Clarias batrachus*), cork (*Ophiocephalus striatus*), seluang (*Puntius* Sp.), sepat (*Trichogaster pectoralis*), papuyu (*Anabas*

testudneus), Patin (*Pangasius polyuranodon*), jelawat (*Leptobarbus hoeveni*), lais (*Lais hexanema*), shrimp (M*acrobrachium malayanum*), eel (*Monopterus albus*). In 2015, two types of fish disappeared at the exact location, namely Patin (*Pangasius polyuranodon*) and shrimp (*Macrobrachium malayanum*). Not only in creeks and those two types of fish. Since 2012, lancing, baung, lais, and jelawat (*Leptobarbus hoevenii*) have also been rare (Prokaltim 2018), also baung, papuyu, kelik (C*larias leiachanthus*), biawan, and kalabo (Suyatna, Syahrir et al. 2017).

2. The reduced fish population also has been seen from the decline in the population of dolphins, especially in rivers that become transportation routes for coal ships, which is seen from the movement of dolphins from the river channel.

One academia believes that the reduced catch may be due to the lack of sample location. Try to increase the location of the catch, and maybe there can still be quite a lot. There is a decline because the fish go to a new place. The place for the decline is there. That is why it is necessary to ask the fisheries department where the fisheries service takes samples. Then, investigate its location. Every time people pick up there, how frequent a day, but if all the residents go to the estuary, then fishing ends? To see whether the fish is reduced or not, it needs to know about the location of the catch, the intensity of the catch, the number of fishers, fish migration patterns, types of fish caught, and the number of catches based on the fish type. Counting the number of catches means counting the fish caught, not counting the fish in the river. So, because of the compulsion to get many catches, all fish are caught so that no one else breeds and uses all methods of catching, including chemical matter. That is all that causes the fish to run out, the type of fish that only 3 or 4 tails carry all. There is nothing left. Fish can save themselves from threats by migration.

Another academia believes there are differences in fisheries condition data. For example, Fisheries statistics show that catches always rise, but data obtained from fishermen interviews show the opposite. Trends in fisheries statistics have always risen based on assumptions of increasing use of increasingly sophisticated and increasingly large fishing gears, but not based on the number of natural fish stocks (carrying capacity is not counted). The use of the assumption of the more

sophisticated the fishing gear (technology intensification), the higher the amount of production or the number of catches is also seen in the fishing gear assistance program, which is given every year.

One source of data used to calculate fisheries statistics is data from fish landings. A fish landing pier is legally under the responsibility of the Fisheries Agency. However, the validity of the data collected from the fish landing is questionable because the supply chain or from the fish compared is not necessarily subject to supervision. It could be that the fish landed at fish landing came from outside the province of East Kalimantan. Furthermore, or the data is not sorted based on the origin of the district.

4.1.3.b Water quality

In the past, the Mahakam River experienced a crisis created by logging. However, these activities only cause sedimentation, which has an impact on water quality. However, some factors now cause a decline in water quality, such as oil palm, coal, settlements, factories on the riverbanks, chemical companies, wood factories, and dry season. The impact of lower water quality can be seen on the first day after rain, the second day, and so on no later than a week after the first rain. It depends on the powerful combination of bad water.

Water quality decreasing indicated by:

1. The function of the Mahakam River as the connectivity of biota migration from the sea to the river and vice versa is an indicator of pollution. Pollution becomes a barrier to migrating biota. Prof.'s research Suyatna showed that in the Middle Mahakam, there were at least four species of marine fish there. However, only one species was found. The four species are the lamp fish-lampang, apri fish, snapper, lidah fish. So, if the Mahakam River is functioning as connectivity, more sea fish will be found there because the fish can detect whether they can detect the environment is terrible or not. How to detect it, among others, by the lateral line, the lateral line contains many nerves, which are sensors that can detect water, something is approaching or not, then the environment is right or not.
2. The catch or the fish population is getting down here more and more. However, the change in population declines not significantly seen. The

evidence for the decline is that of succession. For example, the fish had been captured, so the population dropped, fish size getting down, the quality also dropped. In the sense that Biawan fish (*Helostoma temmincki*) used to spawn large size, but now small fish have spawned. That means the environment does not support growing up. Biawan (*Helostoma temmincki*) is still found but only partial. Now there are lots of kendia fish (Cambodian fish). The indicator of river water damage is its color. If the color of the water becomes like milk, it means it is polluted because almost along the Mahakam River segment, its identity has changed to become a distribution channel for the industrial sector, especially coal. Now almost all river segments from upstream to downstream have been acutely polluted.

Table 13 unmet water quality standard within companies' boundaries

Company	EIA report	Unmet water quality standard	River/tributary
PT. Bara Tabang	2017	turbidity of the water, pH, TSS, TDS, sulfur and phosphate, BOD iron, and COD	rivers within the ecological boundaries of PT. Bara Tabang
PT. KAM	2015	TSS, ammonia, lead (Pb), TSS, COD, zinc (Zn); and ammonia and lead (Pb).	Seguntung River, Kedang Kanan River, Sabintulung River, Sengai Sedulang Ulu and Sedulang Ilir River.
	2019	BOD, COD, pH, TSS, oil and fat, total nitrogen, cadmium, copper, lead and zinc.	
PT. ABK	April 26, 2019	BOD_5, COD, free chlorine, and phenol	the upper stream of the Menamang river and downstream of the Sedulang river
PT. AEK	semester 1 of 2009	Copper (Cu) parameters of <0.06 mg / L, zinc (Zn) of 0.06 mg / L, lead (Pb) of <0.3 mg / L and cadmium (Cd) at <0.02 mg / L, turbidity, iron content, color, and total coliform	
PT. ATK	semester 1 of 2019	copper (Cu) of 0.1 mg / L, zinc (Zn) of 0.1 mg / L, lead (Pb) of <0.3 mg / L and cadmium (Cd) of <0.02 mg / L, turbidity, total coliform, BOD5, color, pH and iron (Fe)	Liang Buaya and Tunjungan Rivers.
PT. SKL	2019	pH, BOD, COD, oil, and fat are below the quality standard threshold	

Opposite to others, some government respondents do not agree with the judgment that water quality is changing because Environmental Agent actively takes a role in collecting pollution sources, identify companies in the riverbank, and monitor

water quality. There are 11 digits of water monitoring points to see the quality standard. Based on Mahakam watershed monitoring data, the water is still below the quality standard, only complaining, there are many facts, there are urban activities, company activities, coal transportation. So, the government argues that people must not judge company activities as a single factor of water quality changing.

Furthermore, they argue that the notion that oil palm is a water-hungry plant is a false assumption. Likewise, the notion that oil palm plantations on peatlands cause drought is also a false assumption because the company will maintain the land surface height not to exceed 40 cm. Otherwise, the company will suffer losses and increase the risk of fire during the dry season. The maintained groundwater level had proven three years ago when there was a long dry season; at that time, there was no drought in oil palm plantations. This misperception arises from the notion that companies do not pay attention to the rules of conservation. On the contrary, the government closely monitors the company's efforts in managing an area. One recommendation to keep the plantation's location from drought and runoff is to plant cover crops, namely legumes.

Although there is a refusal from the government for the decline in water quality, environmental monitoring reports from several companies show the opposite. Mustakim (2006) analyzed water quality in Semayang Lake. He showed that, in general, the TSS, pH, and iron (Fe) content in Lake Semayang had exceeded quality criteria (Mustakim 2006). Research conducted by Gitarina (2018) also shows a decrease in water quality in Lake Jempang. Lake Jempang is the largest lake between the Middle Mahakam and the Upper Mahakam. The landscape and hydrological conditions are almost the same as Semayang Lake. He found that the levels of ammonia (NH_3) throughout the sampling locations exceeded the quality standards threshold (Githarina 2018). The value ranges between 0:10 mg / L - 0:12 mg / L. The high concentration of ammonia in the lake may indicate high activity of decomposition of organic matter in the lake. Thumbs up that are likely to come from various sources such as oil palm plantations, agriculture, and aquaculture, as well as household waste. The sampling location, which has the lowest water quality, was far away from the flow of water from the Mahakam River and adjacent to the oil palm plantation activity.

Water quality degradation also occurs in Central Mahakam, namely the Kedang Kepala River and the Kedang Rantau River. The technical report of monitoring Mahakam dolphin and water quality for 2017-2018 by RASI shows that several heavy metals have contaminated the Kedang Kepala river. In the upper reaches, in the Muara Ancalong village segment, the Kedang Kepala river is polluted by cadmium (Cd), whose concentration is four times greater than the quality standard. While in the middle, precisely in the village of Kupang Baru, river water is contaminated by manganese (Mn), lead (Pb), and iron (Fe). At the same time, the downstream of Muara Siran is also contaminated by manganese (Mn) and lead (Pb), whose levels are four times greater than the quality standard. Like the Kedang Kepala river, the Kedang Rantau River is contaminated by heavy metals. In the middle, namely in Puan Cepak and Tunjungan Village villages, the water has been polluted by lead (Pb) and copper (Cu). While the downstream, precisely in the village of Sabintulung polluted by iron (Fe), cadmium (Cd), lead (Pb), copper (Cu), and zinc (Zn).

Based on fisheries state findings, although qualitatively, fish catches were declining (32.1%) and water quality was also declining (19.4%), quantitatively, there is no correlation between fish catches declining and water quality declining. The reason is that fish catches declining was affected by water quality decreasing, but it also affects fishing ground reduction, water level, and mass fish mortality where all of them are directly and indirectly affected by pressuring factor. The direct pressuring factor of fish catches declining is destructive fishing. That is why water quality declining do not correlate to fish catches declining.

Table 14. Crosstabulation of water quality and fish catches decreasing.

Crosstabulation	Chi-square ratio	Exact sig. 2-sided	Exact sig. 1-sided	Contingency coefficient	Approximate significance
Water quality x fish catches decreasing	.816	1.000	.950	.037	.816

4.1.3.c Mass fish death

The phenomenon of mass mortality of fish is an extraordinary event that is temporary. However, the temporary mass fish mortality can be used as an initial indicator of the weakness of environmental management. Since 2012, there was a fish mass death in

the Mahakam tributaries in which it must flow to the Mahakam River (Mongabay 2012). Once again, in 2013, mass fish death re-occurred in Jembayan village (Win 2013). In 2016, there was many fish in cages in the village of Kehala Ulu and Tubuhan. In Semayang at that time, it was safe. For wild fish, it has never been found dead. In 2018 there was a mass death of fish evenly distributed throughout the Mahakam. There are tons of dead fish. In 2019, thousands of fish were dying in some Mahakam tributaries, including in Sabintulung River, Segah river, Perak River, and Bengalon river (Amin 2019). Usually, those who die first are fish in cages, including baung, sangkuriang catfish, haruan, betutu, and shellfish or fish that do not have a labyrinth or are called white fish, such as baung and catfish. The only catfish survive. After that, the wild fish also died, but only small fish and the baby fish that died, for example, the baung fish. Catfish are more resistant than baung fish. While fish with a labyrinth tends to be more resistant, for example, betok, biawan, groupers, and tomans. There were ten dead dolphins, as well. These dolphins died from eating fish that had been contaminated by waste (RASI 2018).

Figure 16 Mass fish death in the study area

The incident did not only occur upstream of the Mahakam River, especially in the upper tributaries, including the Kedang Pahu River, Belayan, Kedang Rantau, and Kedang Kepala in the middle segment such as Muara Wis, Muara Kaman to Tenggarong. Most of the research sampling locations have ever had fish mass death

except Sebelimbingan and Sangkuliman. In the village of Muara Siran and Sebelimbingan, there used to be many aquacultures. Since 2012 not many people have cultivated anymore because the fish often die. Once upon a time when fish emerged, died, fainted, and emerged to the surface. Tons of fish have died. It happens in the Belayan River and the Kedang Rantau river, most of which are baung fish, which live on the riverbed.

Based on its location, mass fish deaths occur in:

1. Mass fish dead events usually occur in lakes and swamps if fishers poison the fish during the dry season. The suspect of the pollution is the fishermen.
2. In the river. River fish type that first die is fish in cages and usually occur at the beginning of the rainy season. The suspect of the pollution is the company. If pollution occurs in a river, fish escape to the lake and swamps. Moreover, vice versa, if pollution occurs in lakes and fish, marshes run into the river.
3. Lakes, swamps, and rivers. It is a combined effect of fish poisons, waste, and natural phenomena. It usually occurs in the rainy time.

The cause of the occurrence is complex, combinative, synergistic, and collaborative between waste and natural factors. Namely, the reduced volume of water during the dry season, where the process goes through a very long process began since prolonged flooding in the previous year, in 2017. Many heavy metals settle at some point. Then later, when the water began to recede, white fish in the river began fainted. The heavy metals mixed with pollutants from the settlement. Academia stated that this phenomenon does not reveal; anything of this phenomenon documented. Where the poison came from has never been studied. It is not yet known what causes death, and one cannot blame the plantation activities nearby. Everything must be proven first. A contributing factor alleges that the company's waste is dumped or overflowed into the river must be proven first. However, some fisher believes that a mass death of fish was affected by palm oil waste due to the collapse of the waste collection pond and a run-off takes chemical waste from mining activities upstream of the Belayan River.

4.1.3.d Water level changing

All NGOs, academia, and fisherman respondent groups and some respondents from government groups argue that the water level is changing. In the past, the swamps never dried up, and there was always water so that fishers could still be found. Coal significantly reduces the availability and volume of water. Areas that were initially a reserved area to maintain water availability, but surface water had disappeared due to massive forest clearing, and most groundwater has begun to be critical. Finally, everything depends on the supply of Hulu Mahakam water. Upstream of the Mahakam River is still reliable because the Mahakam Ulu is an area that is locked by its transportation routes. It is inconceivable what would have happened if the transportation route was open because the area was supplying freshwater to three cities.

Figure 17 low water level in one of Mahakam tributaries

Figure 18 Moderate high-water level in one of Mahakam tributaries

Figure 19 Quite high-water level near to Semayang Lake

Mislan and Suyatna (2016) researched the dynamics of water levels because of climate change in the Mahakam Cascade Lake region. Their results showed that the water level in the Mahakam Caskade Lake region changed hugely fluctuated compared to the previous decade, so that flooding, regular, and receding periods are difficult to predict. In the dry season, lakes and rivers connected to the river will be cut off due to a long dry season. It causes ecosystem disruption and will have implications for decreasing fisheries' productivity. The cascade lake is a lake of flood exposure that has a lower altitude than sea level so that lake water level fluctuations are strongly influenced by seasons, and the lake's area is very dynamic (Mislan and Suyatna 2016).

4.1.3.e. Fishing ground reduction

There are four fishing areas in central Mahakam: lakes, swamps, rivers, and peat forests or wetland forests. In the rainy season, fishers look for fish in swamps, reservoirs, and lakes, while in the dry season, fishers look for fish in rivers. The main fishing areas are different for each region. Some areas are large rivers, lakes, or swamps. Each village has different issues regarding reducing fishing areas because each has a different main catchment area—Sedulang fishing ground in the lake and swamp. At the same time, the fishermen in Muara Kaman and Sabintulung villages look for fish in the river and swamp. For Muara Kaman, Muara Siran, Sabintulung, Liang Buaya, Puan Cepak, and Sedulang, the main fishing ground is the swamps.

Now, with the entry of plantations, many swamps and tributaries are closed by oil palm roads. Lakes and swamps used to be a place for fish to breed reduced

because, since the introduction of palm oil plantations, many swamps have converted into palm oil plantations. The most apparent impact of the conversion of land into palm oil plantations in wetlands is the loss of spawning areas. Demolition of peatlands for palm oil plantations causes land damage. Demolition of land or conversion of peat swamps to plantations is destroying fish habitat, which has been a place for fish to lay eggs, find food has been disturbed. So even though the water management system in the concession allows fish to survive and breed, their physiology is changing. The size of the fish becomes small. During the rainy season, peat that has dried up and is dense can no longer absorb water anymore, and then to overcome this, a dam is made. The oil palm concession area affects the volume of water in rivers and swamps, as evidenced by the reduced surface runoff and groundwater. In addition to being caused by the conversion of wetlands into palm oil plantations, the reduced catchment area also occurs in rivers.

Figure 20 Average fish catches size in the MMA

From the company and government's point of view, the construction of canals and dams within the plantation concession area aims to regulate the water level. These dams and canals opened during the rainy season to prevent inundation within the plantation and closed during the dry season to maintain the water level and prevent drought, which can potentially trigger a fire. However, unfortunately, this water management system destroys fish habitats.

For fisheries, draining peatlands removes fishing ground areas or fishing ground. Significantly reduced fishing areas occur because there are no clear boundary markers on the land owned by fishermen in the traditional tenure system. Fishers only mark it with fishing gear placed on their land. Unfortunately, when the company came to the village to verify their permits, a lot of the land owned by the fishermen was included in the company's permit location, but because the fishermen had no legal proof, the fishermen could not defend it. Traditional fishing areas are in rivers, swamps, and lakes. However, because, at present, these areas are legally designated for their everyday use, fishers cannot sue because they are not a state territory.

The reduction of traditional fishing areas in Kutai Kartanegara could be seen from mining and plantation permits granted to the company. For example, overlay maps of cultivation rights and coal mining license in 2015 with water bodies in Muara Kaman Subdistrict showed that the extent of water bodies, wetland agriculture, lake borders, and river borders reduced to 19,513.34 ha (Agency 2017).

From the cultivation rights and plantation, business license gave to PT. KPM also shows the total permit area of 20,868 ha, productive land for plantations is 80% or 16,201 ha, while the area of land which is ineffective for gardens because of the burden of using forest, peatland, and river and lake borders, the total the extent of 4,565,456 ha. This research is like Dharmawan et al. (2016), who found that the development of palm oil plantations in Kutai Kartanegara carried out in two types of ecosystem landscape: peat areas and non-peat areas, in which most are in the peatlands. He also found that due to the company manage the water level using canalization in the conditions of areas outside, and the plantation is experiencing drought.

4.1.3.f Hypothesis confirmation

Based on fisheries state findings, although qualitatively, fish catches were declining (32.1%) and water quality was also declining (19.4%), quantitatively, there is no correlation between fish catches declining and water quality declining. So, H1.2 is rejected. The reason is that fish catches declining was affected by water quality decreasing, but it also affects fishing ground reduction, water level, and mass fish mortality where all of them are directly and indirectly affected by pressuring factor.

The direct pressuring factor of fish catches declining is destructive fishing. That is why water quality declining do not correlate to fish catches declining.

Table 15. Crosstabulation of water quality and fish catches decreasing.

Crosstabulation	Chi-square ratio	Exact sig. 2-sided	Exact sig. 1-sided	Contingency coefficient	Approximate significance
Water quality x fish catches decreasing	.816	1.000	.950	.037	.816

4.1.4 Impact

As been predicted in the DPSIR framework, humans and nature are interrelated. When the environment is heavily changed because of anthropogenic activities, this environmental change then affects humans themselves. In this study, we focus on the impact of environmental change on human security. We found that the state of environmental change previously mentioned negatively affect economic security (30.8%), community security (20.6%), health security (15.4%), food security (9.1%), political security (9.1%), environmental security (8%) and personal security (6.8%). Again, fisher's concern in those themes is the biggest. Even NGO and government do not have any concerns or few concerns about some of these themes.

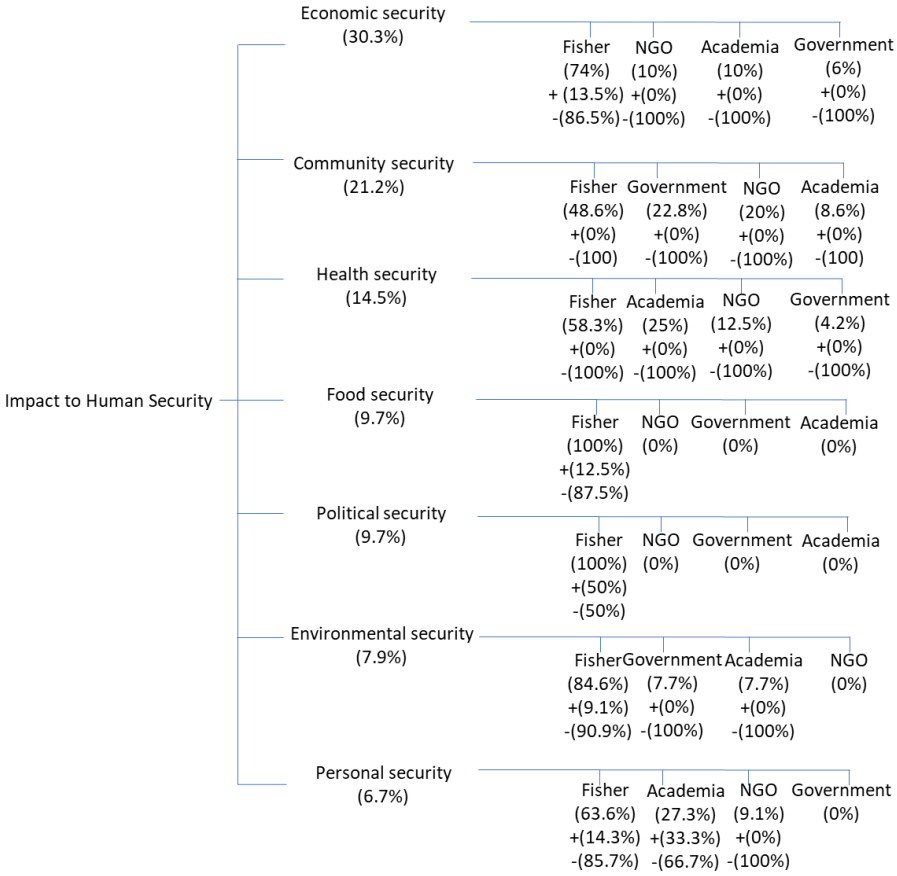


Figure 21. The percentage of the impact of fish catches to human security.

Since the fisheries are the main livelihood of the fishing community in MMA, the change of fisheries significantly impacts human security especially economic security and community security. A fisher conveyed, "*There is indeed here, yes, it is difficult, this is difficult ... Because let us see, the only livelihood is fisheries".* Another fisher added, "*So since there is coal, miss, some of them are happy, but some of them are hurting, hurting the eyes of the community's businesses, right? These are fishermen, let alone explosives attaching tools to the top".* The community income from the fisheries sector has decreased dramatically because the fishing ground has converted to plantations. The livelihood structure also changed from what was fishery-based initially to plantation-based. Some fishing villages wish a better living from the positive impact of palm oil plantation, such as from plasma partnership royalty, but this royalty is not comparable to fishing income while in the meantime, the fishing ground has lost. A fisher stated, "*Our plasma is hopeless, the impact of this oil palm runs to us, we want to work hard so that we can go home to our village, we can do it, there are people from the village here, we get paid work for 1 hectare 60 thousand. Not according to our expectations".* Whereas the negative impact of environmental change has no

boundaries thus, it affects the whole area of MMA, including the area outside land concession where people do not have any other livelihood other than fishing. Therefore, it leads to community insecurity between the fishing community and between the community and company. A fisher stated about social conflict led by destructive fishing "*If we want to force it, then we will have to clash. If he was told, for example, he did not want to. In the end there will be hostility or beatings, then we are judgmental".* Another fisher stated about the social conflict between community and company "*We have clashed with a palm oil company. The clash was at its peak in 2011 in May. Yes, we had a contact there, you had physical contact, but the people just cut the oil palm trees because there is also an effect on our community of oil palm, it means that such activities have an effect once with our catch.".*

4.1.4.a. Economic security

The rural livelihood of the Mahakam River is dominated by the agriculture and fisheries sector. The central region is an area between the upstream-downstream binary opposition. The beating of the farmer's and fishers' economy began since the river is no longer an economic capital for fishers because almost along the Mahakam River segment, its identity has become a distribution channel for the industrial sector, especially coal. Since the catch continues to decrease, the fishery potential is no longer promising for fishers.

Normatively, the presence of mining is undoubtedly expected to have a positive effect, increasing community income, and increasing business opportunities through CSR activities and the recruitment of workers. This expectation is included in the EIA document, one of the requirements to obtain an operating permit. PT. Bara Tabang, for example, is expected to absorb 535 local people. Unfortunately, the middle Mahakam region is not within the boundaries of the company's project, namely the space where the planned mining activities will occur. Therefore, residents of the Middle Mahakam region are not included in the priority of the workforce to be recruited, which means that the positive impact of mining activities on the local economy is minimal. The same conclusion was conveyed by Suharto et al. (2015), who also researched Kutai Kartanegara. Suharto found that residents felt more negative changes than positive changes after coal mining operations were operating in their area (Suharto, Hilmawan et al. 2015). The community has had positive impacts,

such as livelihoods and income, but their nature is indirect and temporary. When coal mining ends its operation, income and livelihoods will also cease. Although now there is diversification of livelihoods, they need time to learn to master something new, and they become laborers or manual labor (Subarudi, Soedomo et al. 2016).

As well as being impacted by coal mining, community livelihood had also been impacted by palm oil expansion. Normatively, investment in oil palm plantations also aims to revive the community's economy, not only because of the direct impact of absorbing labor and increasing the income of plasma members but also because of the multiplier effect because oil palm plantations are not exclusive and do not close the opportunity for the community to provide services and trade with the company. Moreover, communities can establish MSMEs around plantations.

All plantation EIA documents state that plantations will benefit local communities by prioritizing local people as laborers on plantations or factories. Data as of June 2019 shows that the total workforce of PT. ABK is as many as 916 people, only 138 (15%) of whom are residents. Data of PT. ATK 2019 shows that the percentage of local workers who work at PT. ATK is only 10.66% or as many as 123 people out of a total of 1154 people. Moreover, based on EIA documents, PT. KAM is estimated to absorb 3,267 people during the construction phase and 5,223 people during the operation phase.

If residents are recruited as workers in the company, there will be an increase in welfare around the company location, but the reality is not. Residents are unable to compete with migrant workers who have higher work motivation. Moreover, not all villagers work on oil palm plantations. Recruitment of local workers is mainly done in seeding activities. The low absorption of local labor is due to local cultural factors that still follow traditional agrarian work patterns, the concept of financial management, the concept of life, and social activities. It is related to the low adaptability to the modern work ethic. Therefore, they are unable to compete with newcomers. The pattern of fisher's life is inherent, so some of those who have worked in the company will return to being fishermen. However, when they returned to being fishermen, they found that fisheries had changed and could not be expected anymore. Therefore, they were forced to adapt to changes to get income.

The plantation sector is in the third-largest position in terms of employment in East Kalimantan (Satria, 2017). However, this employment is also the most productive and high unemployment rate, which means that the average wage rate in the plantation sector is low (Satria, Ahmad et al. 2017). If this fact is placed in the context of plantations in Kutai Kartanegara, where local people who work on plantations are fishermen who switch professions to laborers in the plantation, then it can be said that switching from professions to fishers to oil palm workers does not guarantee a better economy. On the contrary, shifting sources of livelihoods from fisheries to plantations creates dependence on the plantation sector, and at the same time, fisheries can no longer rely on fishing. Thus, the situation is like two sides of a coin. On the one hand, when they turned professions into labor, their economic situation did not improve. On the other hand, however, when they survived to become fishermen, the situation also worsened.

The deteriorating economic condition of fishers is seen from the socio-economic survey of fishermen households conducted by Fisheries Agency Kukar (2016), which found that the Fishermen Exchange Rate Index in 2016 tended to decline compared to 2015. *Fisherman Exchange Rate Index* is an index that describes the welfare of fishermen's households from time to time. Research conducted by Heleosi (2006) in the downstream part of the Mahakam watershed shows a similar result, before the damage or shallowing and pollution of the Mahakam River, the average household income of fishers from fishing in the Mahakam River and the river mouth in 2001 was an average of Rp. 5,133,773.63 per month. After damage or shallowing and pollution of the Mahakam River, fisherman income was Rp 1,004,523.56 per month. This figures out that there has been a significant decline in the economic well-being of fishing households in 2000-2006. A study by Mulawarman University and Fishery Agency (2001) also shows the same result. Using some fishery sustainability indicators, namely

1. income over the last ten years,
2. the nature of ownership of fishing facilities,
3. subsidy level,
4. the level of income and productivity of working time,
5. marketing level of fishery products,

6. alternative employment and income,
7. profit transfer between local economic actors and external economic actors,
8. the ratio of income to cost of daily living,
9. per capita income, and
10. The contribution of fisheries to GRDP (DKP and UNMUL 2011).

The evidence of economic fishery unsustainability found in this study demonstrated from Muara Kaman village that experiencing the most economic fishery insecurity. Until the end of the 19th century, Muara Kaman and its surrounding areas were still the largest freshwater fish producers in Kalimantan, 90% were fishermen, and the rest were non-fishermen. However, now the situation has changed. Now the composition is 50% of fishermen, 40% of unskilled laborers in oil palm plantations. On regular days, the average fishermen's income is IDR 150,000. However, at the peak of the harvest, income per day reaches Rp. 400.000, which usually happens at least one month in a year. The income from fisheries is higher than the income from palm oil. However, because income from fisheries is unstable, especially now when fisheries are decreasing. Thus, many fishers change their profession to be plantation labor.

4.1.4.b. Environmental security

Environmental security in terms of river water is only used for bathing, but water cannot be used after wastewater passes. As for drinking water, people must buy 20 liters / 2 days for Rp. 5000. What is clear is that now the economic burden has increased because previously, free drinking water was taken from river water. Residents who take river water for drinking are affected by vomiting.

4.1.4.c. Food security

In flood-exposed areas, the environmental damage caused by changes in land use for oil palm affects communities that change their livelihoods to oil palm and affects all communities in the watershed. Economic insecurity is interlinked with food security (Nurrachmawati, Anggraeni et al. 2019). Fisher's ability to meet the subsistence necessities and fisheries expenses decrease. Based on a survey conducted by Mulawarman University and Fishery Agency (2017), fisheries income in 2016 was higher than in 2015 because fish are getting scared. Thus, the fish price was increased.

However, due to increasing subsistence necessities, fishers tend to sell the fish to meet the subsistence necessities rather than daily fish consumption. Although per capita fish consumption in East Kalimantan is above the national average, it is about 43.6 kg (Ishak 2015), and the most protein source comes from fresh fish (Nurrachmawati, 2019) but locally, the fish's diet is changing. The fishing villager who used to be able to eat fish every day now they cannot. In the dry season, they even must buy and eat seafood or eggs. Previously, people only need to go to the river when they want to eat fish.

4.1.4.d. Health security

From the first, palm oil has caused pollution, people who consume polluted fish and polluted water experience vomit defecation, they are food poisoning. This case had occurred in Muara Muntai. Fish is not only polluted by heavy metals from palm oil and coal waste. However, it can also be polluted by fish poisons. Tests conducted by RASI found rat poison in the body of a dead fish in the case of pollution. Fish poisoning takes two forms. Firstly, fish poisoning due to eating fish that altered because of contamination. Secondly, fish poisoning is due to eating fresh fish that accumulates heavy metals. Heavy metal is a hidden enemy in the food chain. The higher the position in the food chain, the heaviest metal accumulates. The result can trigger degenerative diseases and reduce the immune system (Anggraini and Anwar 2019). Besides, after a palm oil and coal company upstream, fishers downstream experience itching, e.g., Semayang, Tubuhan, Kehala villagers. They feel the changes in the water. Human diseases caused by contracting fish diseases have not yet existed. Toxins of fish that humans eat cause digestive disorders (poisoning), such as vomiting. 20 out of 40 fisher respondents in this study experienced diseases-related water pollution, mostly are itching.

4.1.4.e. Personal security

Both NGO and fisherman respondent groups stated that young people rarely want to be fishermen or farmers because there is no future for fisheries there - nothing expected. There are no young people in the village who are interested in becoming fishermen. Young people point of view, just like their parents. Fisherman argues that the number of fishers is too much, and the productivity of the remaining fishermen is

only 10%. With the condition of fisheries like this and if there is no change in fisheries conditions, the best choice is to prepare the younger generation's future through education so they can work in plantations or mining. Fishers do not expect their children to become fishermen so that their children will not suffer as their experience. They want their children to work on plantations. Although fisheries were experiencing a crisis, however, some fishermen seeing the long history of human life that cannot be separated from fisheries and how fisheries contribute to food security, so that fishers hope that fisheries can develop and be sustainable and that there will still be a younger generation that continues the work of fishers because fishers cannot be eliminated.

4.1.4.f. Political security

Village communities communicate both bottoms vertically up and top-down with the village government—bottom-up communication is done through meetings at the community level. The community then conveyed to the village level. And then to the village that is communicating with the company. However, usually, the company's response is not conveyed by the village to the community. Moreover, communities usually convey their aspirations verbally to village officials in the form of complaints or protests. However, the community felt that village officials did not consider their appraisals because they also had interests.

4.1.4.g. Community Security

There were two driven conflicts in the MMA. Firstly, social conflict is driven by destructive fishing practices. It is a horizontal conflict between destructive fishing fishers and their opponents. There will be two kinds of conflicts:

1. Between residents and residents
2. Between villages and villages example: in Liang Village, in Semayang Village, in Muara Wis, Kenohan and Kota Bangun
3. Between fisherman and company, it is more related to fisherman fishing ground permit

Even capture fisheries, like SME and small-scale fisheries, do not have a location permit because traditionally, fishers used to use public waters as a fishing ground. However, if a fisherman conflict with the party who has a permit at a specific

location, the fisherman does not have a bargaining position. As a result, the Fisheries Agency usually mediated the settlement of conflicts between fishers.

Secondly, social conflicts are driven by investment arrival. This conflict usually happens at the beginning of the incoming investment. It is a conflict between residents who agree with the entry of investments and those who do not agree. There will be three kinds of conflict driven by investment arrivals: (1) between residents and residents (This conflict arises between people who aim to get a double benefit from the land compensation system, (2) between villages and villages, it happens because at the time of verification of the location of the permit, often the location of the permit enters a different village administration area. In contrast, the villages agree, and there is a disagreement with investment, which, of course, will result in land claims. If the process of mutual claims does not find a meeting point, so the district will take the decision, usually, the middle boundary taken between the two claimed areas. With this mechanism, there must be those who will be disadvantaged. This kind of conflict occurs between Muara Siran and Kupang Baru; and (3) communities - companies. Companies often take cases of community land grabbing—for example, the eviction of 600 families of villagers in Karangan.

Another example is land grabbing in the villages of Puan Cepak and Sedulang. Land disputes in Puan Cepak and Sedulang occurred in 2007-2008. In that case, residents were told not to recognize their land titles. Land grabbing in peatland areas is accessible because peatland communities are not familiar with land tenure systems in the traditional tenure system. People only point out that specific locations are their fishing locations, but they do not recognize this method. They only know the system of claims for capture locations that are often unmarked. So, when the company came, the company found no evidence of land ownership.

Environmental quality deprivation magnified social vulnerability (Shrader-Frechette 2002). Cases of land conflicts also occur in Kutai Kartanegara District, and until now, it is still a complex problem to solve by the local government. It is mainly in communities' demand for land in the plantation concession and communities' land overlapping. This agrarian conflict often emanates and led physical tension between communities and companies. The number of parties with different interests sometimes

leads to mistrust, especially the government. Therefore, conflict resolution is often deadlocked and prolonged (Dharmawan, Mardiyaningsih et al. 2016).

4.1.4.h Hypothesis confirmation

Based on the above finding, the most human security aspect impacted by fish catches declining is human security. That finding was also confirmed quantitively by the below test. Thus, H1.3 is accepted.

Table 16. Crosstabulation between fish catches decreasing and human security.

Crosstabulation	Chi-square ratio	Exact sig. 2-sided	Exact sig. 1-sided	Contingency coefficient	Approximate significance
Fish catches decreasing x food security	.648	1.000	.583	.072	.648
Fish catches decreasing x economic security	.048	.117	.117	.298	.048
Fish catches decreasing x health security	.311	1.000	.500	.158	.311
Fish catches decreasing x social security	.504	1.000	.677	.105	.504
Fish catches decreasing x personal security	.767	1.000	.646	.047	.767
Fish catches decreasing x political security	.826	1.000	.676	.035	.826

4.1.5. Response

Our study found that as the actor, the different respondent groups tend to respond differently depending on their responsibilities, but sometimes they are in collaboration. For example, the government responds to environmentally unfriendly fishing practices by enforcing fishing laws. On the other hand, the government responds more to water quality decreasing through the pollution control program. In terms of response effectivity, each respondent group has also had different sentiments. It depends on their role and their expectation to other actors to oblige regulation. For example, academia perceives pollution control negatively while government perceives pollution control positively.

Another example is plasma partnership. Plasma partnership as a mandatory response to reduce the impact of land concession and its derivative effect does not work effectively since fisher who involve in plasma partnership mostly have a negative sentiment. As well as palm oil expansion effect, palm oil activities impact water quality decreasing and mass fish mortality, which leads to economic loss. There is a lack of response on how water quality decreases and mass fish mortality. It can be shown from fisher's negative sentiment over polluter pays principles implementation. According to the polluter pays principles, fishers as affected communities deserve to get compensation, but up to date, they get zero compensation.

Figure 22 The percentage of responses to DPSI

Many responses have been given to the cause, and the impact of fish catches declining from various stakeholders. NGO and government concern most about pollution control, academicians, concern most about fishing ground protection and rehabilitation, and fishers focus more on destructive fishing law enforcement. Although NGOs and government have the same focus on pollution control, NGOs tend to view negatively and vice versa. A government revealed, "*We take care of the environment. Anyway, we are still monitoring*". Another government added, "If it is suspected that there is a potential to pollute the environment from investment activities, the investment must comply. If you do not comply, the investment will be closed". The government added ISPO as an environmental monitoring instrument. A government stated, "*So there is nothing that can be covered up with this ISPO, ma'am, everything is open. If there is indeed something that is covered up, it is useless. If it is just covering it up, you can, but the ISPO cannot come out then, so it must be open. Apart from that, he must be open. He must make improvement efforts*". Unlike the case with NGOs, they view environmental monitoring negatively.

In response to fishing ground reduction, some action was developed by the fisheries department to protect or rehabilitate fishing areas, such as fish restocking and fisheries conservation areas. However, some actions were part of plantation or forestry regulation, such as social forestry and plasma partnership. Fisher and the government tend to view fish restocking programs positively to revive fish catches, while academia emphasizes the conservation of integrative fisheries. An academic stated, "Sometimes, fish restocking is part of CSR aims to compensate fishing ground reduction. A government stated, "*I regretted that when PT ATK, AEK, all kinds of things opened plantations, I told them. Now, it is companies' responsibility, just one, I ask for their obligation to restock fish every year*". A fisher stated, "*People from the fisheries department, when they come here, spread tilapia here, so now people often get tilapia. In the past, there was not".* Lastly, the government combated destructive fishing practice by criminalizing destructive fishing actors, "it is *already in another zone in the sense that it is swamp protection and whatever, zones up to rivers like that.*

Because the river has a role there because it is also to protect fishery assets to get food from the iron entering the river, continue to lay eggs on the roots of the

riverbank. So, it creates a good microhabitat for fish." An NGO stated about social forestry, "If you want a permit, there is already a permit that we have designated as a customary forest area. Alternatively, we make something like that, a protection system for fish catches areas based on village regulations. Later, people are prohibited from coming there. Our territory is ours. However, fishers ignore it. A fisher stated, "*But now the government is not responding to it. We have even reported it to the fishery department. However, there is no response. The village is just enough to appeal. We even wrote letters from village to village. Yesterday there, the police were here, right in front of here, expelling the fishermen. However, yes, one day it was not there, the next day it came again. There is a monitoring community group here. Yes, it is difficult*".

4.1.5.a Response to fish catch declining - Government aids.

The response to fish catches declining is government assistance. Assistance can come from various agencies and various levels of government. Fisheries Agency develops a training program in developing alternative livelihoods for fishers in the form of fishermen empowerment programs, skills training, capital provision, providing market information, and fishers regeneration programs. All the assistance gave to fishers aims to help fishers to adapt to the changes. It is based on groups, not individuals. So, the submission of assistance is made through groups. Assistance provided to individuals must meet the requirements given by each agency. It is based on Governor Regulation No. 26 of 2013 that the step for submitting a proposal is that the community must propose that the Head has approved of the village. The proposal goes to the Regent, the Regent disseminates to the Fisheries Agency, Fisheries Agency verifies to the field, the verification results are returned to the Regional Secretary at the Regent's office, if approved by the Regent then discussed at The House of Representative Budget Board.

The distribution of aid depends on two-way communication between the village and district governments. On the village side, the government must actively seek information about assistance programs for fishers, then submit proposals and oversee the proposal until the aid is disbursed. Other aspects of the distribution of aid to fishers also depend on the government's political will to disclose information about the assistance to the village government. For example, the provision of

environmentally friendly fishing tools is intended so that fishers do not use illegal fishing tools to maintain the environment in the long run.

Assistance from the government is incidental and periodic. Incidental assistance is provided if extraordinary events occur, such as when pollution occurs in a lake. Periodic assistance is assistance that has been programmed by the local government to be distributed annually. It means that every year the village government must propose a fishing aid program. However, the village government cannot guarantee approval because the Development Planning Forum decides every proposal. The amount of aid, the number of villages and groups that get aid depend on the number of members and requirements fulfillment. The requirement Problems related to government aids:

1. Fishers must know the different procedures from each aid provider.
2. The amount and type of assistance often do not match what the fisherman needs.
3. Not on target. Beneficiaries are not determined based on who needs it most.
4. Uneven. The number of fishers entitled to receive is far more numerous than the amount of aid distributed so that it cannot be shared equally.

However, fishers are grateful for the assistance of fishing equipment provided by the Fisheries Agency.

4. 1.5.b. Response to fish catches declining-Fish restocking

Since capture fisheries are currently experiencing a decline, the government is trying to find alternative livelihoods such as aquaculture in cages or partnerships with fishing companies. The restocking program aims to prevent reducing the number of fish so that fish do not become extinct. The restocking of fish has been going on since President Soeharto's time. At that time, the fish that spread were conjoined sepat fish (*Trichogaster pectoralis*). The restocking program by introducing foreign fish then continued by subsequent government regimes, including the introduction of sangkuriang catfish (*Clarias batrachus*), carp fish (*Cyprinus carpio*), and tilapia (*Tilapia nilotica*). Besides, the introduction of fish is also carried out by the community.

The purpose of fish restocking is to increase production; thus, it must not negatively impact both the environment and the economy of the community. The types of fish stocked on restocking may not be predatory fish species. Even if not,

local species are still allowed if they are considered safe, do not harm other species. The release of introduced fish in the wild is a program that is very dear to the government because the program is easy to implement and does not require community empowerment and capacity building.

However, since the introduction of toman fish (*Ophicephalus micropelles*), the number of local fish sepat (*Trichogaster pectoralis*) has decreased. Likewise, since tilapia (*Tilapia nilotica*) introduction, the Biawan fish (*Helostoma temmincki*) have decreased because they have lost and disappeared. Moreover, toman fish (*Ophicephalus micropelles*) introduction endangers fish populations in rivers. The impact now felt by the community is the reduction in wild fish seedlings that are usually used by fishermen to be raised in cages. Unfortunately, even though the introduction of predatory fish is dangerous, there is no ban from the government. The most critical introduction of fish is toman fish (*Ophicephalus micropelles*). This fish threatens all types of fish, both larger and smaller, including Mahakam dolphin (*Orcaella brevirostris*) and shrimp.

Fisherman thinks that the distribution of seeds directly into the lake will not be maximized. To be maximized, it should be stocked in parts of the lake whose environment has been prepared to be able to support the lives of the fish seeds. After adapting, it is only opened and allowed to spread in the lake and protected from destructive fishing. In addition to restocking, lake rehabilitation programs that must be carried out are (1) Dredging, (2) Waste management and household waste, and (3) Planting trees around the lake. Fishers try to adapt the reduction of fishing catch and fishing ground by looking for alternative work following local conditions such as planting a tree around the lake where the leaves are sold as herbal medicine and the roots of the tree expected to be a place for spawning fish.

4.1.5.c. Response to Social and economic impact - CSR

The obligation of a mining company to carry out CSR is stipulated in Ministry of Energy and Mineral Resources Decree number 46 of 2017. It states that all companies must prepare a development and empowerment plan, where the document must be adjusted to the EIA document because, in the EIA document, there is a breakdown of how much the costs of community empowerment programs are. CSR

program planning is done bottom-up, so the community does not have to propose proposals to submit these funds, and it must be based on community input.

The formula for environmental compensation and CSR is not standardized. It is just that each company is required to have a master plan for community empowerment to stop the environmental, social, and economic sustainability of the community. Based on environmental management funds (including compensation), coal mining's CSR is determined based on 20-25% of the company's total overhead cost. The provisions stipulated in the planning document are incidental and not-budgeting. Meanwhile, in oil palm companies, the government does not determine the amount of CSR funds because it must be based on a force major.

If palm oil plantation tends to employ plasma partnership to tackle social and economic security, coal mining tends to apply CSR as an integral part of the business model. Of the ten research villages, two villages received CSR from coal mining, and one village receives CSR from palm oil which was then integrated with the village development program. Villages that get CSR tend to tolerate the impact of company activities even though at the same time, they also complain about this impact.

4.1.5.d. Response to worsened water quality-Pollution Control

Exploitation activities of natural resources potentially damage the environment. Government guidelines for conducting environmental supervision and control are EIA documents planning and report. Pollution controlling is under the responsibility of the Environmental Agency. A part of the Environmental Agency's responsibility is to control EIA's planning, implementation, and post-operation. For example, while the company is implementing its plan, Environmental Agency controls the flow of sprays and fertilizers by monitoring wells, controlling the effects of sprays, fertilizers, and waste by imposing rules on the minimum distance between plantations and river borders.

Palm oil pollution control is carried out by controlling the palm oil mill effluent and empty fruit brunch. The remaining fertilizers and pesticides that dissolved into the river are categorized as waste, but if they enter the river, it dissolves and disappears and needs to be advanced sampling. Monitoring and supervision of the use of pesticides and herbicides are also carried out by supervising traces of B3 bottles and monitoring them through periodic reports made by the company. Environmental

Agency officer stated that until now, hazardous waste treatment is still following the standards and regulations. However, companies must not be careless, and they must manage the environment if there is disobedience, sanctions, warnings, and revocation of permits.

Besides EIA, an instrument of environment monitoring control developed by the Indonesian government specifically for palm oil is ISPO. ISPO was born as a form of resistance to the black campaign on oil palm. The ISPO assessment process applies backward and withdrawn from the beginning of land clearing, planting, maintaining, harvesting, and processing. ISPO is a rule made to see how far the company complies with the implementation of 9 components, namely aspects of regulation, legality, management, plantation management, and environment. In ISPO audits, companies must be transparent and disclose information about pollution complaints. It is a complaint from the community through District Environmental Agency or pollution information directly obtained from the plantation office. ISPO auditors also have the right to get information about how District Environmental Agency executes pollution complaints. Then cross-check it to the community. After the audit process is complete, ISPO must guide and advise the company. So, ISPO is an instrument to control how companies carry out environmental management. In other words, it is an instrument to know whether the company has carried out the EIA correctly or not.

Besides being carried out by Environmental Agency as a non-technical agency, environmental monitoring in mining coal is also carried out internally by specialized agencies; it is called a mine inspector. The scope of work of the mining inspector is limited to mining activities, to the processing of the mine inspector is limited to mining activities to the processing of waste in the settling pond, ensuring that waste flows to the settling pond. Therefore, the supervision is technical and megascopic, unlike the Environmental Agency, which explicitly oversees environmental quality standards and pollution monitoring. Therefore, environmental monitoring reports by mine inspectors are also technical, such as land clearing, topping stripping, topsoil storage, mining activities, reclamation, and utilization of outlet water settling ponds.

The superintendent inspector is a civil servant. However, the number of mining supervisors in East Kalimantan is only 38 people responsible for overseeing 1404 mining companies. In other words, one supervisor is responsible for overseeing 38

companies. It is far from ideal because, ideally, one supervisor supervises only five up to 7 companies. With this amount, NGO's respondent group criticizes environmental control as not being effective.

According to the Environmental Agency's pollution control, the Mahakam River water quality is still below the quality standard threshold. In the case of pollution caused by waste, the government stops disposing of waste and provides sanctions against the culprit. The Environmental Agency's officer stated that supervising and controlling companies with official permits is easier than supervising illegal companies because they always coordinate with relevant agencies. While companies that illegally carry out their activities clandestinely, are not coordinated, cannot be taxed, are backed up by thugs, and are usually owned by high-ranking officials.

4.1.5.e. Response to fish death - Paying for environmental loss – PPP

The government is obliged to carry out environmental restoration because of the accumulation of long-term and cross-regional environmental impacts, in the case of pollution that causes mass death of fish categorized as force significant cases. The source of the pollution should be traced so that the perpetrators are subject to carry out rehabilitation obligations or be given a penalty. The solution to the problem of fish pollution and fish death must be seen from the two sides, namely the fishery side and the non-fishery side. From the fishery side, what needs to be clarified is the fishing methods and equipment used by fishermen (additional: time, fishing ground, and the time of death of the fish, as well as the number of illegal fishing fishers). From the non-fishery side, activity around the source of pollution at the incident location must be considered.

In the complaining reports, residents usually judge that pollution has occurred. On the other side, when Province Environmental Agency receives complaints from the community, Environmental Agency cannot immediately decide. Province Environmental Agency will verify to the field, at least use the provisional word suspicion because pollution needs proof, Environmental Agency ensures the cause and effect. If it is proven to be detrimental to the community, the government does not say direct compensation but asks companies to carry out restoration and repair the ponds. If there is a compensation claim, the losses are calculated by the community, the company, and the Fisheries Agency. Fisheries Agency is not explicitly addressing

the problem of fish mortality and water pollution. If there is a complaint, the Fisheries Agency coordinates with the relevant agencies. Thus, the results of the calculations from each party were then submitted during mediation. Determination of the amount of compensation carried out through a consensus agreement. Environmental Agency facilitates and collects the complete data. Sometimes companies are penalized and imprisoned.

Compensation is a form of pollution pays principles because of side effects of company activities. Compensation is a sum of money voluntarily given by a violator to a victim. The amount of which is determined based on an agreement or applicable regulation. Calculation of compensation for a fish farmer is more straightforward than capture fisheries—the calculation based on the catch or extent of the fishing ground. Compensation for traditional fishers is possible if the equipment used by fishermen is environmentally friendly. The government is pushing for collective compensation funds so that the benefits are sustainable. One of academia respondent group suggests to accommodates compensation regulation in the article of fishermen's protection law or regulations on CSR or the environmental protection and management law.

4.1.5.f. Response to destructive fishing-IUU law enforcement

The government has very often campaigned about the regulation of destructive fishing prohibition. Government collaborates with police, community groups, and the community in combating destructive fishing. The penalty for destructive fishing is six years in prison. However, the fishermen ignored it. Fishers continue to use small-eyed nets and catch pregnant fish because until now. The government is still being tolerant. Going forward, the government plans to be more assertive in terms of

1. Door to door inspection on destructive fishing gear,
2. Drive out temporary migrant fishers,
3. Crackdown on illegal catchers because they provide capital assistance to destructive fishing, and
4. Stopping aid for villages where citizens do illegal fishing.
5. Concerning combating destructive fishing, the community is pragmatic.

In destructive fishing-related pollution, it has been regulated in the (1) Law No. 31 of 2004 concerning fisheries articles 84-102 concerning criminal fisheries. In that article, what is meant is the shocker and collector of the shock results and (2) Minister

of Environment Decree No. 13 of 2011, one fish lost, one tree costs so much, 1 meter of land lost so much price has arranged all. It has been said that the act of polluting the environment is a criminal offense. The destructive fishing actors can be subject to multiple articles.

The government and police carry out the eradication of destructive fishing in collaboration with the community. At the village level, villagers make a village regulation that is the perpetrators of destructive fishing are subject to fines where the fines handed over to places of worship. The community always reminds the prohibition of destructive fishing. However, destructive fishing is difficult to eradicate because all of them are family. There are always pros and cons regarding destructive fishing among villages. Even though destructive fishing actors have been arrested and taken to the police station, the ends settled in a family way. Even in some instances, the combined police and military forces were defeated by the people who behaved like they had a superpower.

The village government also does not remain silent. The fisheries service often holds socialization about the regulations of destructive fishing. The village government has also made agreements between villages on the prohibition of destructive fishing so that not only some villages would prohibit it, but others would not. The village government actively sends appeal letters to other villages to prohibit its citizens from doing destructive fishing. The village government has reported the rise of destructive fishing to the local government, but there is no response. Indeed, sometimes the local government and police conduct raids and evict destructive fishing fishers, but the community catches the impression that the government is not severe in combating destructive fishing; the impression is captured based on consistency, frequency, and punishment perpetrators. There is no deterrent effect on destructive fishing. The perpetrators of destructive fishing ignored the warnings from the community because they knew that the government's capacity to secure the entire territorial waters from destructive fishing was insignificant. So, they are less likely to be caught.

4.1.5.g. Response to fishing ground reduction-Social forestry

Wetlands are complex ecosystems and have high biodiversity. The river border is also essential to protect to prevent sedimentation. In general, because rivers and lakes are part of the Mahakam watershed, its management is the responsibility of the Forestry Service, except for reservoirs that have been designated explicitly as fish spawning areas, which are, therefore, the responsibility of the Fisheries Service. As part of watershed management, the government has established a series of policies to protect peat ecosystems, including Social Forestry through the allocation of Indicative Maps and Social Forestry Areas (PIAPS), the establishment of Indicative Maps for Postponement of New Permit Issuance (PIPPIB) on Peatlands, Forest Business Reconfiguration through the 20% allocation of the concession area for life plant partnerships, a moratorium on the issuance of permits on Peatlands and the establishment of a peat ecosystem management unit namely the Peat Hydrological Unit (Agency 2019). Although these policies and programs are not explicitly aimed at rehabilitating rivers, lakes, and swamps, because they are all integrated entities, traditional fishing catchment areas will also benefit from these programs.

Fishing grounds in the Middle Mahakam are rivers, lakes, creeks, marshes and reservoirs, and peatland. All of them are within the freshwater wetland ecosystem. Due to the continued damage to the peat ecosystem, many companies feel guilty because they have converted the valuable peat ecosystem. Therefore, the company and the government intend to fight global warming and the black campaign against oil palm by restoring peat function. Current rules state that peatlands should not be planted because peatlands are a high conservation value considered. Companies that get concessions are required to reserve their concession areas for conservation areas. The extent to which a high-value conservation area is adjusted to land cover depends on whether the area is included in the conservation area or not. The high conservation area is reported every year. If not, then the company cannot sell its crude palm oil.

To restore peat function and make peat a high conservation value area, the government decide to ban opening oil palm plantations on peatlands through a moratorium on the temporary suspension of oil palm plantation permits. Besides, the government offers a dollar to dollar and dollar to the land scheme through various programs, such as canal blocking programs. In essence, this program aims to maintain

groundwater so that it does not exceed 40 cm so that peat moisture can be maintained—this program is designed for the company. The company is then required to study the groundwater level and report it to the center. Besides being implemented by companies, this program is also carried out by the government and the community. The government implements it through a third party, namely the peat restoration council. While the community is encouraged to implement it in groups through groups caring peat ecosystems, communities may work on public land and open rice fields but are prohibited from making irrigation more than 40 cm. Meanwhile, the company is obliged to plot the area and map the location of the wells to monitor groundwater levels.

One of the villages that are highly dependent on peat forests is Muara Siran. Muara Siran integrates forest management into long-term land use and spatial planning to maintain and sustain the peat forests. Of the total land included in the Muara Siran administrative area, only lands on the riverbanks have been claimed by the community as their own. The rest lands are still unclaimed vacant land. The empty land is arranged in the village land use and spatial planning into several zones, such as conservation zones. Then, it proposed to become village forests through social forestry schemes. Social forestry is forest management rights awarded by subnational officials on behalf of the Ministry of Environment and Forestry to the communities under strict government monitoring in which ownership rights belong to the State (Myers, Intarini et al. 2017). The main objectives of proposing a village forest scheme are (1) Protecting areas where there are fish, (2) Maintain catchment area, (3) Anticipating Forest fires, (4) Refuse plantation investment. Forest area divided into two, namely production forest and protection forest. All the non-forest area areas are typical peat swamp or water swamp where fishers look for fish. The non-forest area could be managed by villagers only if they got a government permit. Fisher stated, "*We are happy. Hopefully, nothing untoward happens. That is why it has maintained here, around 2000 hectares of peatland*".

4.1.5.h. Response to fishing ground reduction-Plasma partnership

The nucleus-plasma partnership was developed after recognizing the benefits of the activities of large plantation companies on the one hand, while on the other hand, there were often problems with the surrounding communities. This plantation development partnership program aims to increase community income; provide employment opportunities; increase land productivity, added value, and competitiveness; meet the needs of domestic industrial consumption and raw materials; optimize the management of natural resources sustainably, and increase State revenue and foreign exchange. Under this partnership scheme, plantation companies must allocate 20 percent of the total land concession area for partnership participants, including residents and landowning communities (Perda 2008). However, fishers who own land and are involved in plasma partnerships with the company cannot enjoy the profit-sharing due to some issues:

1. Land incompatibility issues so that palm oil cannot produce as expected.
2. In the community's understanding, plasma plantations are divided according to the number of members of the palms so that ownership is individual, and the location of the plantation can be identified. However, in the plasma plantation companies' understanding, the community does not need to know plantation location if the profit is shared equally.
3. The cooperative carries out plasma plantation management. As a party that was bound to an agreement with the company from the beginning, the community represented by the cooperative considers the company to implement a discriminatory policy, in implementing a discriminatory policy, for example, in implementing a fresh fruit bunch price policy. The company's fresh fruit bunch follows the price set up by the plantation agency, while plasma's fresh fruit bunch is set at half of the plantation agency's price. Besides, the company also denied many points in the agreement. For example, the area of plasma is not following what agrees.

The company has no transparency regarding plasma management, and even plasma management is not following the agreement. The area of plasma is more minor than stated in the agreement

4.1.5.i. Response to the lack of community participation in the decision-making process-Advocacy and Community Empowerment

Some NGOs that advocate MMA's community are:

1. RASI's main program is to protect Mahakam Dolphin and conserve its habitat. By doing this, RASI indirectly empowers fishers to sustain fisheries through training activities and marketing assistance of processed fishery products, spawning, and fish rearing.
2. BIOMA focuses its works in Muara Siran to facilitate land use and spatial planning and village spatial allocation, advocating for peatland conservation so that oil palm licenses on peatlands stopped, to form social forestry, and to empower the community. BIOMA tries to raise people's awareness about the relation between forest and fish.
3. BUMI facilitates the community in managing land use and spatial planning, and space allocation through social forestry. BUMI increase public awareness and public right for information disclosure.
4. JATAM is an anti-mining network. JATAM advocate local community to resist for mining and to get the environmental right through social movement.

1.2. ENVIRONMENTAL JUSTICE

Injustice results from the environmental decision-making process because these systems reproduce the conditions of exclusion in the political system, they are part of (Bustos, Folchi et al. 2017). According to Paloniemi, environmental injustice that occurs at the local level can be traced through the processes that underlie the resulting injustice, one of which is through 1) procedural justice, namely how decision making is carried out through transparent, accountable, and participatory procedures and 2) justice of recognition, namely environmental vision. Whose property is recognized and who participates (Paloniemi, Apostolopoulou et al. 2015). In line with this opinion, we find that environmental injustices that occur at the local level result from the decision-making processes of spatial planning, land concessions, development planning, and EIA that do not consider aspects of environmental justice. In most of the villages that were never involved in the four decision-making processes, they had a higher perception of injustice than the villages that were involved.

4.2.1 The tenets of environmental justice

4.2.1.1 Distributive justice

Distributive justice in the decision making of development planning

As is widely understood, development is a change to a better condition. By opening investment in the natural resources sector, the government encourages job creation and reduces unemployment. Compared to horticultural agriculture, capture fisheries have been under attention and under-taken care of in the development planning because this sector does not directly produce local government revenue. The fisheries sector cannot be taxed because it is managed by small fishermen whose orientation is subsistence. Institutionally, the functions of the Fisheries Agency are limited to being only technical institutions responsible for increasing regional income. So that the work program only focuses on increasing production as high as possible by providing production equipment and means such as fishing gear, boats, and fish seeds.

Distributive justice in the spatial planning

The environmental impacts are not heeded in spatial planning. However, spatial planning that is not appropriate because it does not pay attention to local ecosystems can exacerbate environmental damage because that is the preparation of the spatial planning has been accompanied by the strategic environmental assessment (SEA) document. An example is the use of peatlands for oil palm plantations. In terms of spatial planning, those included in APL or Forestry Areas do not violate the rules. If it is not done in protected areas and technically it can be done, the opening of oil palm plantations on peatlands is not against the rules. However, suppose it follows the guidelines for preparing the SEA, a spatial planning-related document. In that case, peatlands as oil palm plantations must be considered because it causes more multiplier effects than expected, namely the reduction in fishery resources and their derivative effects.

However, some respondents in this study argue that spatial planning in the Mahakam is prioritizing and considering investment rather than considering land type habitat, living space or space for animals to find food, and the impact of investment on the environment because its constituents never know the location and do not know

the actual conditions. The existing spatial planning is more concerned with economic interests so that in practice, it is difficult if the responsibility of conservation is given to the company. Many areas designated as non-forest land areas are forests, and their biodiversity is still quite good (Myers et al., 2017). The fisherman stated that "*we were defeated by those who played there*."

The preparation of the spatial planning is considered something partial and has never been accompanied by a study of environmental carrying capacity. Empty land is considered an idle resource. Its function does not see in the ecological environment and the overall ecosystem. In the Middle Mahakam Area case, the lack of anticipation or consideration in granting permits at peat locations occurred because the spatial planning map has not covered the use zone on peatlands as owned by the Peat Restoration Agency (BRG). If the policy above feels that it is village land and is considered idle land, that is fine. Well, the one above is for the land. Yes, I feel like it is empty. If you want to see the impact, go back to earlier, the location has never been visited, I do not know the exact condition. How do you think about the impact? They do not know the condition (NGO respondent).

Land suitability is also not well assessed, so the impact is not well anticipated. The existing spatial planning is more concerned with economic interests than land type habitat, living space, or space for animals to find food. Many of the areas designated as APL areas are forests, and their biodiversity is still quite good. The land should not be suitable for the plantation, but it is used for plantation. So that in practice, HCV must not be given to the company. Academia respondent stated, "*The problem is that many non-forest areas still have significant forest areas --- Yes, that means areas that can be used as plantations. It is still in good condition if it is not considered a forest because the forest is special. Indeed its management is under the ministry of forestry. So, there are still quite good areas of forest as well as in terms of biodiversity, but they are still called non-forest areas"*. Because the company is already operating, fishers have no choice but to sell their land to the company.

While those who have positive sentiment view that the preparation of the spatial planning has included and based on (1) Strategic Plan, (2) spatial planning, (3) Action plan, (4) utilization plan, (a) existing licenses (Determination of spatial patterns in the spatial planning and large-scale concessions have been going on for a long time, East

Kalimantan is now in a position to accept what has determined Permits for mining are granted to areas that indeed accommodated (determined) to become mining areas. Location permits included in a conservation area such as a nature reserve area, the land agency will reject it. However, if all permits have been issued, nothing can be done), (b) review of the strategic environmental assessment is ecological consideration regarding potential environmental impacts. It is the procedures that must consider, considered and passed in the preparation of government regulations. If then there is environmental damage due to the stipulation of certain areas as a specific designation, then that is usually caused by implementing activities that are often freelance).

However, the tendency of government respondents who have a positive sentiment towards the preparation of the spatial planning is different from the results of observations and studies of government policies regarding the determination of forest area criteria conducted by Zulkarnain. In his research, he concluded that so far, the East Kalimantan government has designated protected forest areas, conservation forest areas, and production forest areas based only on the criteria of slopes, soil types, and rainfall alone (Zulkarnain 2013). In contrast, the main criteria that can use in determining forest areas are the calculation of community trees as forest formers.

Distributive justice consideration in the land concession

Now, the Government or the State's position is not a protector of people but a regulator. The current focus of the Government is to facilitate investment and make it difficult for citizens. Whatever concerns investment is made easy, even if it has to usurp the people's living space. Permits of some mining and oil palm companies were also not revoked even though these companies violated the EIA and polluted the environment and were proven to violate the 2012 regulation. Moreover, waste disposal into rivers has a potential cross-regional impact even though the granting of permits is only from the district where the company is located. As a result, other downstream areas are only the recipients of the impact.

The findings in this study are in line with the findings made by other researchers both at the provincial and district levels. Rustiadi (2001), for example, argues that the issue of licensing remains a national issue in Indonesia because the issue is related to

the issue of inefficient allocation, distribution of natural resources, and environmental degradation. Furthermore, according to Rustiadi, the issue of licensing is related to the process of land tenure transfer in which it occurs:

1. An asymmetric process between the parties who relinquished rights to those who received land tenure rights
2. The tendency towards increasingly concentrated land tenure structures in particular community groups (tenure distribution) worsening)
3. Increasing landless poor groups

The study conducted by Satria (2017) is also in line with this research. Satria (2017) shows that private land tenure in East Kalimantan reaches more than 80% of the total land. According to Dharmawan et al. (2016), who conducted a study of the agrarian and agroecosystem structure of oil palm plantations in Kutai Kartanegara mentioned that local governments used the regional autonomy law as a "weapon" to open licensing taps for exploitative activities based on natural resources which expected to be directly proportional to the welfare of the community. In 2015, the area of location permits issued by the Government of Kutai Kartanegara for oil palm plantations as of August 2015 reached 873,397.8 hectares, and the total area of Plantation Business Permit was 552,511.4. Even though there was only 376,938 Ha in that year, the land expanded for oil palm plantations outside the allotment plantations according to the spatial planning (Dharmawan et al. 2016).

Meanwhile, in the coal sector, Muhdar and Nasir (2012) stated that the mining license data in East Kalimantan in 2014 totaled 1,443 coal companies operating with an area of around 5.5 million ha consisting of (i) coal mining license 1,360 (94%) and (ii) mineral license 83 (6%). The massive granting of licenses is inseparable from the views of the provincial and district government elites, who believe that coal is explored to increase regional income and finance development (Yuwana, Nugroho et al. 2012). However, many studies show that the increase in the number of permits is not directly proportional to the welfare of the people of East Kalimantan. Even an increase in licensing is proven to marginalize the community and the environment (Yuwana et al. (2012); Dharmawan et al. (2016); Rustiadi, (2001); Satria (2017); Hapsah and Mas'udi (2012) and Sabarudi et al. (2016) The value of the loss in the granting of a lease-to-use forest permit for plantations and mines is not proportional to

the loss because the Government has not calculated the cost of environmental recovery

Distributive justice Consideration in the EIA Decision Making

The government's statement on pollution control was criticized by NGOs and some academic's respondent groups. They argue that environmental management planning was not based on the baseline environment and carrying capacity. The prediction in the EIA is made based on studies, but because of limitations, ignorance, and human indifference. So sometimes forgetting to capture what is important and what is not important. Eventually, the impact recipient is forced to adapt. Fisheries must be considered in the EIA. The baseline or the initial conditions before the industry was also read. Unfortunately, it only compares between the initial and final conditions because this EIA is just a prediction. Forecast about the future, meaning that the exact fishing conditions that are coming are not known for sure. In other words, the potential impact will only be known later after monitoring. If the monitoring results are lacking, then you can find a way to control it.

Until now, the government does not have a "list of activities that impact waters and fishermen" that can be used as a reference in granting permits—based on that fact, meaning that the exact fishing conditions that are coming are not known for sure. In other words, the potential impact will only be known after monitoring.

This fact can be proven by how environmental controlling done:

1. The distance regulation of 50-100 meters on the river border as a retention area is not following the law. The required border areas are conserved and purchased from any use during the dry season should be needed or used according to the outer limits when floods and water overflow.
2. The sampling point is never changed. Determination of sample points does not consider river width, air height, and time or season. Water sampling in the dry season is expected to produce excellent water quality. Interpretation and monitoring of water quality should not be carried out only normatively. It is not only interpreted based on conformity to air quality parameters or parameters and their effects on ecological aspects but also must also discuss social aspects.

3. A study on social aspects of environmental impact analysis is not carried out at the location included in the study limits on environmental impact analysis. In other words, the Environmental Impact Assessment is less dangerous.
4. Oil palm companies that connect with different company names following the tricks of the company so that they are not ensnared by the law or regulations regarding the maximum extent of plantation area, even though these companies are children of the same company.
5. There is no attention to wildlife protection routes within and between companies, even if HCVs (High Conservation Value) is fragmented, and even if there are HCVs, the company intentionally depletes HCVs that previously needed to be identified.

In opposite, the government believes that all potential impacts caused by palm oil plantation and processing activity have been carefully estimated. EIA aims to reinforce the rules regarding environmental protection. All forms of violations must have sanctions.

4.2.1.2 Procedural justice

Development Planning Forum is only a formality and a tool to legitimize the State Budget. From Fuady's findings (2017), a bottom-up planning system from villages and sub-districts was implemented, but when it arrived at the district level, the proposal was juxtaposed with the program proposal made by the district Local Government Working Unit (Fuady 2017). In principle, proposals from villages that are like proposals from district Local Government Working Unit did not approve because, on the one hand, community participation in district Development Planning Forum is relatively low except for villages that get advocacy from NGOs. On the other hand, the government did not transparently inform the village community about the village proposals that were approved for inclusion in the State Budget plan document.

Procedural justice consideration in the Decision Making of spatial planning

Negative sentiment over the implementation of public consultations in spatial planning arises because participation is considered low. The preparation of spatial planning is dominated by companies that have very close relations with politics. The

relations between the two perpetuate political policies in regimes that extract natural resources. During the first public consultation, participants were dominated by the company and UPTD, and a small number of civil societies.

Public consultations were indeed carried out at the time of the drafting of the Spatial Plan, but only the legislative and executive branches and some elements of society such as NGOs, community leaders, and academics. Sometimes the public consultation was only the village head and Neighborhood Head who came (Myers et al., 2017). Residents who are impermanent fishermen did not include it. That too invited him, so suddenly that fisherman could not attend. In sum, "*almost as a whole, the space for the exploitation of economic resources has no integrative procedures, and the process is not deliberative*" (Academician respondent). Fishers are potentially affected but not invited.

The spatial planning regulation stated that everyone has a right to know the spatial planning document because the spatial planning document is a public document. However, implementing that regulation raises a negative sentiment since it is closed and difficult to access by the public. Some respondent argues that the spatial product is confidential but cannot be accessed even by academicians. It can be accessed only by a limited circle to maintain confidentiality and reduce the potential for abuse.

The findings related to spatial planning in this study align with the results of a study conducted by Gunarso et al. (2009). They found that the Kalimantan spatial plan prepared by the government was of no benefit to the broader community because, in its preparation, the government had collaborated with Collusion entrepreneurs to allocate land that will benefit the entrepreneurs. Existing planning tends to function as a tool to legalize entrepreneurs' access in exploiting natural resources at the district level. Therefore, the Kalimantan spatial planning often ignores protected forest locations and protected areas within a watershed. Community participation in the planning process, as required, is also often ignored. Because the process is not participatory and not transparent, according to Gunarso, the existing spatial planning is often not immediately used as a policy tool and even rarely published. The regulation of spatial use is built based on the logic of capitalism, which prioritizes the principle of commercialization of land as an asset of production

(Gunarso, Santosa et al. 2009). On the other hand, subsistence-oriented fishers are marginalized and do not receive space to preserve fishing activities.

Although most respondents have a negative sentiment on spatial planning, few respondents argue that spatial planning is done openly through public consultations. Instead, they argue that spatial planning results from many people's decisions, cross-sectoral extraordinary, and complicated at many stages.

Procedural justice consideration in the land concession

The community's legitimacy process for granting land permits is often confused with the process for granting environmental permits because it is done concomitantly. Hence, fisher did not receive in-depth consideration of their claims and complaint on environmental impact because it is assumed that fisher has contributed to the environmental damage by approving the entry of companies into their territories. Environmental permits should only be granted if there are no land disputes, and the community has informed potential impacts. Thus, it is against free, informed consent principles (*procedural justice*).

Not only is the public consultation carried out to obtain environmental permits that are not following procedures, the extension of mining permits carried out by the Ministry of Energy and Mineral Resources are also full of controversy. Based on 2009 Mineral and Coal Law No. 4 of 2009, when mining licenses expire, they must offer first to be returned to the country. Then the state considers whether the concession will be returned to the state reserve area or not. It must be closed in the House of Representatives, The House of Representatives, in commission 7. If it turns out that it is not included in the state reserve scheme, it should be offered again to the Ministry of SOEs whether BUMN will take this over or not. If not, the two things that were not done were finally rereleased to the public, auctioned. However, the procedure was carried out.

The task of the governor or regent is to give permission, but the community has never been involved. Based on the logic of continuity, permission is given first, and then the company resolves the land acquisition case. "*Such divisions have been going on for a long time, Ms. Maybe it is just that I have not become a civil servant. There have been things like before. Especially now that the position of receiving has been*

divided" (Government). The community was confronted with the company. If, from the very beginning, the community involved by the Government, would not have been a conflict with the company. Finally, if the community rejects the presence of the mine, it will be criminalized because it is considered rejecting development. People have no choice to refuse. If they reject them, they are considered dissidents. Well, because consultation and public involvement regarding determining the allocation of space did not occur, then finally, there was an injustice in distributing space. "*For space planners, space means money*" (NGO respondent). Not disclosing the information on spatial planning and land concessions eliminates the people's right to retain the allotment of fishing ground (*distributive justice*), which ultimately disenfranchise fishers to get protection for their fishing work.

Procedural justice Consideration in the EIA Decision Making

1. Community involvement in the preparation of EIA is very lacking. It can be seen from the community's control over the EIA implementation document, which was very low, including how and who carried out the environmental valuation and whom the experts who compiled the plan were also not done transparently. The public has the right to know the results of the study contained in the EIA document so that they have a solid basis for refusing the presence of the company.
2. Public consultation is also not carried out in a participatory manner. Even if someone is invited, usually at the sub-district level, the sub-district head is considered a representation of the community, or if there is a representative from the village, it is only the customary head. The proponent invited the people because they felt they already had a permit. According to respondents, representatives readily invited to negotiations "negatively" "whose faith is not strong" by the company are the village head, BPD, and customary head. They have veiled hands where the permit or agreement of the village is with them. When a company succeeds in convincing them, the company is guaranteed to get a recommendation (Myers et al., 2017).
3. Public consultations have never been carried out at the village community level. Public consultations are carried out only at the sub-district level. The

community also wants to participate and express their aspirations but has never been involved. The company once conducted a location permit socialization, part of the EIA, but it was only a formality. In practice, during public consultations, the public was only informed about the positive side of investment and new licenses. The company said that the company's activities did not have a negative impact. The essence of public consultation should be the dialogue about potential impacts and impact management plans. The dialogue did not occur because the government had prepared the management plan. So, in essence, public consultation is a means of socializing management plans that the government has prepared. The public has never criticized the practice because they do not know that they have the right to access it where that right has guaranteed in the Law on Public Information Openness, how their procedures are not known.

4. Representatives who are quickly invited to negotiations "in a negative sense" "whose faith is not strong" by the company are the village head, BPD, and customary head. They have veiled hands where the permit or agreement of the village is with them. When the company succeeds in convincing them, the company is guaranteed to get a recommendation. Public outreach or consultation is often only a guise of companies or EIA consultants in getting legitimacy or recommendation letters from the village. In the case of the Muara Siran, the village head succeeded in rejecting the company because the village head only wanted to sign if the head of the service first signed. While the government agency chief does not want to sign if the village head does not sign first, both are looking for safety.
5. The preparation of the environmental recovery plan is not carried out in a participatory manner, including how to do an environmental valuation and whom the experts compiled the plan do not do transparently. The village head's recommendation also contained an element of manipulation, wherein the EIA document stated that 100% of the village community approved the company's entry, but it did not. RKL - RPL, especially environmental monitoring related to social matters, has never been carried out by the company. After the document was completed, community control over the

implementation of the document was also deficient. The company and the government have never conducted environmental monitoring in the villages around the company's area.

4.2.1.3 Justice of recognition

Recognitive justice consideration in the decision making of development planning

The fisheries sector is not given much attention in the development process based on several facts:

1. The designation of a space allotment and the granting of permits and concessions in the Middle Mahakam region have never been based on cost and benefit analysis. The government does not have data about fishermen's livelihood and how many fishers were affected by the project. The government does not want to bother. As mentioned by fisher, "*So those who become rulers here are immigrants, we are the ones who are trampled on. One thing I still dream of from the government is closing the company*".
2. Although fishers are potentially affected, fishers are not procedurally involved in planning a project. Fisher expressed, "*We, the fishing community, understand. The problem is that we are powerless. The government should think. We sometimes think this society is being fooled. We are not yet independent. This government program and management are still fooling us. That is fisheries.*
3. There is no conservation effort. Capture fisheries areas that are equipped with zoning distribution aimed at protecting the fisheries sectors.

Recognitive justice consideration in the Decision Making of spatial planning

In the Indonesian context, community participation in making environmental management decisions is recognized and regulated in various provisions, ranging from spatial planning, Strategic Environment Assessment, environmental permits, environmental impact analysis to the granting of business licenses. Given that community participation in decision-making requires disclosure of information, the state also guarantees the right of people to obtain information. On the other hand, businesses or activities must be honest, accurate, open, and timely in environmental management. If not, the government will provide criminal sanctions (Wibisana 2017).

However, the problem of environmental injustice caused by no decision making not departing from the site occurs in Kutai Kartanegara District. Decision-making is not based on community needs and is not participatory. For example, development planning communication platforms such as the Development Planning Forum explore aspects of infrastructure development, not economic development or spatial policy and natural resource management. The community does not have a veto to cancel the Development Planning Forum decision. The villager is not involved in spatial planning. With this pattern, the determination of spatial patterns often leads to land disputes.

Moreover, in the preparation of the spatial planning, there is also no recognition of fishing areas on land. In the preparation of the spatial planning, strategic areas of high economic value are determined in advance without considering the fishing areas. The government stated, "*Land use and spatial planning for fisheries may sometimes not exist at all. We only have a lake. We see that the swamp is pegged. The difficulty in including fisheries in land use and spatial planning is that during floods, water reaches anywhere. The forests are included in their fishing ground. The higher the flood, the wider their catchment area".*

Recognitive justice Consideration in the EIA Decision Making

Fisheries must be considered in the EIA. First, there must be a baseline or the initial conditions before the industry operated. Unfortunately, EIA only compares the initial and final conditions because this EIA is just a prediction. Impact forecasts do not predict correctly because the baseline is not equipped with adequate data. First, the baseline has no complete socioeconomic data, so the socioeconomic impact cannot be predicted accurately. Second, there is no initial data on the profession of fishers and final data on fishers, so they cannot predict who the actual beneficiaries and beneficiaries are. For example, the people who live around the company (negative impact recipients) do not experience a significant increase compared to the community outside the company location (does not receive negative impacts). Third, there is no preliminary data on fishermen's income from fishery activities, so there is no anticipation in preparing alternative non-fishery income sources. For example:

once the income from fisheries was relatively high after there was a palm oil company, the fisheries' income was directly dropped.

In every process of EIA on coal and palm oil, the government knows that this activity will affect fisheries, but the government cannot stop or not issue permits for that activity due to investment. An academic respondent stated, "*The government is slightly or partially in favor of the community. The community, in this case, is the company. Companies are investors for the regions, and even the government always invites investors to invest. Earlier, the activities that come from that investment certainly have an impact on the environment. So, therefore, to minimize the negative impact, the EIA instrument was used. Only this does the company, after the operating permit, carry out what is mandated in the EIA. Some research results say that oil palm mining pollutes the environment, both land and water. However, no one stopped*". Sometimes the government forgets to catch what is essential and what is not essential. Eventually, people are required to adapt. An academia respondent said, "*Indeed, on the one hand, we talk about EIA, but the reality is that the implementation is not correct, that is the problem. Why isn't it true? Because people do not believe in the environment, we tend to adapt. The important thing is that I get money, right*?". If a violation occurs, the government does not stop, but the government begs the proponent to preserve and protect the environment, namely the community and its biota. Therefore, they feel marginalized. The fisherman said, "*Most of us are stepchildren. However, the company still does not respond to us. That is the difficulty of the least advantage community*".

4.2.2 Environmental justice dimension in the DPSIR

In general, the DPSIR in the research site can be demonstrated in the above description. Based on the DPSIR finding mentioned above, environmental justice is found in all DPSIR chains. It is relevant to Rodriguez and Labajos (2017) to argue that environmental justice is like a scale. The scale varies at each stage and project activity, project impact, community, and institutional response. If the framework developed by Rodiguez and Labajoz is juxtaposed with the DPSIR framework, perhaps we can say that the scale of environmental justice is different in each driver-pressure-state-impact-response chain.

The identification of environmental justice in the driver chain is relevant to

Dharmawan et al. (2016) opinion, which argued that before determining who is responsible for environmental damage caused by investment activities, we need to look at investment issues starting from the upstream, namely on the politics of space and licensing because expansive plantations are indeed "desirable" by the government. Injustice is the result of the environmental decision-making process because these decision-making systems reproduce the conditions of exclusion that exist in the political system they are part of (Bustos et al., 2017). According to Paloniemi, environmental injustice that occurs at the local level can be traced through the processes that underlie the resulting injustice, one of which is through 1) procedural justice, namely how decision making is carried out through transparent, accountable, and participatory procedures and 2) justice of recognition, namely environmental vision belonging to who is recognized and who participated (Paloniemi et al., 2015).

While identification of environmental justice in the pressure, state, and impact is identified through community grievances due to communities' right losses, community grievance and protest indicates a justice claim and indicates that the system is not working well (Kurtz 2003, Higginbotham, Freeman et al. 2010, Sulaiman, Abdullah et al. 2014). Perception of injustice would create dissatisfaction and conflict (A. Martin et al., 2014). According to Morrice dan Colagiuri (2013), deprivation of the rights or ownership of fishermen, namely land rights, the rights to water resources, and the rights to livelihoods in fisheries. The right to freshwater resources was violated due to contamination which significantly reduced water quality, which then fishermen's right to make a decent living from fishing. Besides, environmental justice in the pressure, state, and impact is identified through how to point source pollution from industrial activity is a significant environmental problem that equally impacts people. In addition to disparate impacts on people, the environment is also unequally impacted by how the use of watershed boundaries in place of traditional political boundaries affect environmental justice analysis (Hill, Collins et al. 2018).

From the human rights point of view, fish catches are decreasing, and its aquatic ecosystem is related to distributive injustice issues because it is related to the loss of fishing rights. The issue of justice in a fishing ground reduction in the distribution and

allocation of wetlands, which is more favorable to investors than the local community, causes land dispossessions and disparities in land ownership. Thus, the problem of fishing ground reduction is indirectly related to the issue of water resource allocation. Meanwhile, the issue of mass fish mortality and pollution are interrelated issues, both of which raise the issue of distribution of the impact of pollutions which is more burdensome for all fishing communities. However, the fishermen do not even receive the benefits. The response to reduce the impact is also uneven. Pollution causes water quality to decline, thereby eliminating fishermen's right to earn a living from fishing and access clean water (Morrice, Colagiuri, et al., 2013).

Moreover, since some water quality parameter in the MMA is above the threshold, it violates a healthy environment's right (Pojman, McShane et al. 2015). Moreover, the fish catch the declining issue. This issue is related to justice in the distribution of fish resources due to the deprivation of fishermen's rights to obtain livelihoods from fisheries.

1.2.2.1 The lack of procedural justice in the decision-making process.

We find that environmental injustice at the local level results from decision-making processes for spatial planning, land concessions, development planning, and EIA that do not consider aspects of environmental justice. Most villages that were never involved in the four decision-making had a higher perception of injustice than the villages involved. The lack of fisher participation in the decision-making at the village level can be seen in the below table. From ten villages, only two villages have positive sentiment to all decision making. In opposite, eight villages have negative sentiment to all decision making in which means that the decision making does not consider the distribution impact and benefit, does not involve fisher as an affected community, and does not consider fisher’s right.

Table 17 Participation level in the decision-making process

Themes	Village 1		Village 2		Village 3		Village 4		Village 5		Village 6		Village 7		Village 8		Village 9		Village 10		Total Sentiment	
Sentiments	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Land concession	0	6	1	2	2	4	0	8	0	5	1	4	4	0	0	3	0	1	1	1	9	34
EIA	0	0	0	3	2	1	1	3	0	3	1	1	2	0	0	5	0	0	0	0	6	16
Development planning	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	1	2
Land use and spatial planning	0	0	0	0	2	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	4	0
Total	0	6	1	5	6	5	1	11	0	8	3	5	7	0	1	10	0	1	1	1	20	50

The two villages that participated most in the decision-making process of development planning, land use and spatial planning, land concession, and EIA were Muara Siran and Sedulang, while eight other villages were the least participated. Interestingly, a village that most participated in the decision-making process is the least pressured village. Muara Siran village government has involved the community and coal companies transporting coal and has transfer shipments in making spatial planning decisions and village development planning. Of the ten villages that became the research sample, Muara Siran was the only village developing participatory ecosystem-based spatial planning and integrated it into development planning. The preparation of the Muara Siran village spatial planning at Muara Siran was initiated in the context of implementing the Forest Carbon Fund Program as part of the implementation of the REDD program initiated by the World Bank in collaboration with Indonesia. With the sovereignty of regulating the space it has, the village has succeeded in maintaining its wetland ecosystem through social forestry schemes, and therefore its fishery catches are also better than other villages.

Interestingly, this village is intensively advocated by NGOs. In the meantime, Sedulang is a village actively involved in the entire EIA process carried out by the company, from land concession socialization, surveys for EIA preparation, and environmental monitoring. *I think it is fair because every time progress is made, they will report it first if people who disagree will not be implemented. The decision is in*

our hands. Yesterday, when determining the factory's position here, there was a meeting in the village. Then the issue of licensing and human resources had also met the requirements (Fisher).

4.2.2.2 Unequal distribution of response to environmental changing and environmental impact

Besides appearing in the policy-making process, environmental justice also arises in how the actors respond to the likely impact of environmental damage. The ability to respond to impacts is related to how environmental good and environmental bad are distributed at the local level. Fisher's ability to respond to the impact influences social grievance and community complaints, indicating the perception of injustice.

In this study case, different primary pressure, state, and impact are associated with natural factors. However, when we look at how this pressure, state, and impact enlarge environment and socio-economic inequalities between affected villages, it becomes an environmental justice issue. The different pressure, state, and impact also become environmental justice issue when it is responded differently by the actor in charge. Environmental change and its impact are responded to differently by the responsible actor. The village that most experienced the environmental impacts does not need to be the village that has received the most responses to reduce these impacts. The different villages had different capabilities to cope with the pressure, environmental changes, and environmental impact. So, pressure will increase inequalities between the village. To reduce the inequalities between the village, the government or company must respond most to the most pressured village. We found that villages that experienced less environmental impact got a better response.

The study found that all villages received all kinds of pressure but at different levels of pressure. The different villages received different pressure levels, although the village had the same characteristic. For example, palm oil pressure level is different between Sedulang, Liang Buaya, Puan Cepak, Muara Kaman, and Sabintulung, although they are all surrounded by some palm oil plantation. Puan Cepak received more pressure from palm oil plantations than other villages. Muara Siran, Sebelimbingan, Sangkuliman, and Semayang also received palm oil plantation pressure, although they have no palm oil plantation within their village.

Puan Cepak, Semayang, and Kehala Ulu are the village most pressured by palm oil plantations. While village that received less pressured from palm oil is Liang Buaya, Muara Kaman and Sedulang. Village that is received most pressure from coal mining is Muara Kaman and Sebelimbingan while the least pressured village is Liang Buaya, Puan Cepak, Sabintulung, Sedulang Semayang, Sangkuliman and Kehala Ulu. The village that received less pressured from coal mining was not crossed by coal transporting. Most villages are most pressured by environmentally unfriendly fishing practices except Sabintulung, Sedulang, and Semayang. Moreover, mostly village is moderately facing natural factor pressure except for Muara Siran, Sabintulung and Semayang experiencing least pressure and Kehala Ulu experiencing most pressure from natural factors. In total, Muara Kaman, Puan Cepak, Sebelimbingan, and Kehala Ulu village get the most pressured from all pressures.

As well as pressuring factor, the pressuring factors affect the state of fishery resources and water resources differently for each village. Overall, the most affected village is Puan Cepak, and the least changing village is Muara Siran and Sedulang. The village experiencing the most fish catches decrease is Liang Buaya, Muara Kaman, Puan Cepak and Kehala Ulu. The village experiencing the most water quality decrease is Liang Buaya, Puan Cepak, Sebelimbingan, and Semayang. The villages that are experiencing the most mass fish mortality are Sabintulung and Kehala Ulu. The village that is experiencing the most fishing ground reduction is Puan Cepak. Moreover, a village experiencing the most water level changing is Liang Buaya, Puan Cepak, Semayang, and Sangkuliman. The least changing village was Muara Siran and Sedulang, while the most changing village is Puan Cepak.

The environmental change also affects differently to human security in the research site. Muara Kaman and Puan Cepak are the villages experiencing the most economic fishery insecurity. In opposite, the village experiencing the less economic fishery insecurity is Muara Siran, Sabintulung, Sedulang and Semayang. Overall, the most human security affected by the current situation of inland capture fisheries is economic security.

One fisher respondent from the village that does not get compensation mentioned, "*There has never been any compensation. We fishermen find it difficult to install tools.* While another fisherman from another village stated, "*We in Muara*

Kaman do not accept the impact even though the company is not in our area. So, we can do nothing,". Whereas a fisher respondent from the village that got compensation stated, "*Many, thank God, many companies are helping in Muara Siran, building roads, breeding…goats, drinking water infrastructure is still under construction. High school is given a computer. Alhamdulillah, if it is from the company side, we do not blame it*".

Unjust response to water quality decreasing

Four villages experiencing the worst quality decreasing are Liang Buaya, Sebelimbingan, Puan Cepak, and Semayang. However, none of those villages have positive sentiments toward government efforts to control pollution. Even another village experiencing the least water quality decreasing has negative sentiment to government effort to control pollution except for Sedulang. For a village that is experiencing the worst water quality changing, water quality changing not only cause mass fish mortality but also affect clean water access.

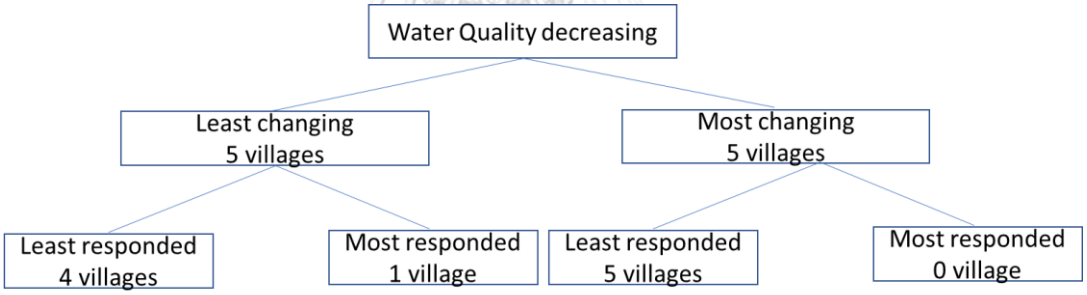


Figure 23 Unequal response to water quality decreasing

According to the polluter pays principle in Law no. 32 of 2009, companies causing pollution should offer compensation. However, to date, not even one company has been proven to commit to compensating water pollution even to a village located within companies' land concessions. Perhaps, tracing the source of pollution is problematic because it is the non-point source, its occurrence complexity, cross-sectoral and combined effects for an extended period, and because the plantations are side by side and the number is enormous. The affected community entitled to compensation cannot fight for their rights due to a lack of scientific knowledge. They have no scientific evidence to describe a pollution case, and they use layman terms such as smelly white water. Uncompensated water quality illustrates

how environmental benefits and losses are disproportionately distributed and illustrate power asymmetries between political and industry interest versus inhabitant of fishing communities. Although there is evidence of water quality decrease, government refuse to accept that evidence because government water quality data shows that the water is still below the quality standard.

Unequal response to fishing ground reduction

Fishing ground reduction and water level changing are two kinds of palm oil environmental impacts mentioned in the EIA. Therefore, its response has never been discussed in the EIA. However, the land conversion for plantations has been discussed so much in the land reform. So, the government has anticipated the potency of social conflict by obligating plantation companies to do partnerships with the local community, such as through plasma partnership.

Out of 5 villages involved in the plasma partnership, only Sedulang has positive sentiment to companies' response towards fishing ground reduction. This village communicates with the company effectively during public consultation and public meetings for land permits and EIA, especially during the preparation of agreements and agreements regarding royalty payments, how much capital, maintenance costs, length of credit period, and fees for the village development. Even at the beginning of the distribution of plasma proceeds, the community needed to fight to receive the royalty payment, but communication could resolve it. Thus, this village be able to control plasma partnership profit-sharing effectively.

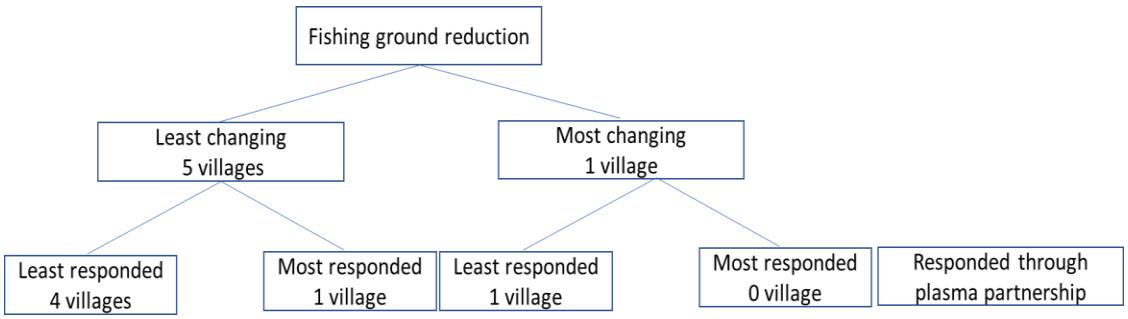


Figure 24 Unequal response to fishing ground reduction

The most village experiencing fishing ground reduction is Puan Cepak. However, the implementation of plasma partnership to respond to fishing ground reduction is different from Sedulang village. Puan Cepak sentiment to plasma

partnership is very negative. The issues in the Puan Cepak related to the shortage of plasma land and the late payment for plasma profit sharing. The community undertakes some communication strategies, such as negotiating with the company, but no agreement exists. In 2018, the Puan Cepak villagers demonstrated the company to demand a shortage of plasma land, but the company dispatched police to secure and repatriate the demonstrators. Lastly, they complain to the government about the lack of plasma land and the protection of river border areas to the Department of Plantations and District Environmental Agency, but there has been no response. Therefore, the community considers the government and companies are not transparent in communicating plasma profit sharing.

Unequal response to fish catches decreasing

Most villages experience fisheries catch decreasing. The most village experiencing fish catches decreasing are Liang Buaya, Muara Kaman, Puan Cepak, Sebelimbingan, Semayang and Kehala Ulu but the most responded village through fishing law enforcement are Puan Cepak, Sangkuliman and Kehala Ulu. So, the only village that got an appropriate response is Kehala Ulu. While other villages that are experiencing the same problem have not got equal response.

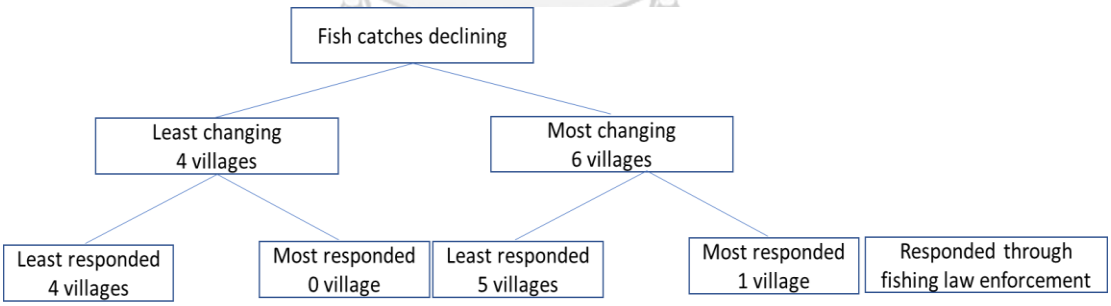


Figure 25 Unequal fishing law enforcement to response fish catches declining.

The government had a government assistance program to increase fish catches, but this program was unproportionally distributed. Out of six villages experiencing most fish catches decreasing, only two villages most responded, namely Sebelimbingan and Semayang.

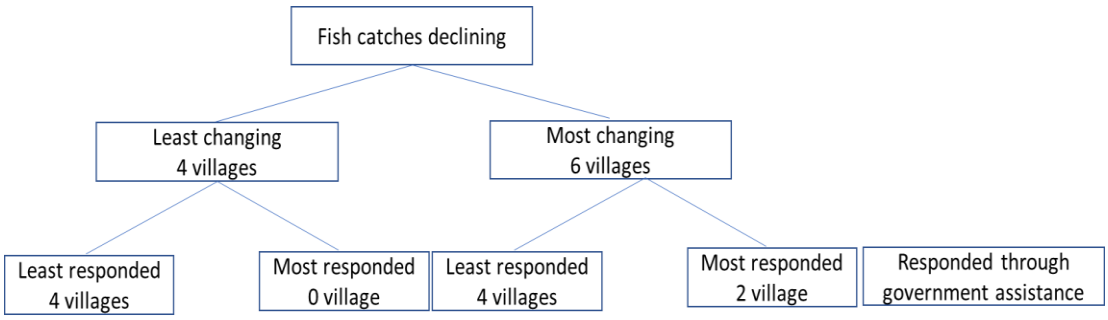


Figure 26 Unequal government assistance to response fish catches declining.

The government also had a fish restocking program to increase fish catches, but this program was unevenly distributed. Out of six villages experiencing most fish catches decreasing, only two responded most, namely Muara Siran and Semayang. Additionally, fish restocking has a side effect. Since the introduction of toman fish (*Ophicephalus micropelles*), the number of local fish sepat (*Trichogaster pectoralis*) has decreased. Since the introduction of tilapia (*Tilapia nilotica*), the Biawan fish (*Helostoma temmincki*) have decreased because they have lost and disappeared.

Moreover, toman fish (*Ophicephalus micropelles*) introduction endangers fish populations in rivers. The impact of fish restocking now felt by the community is the reduction of wild fish seedlings usually used by fishermen to be raised in cages. The most dangerous introduced fish is toman fish (*Ophicephalus micropelles*). This fish eats all types of fish, both larger and smaller, including Mahakam dolphin (*Orcaella brevirostris*) and shrimp.

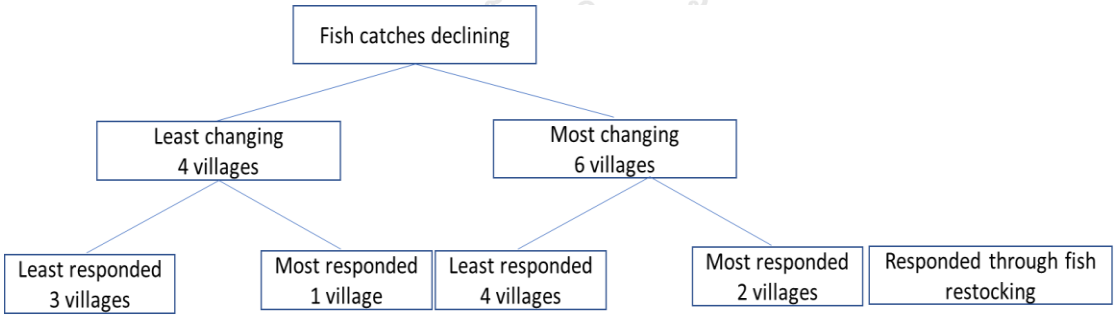


Figure 27 Unequal fish restocking to response fish catches declining.

The government has very often campaigned about the regulation of destructive fishing prohibition. Government collaborates with police, community groups, and the community in combating destructive fishing. The penalty for destructive fishing is six years in prison. Going forward, the government plans to be more assertive in terms of

1. Door to door inspection on destructive fishing gear,
2. Drive out temporary migrant fishers,

3. Crackdown on illegal catchers because they provide capital assistance to destructive fishing, and
4. Stopping aid for villages where citizens do the environmentally unfriendly fishing practice.

The feeling of injustice related to environmental unfriendly fishing is also led by government seriousness to combat it. The impression is captured based on consistency, frequency, and punishment for the perpetrators. There is no deterrent effect on destructive fishing. The perpetrators of destructive fishing ignored the warnings from the community because they knew that the government's capacity to secure the entire waters territorial from destructive fishing was insignificant. So, they are less likely to be punished.

Unjust response to mass fish death

The main issue of environmental management in many villages are pollution and fish mass death. The most village experiencing mass fish death is Puan Cepak, Sabintulung, Semayang and Kehala Ulu. As well as water quality decreasing, this problem is unresolved yet.

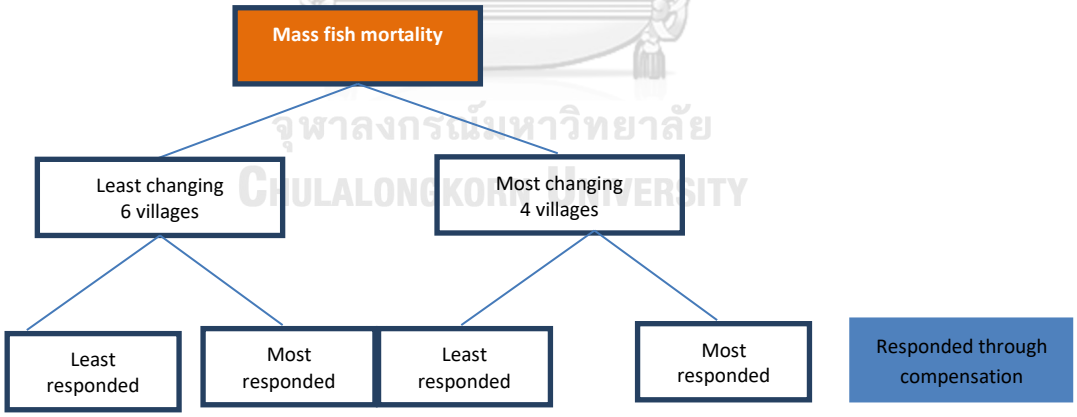


Figure 28 Unjust response to mass fish mortality.

In general, the community never report, complain, or protest because they did not know where to complain and felt disappointed to get compensation. The community can only report to the village head or the District Environmental Agency about a pollution case. Usually, companies do a great deal of improvement in river water quality after getting a warning from the village head or District Environmental Agency. In pollution that results in mass fish deaths, several agencies will conduct

inspections, including the Office of Plantation, Fisheries, and District Environmental Agency. However, the public doubts whether the inspection and verification were carried out correctly. Because the community considers that there has been collusion between the government and the company.

Unequal response to economic insecurity

At the village level, the present situation of inland fisheries impacts human security differently for each fishing village. Overall, the most human security affected by the current situation of inland capture fisheries is economic security. However, CSR is implemented differently at the village level, including Muara Kaman. Muara Kaman is the village experiencing the most economic fishery insecurity and community security but has not received community empowerment through CSR even if the village is located within the companies' boundaries so that Muara Kaman sentiment negatively to CSR. Conversely, the village experiencing less economic fishery insecurity is Sedulang and Muara Siran for community insecurity. Again, Muara Siran and Sedulang are two villages that have positive sentiment to CSR, while eight other villages had negative sentiment.

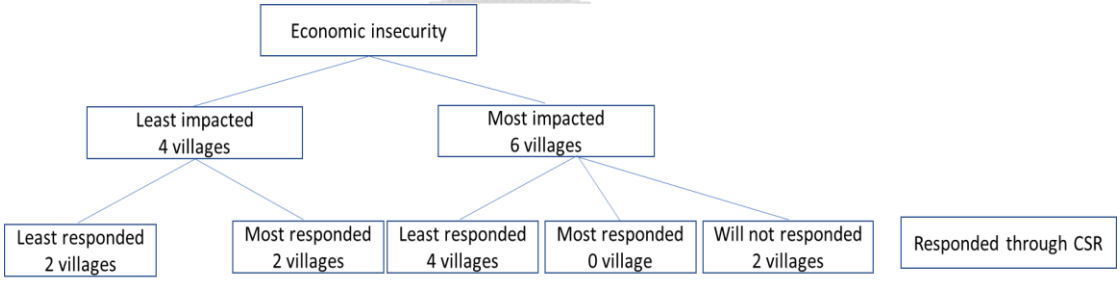


Figure 29 Unequal CSR to response economic insecurity

Muara Siran received many CSR funds because Muara Siran was included in the ring I of the transportation route of PT. Bayan Resources, there are jetty and Ship to Ship transfers that belong to the coal companies, namely from PT. Bayan Resources but not received from oil palm plantations because there are no oil palm plantations. The program includes hard programs and soft programs. CSR hard programs are road construction assistance. In comparison, the soft programs are health, education, and economic development assistance. The company will assist the villagers as long as the community represented by the customary head actively submits proposals to the company. The sorts of assistance can vary. Assistance from the company for the

community is quite frequent, such as clean water aids and socio-cultural activities. Each family gets a food package from the company every month, consisting of 5 kg of rice, 1 kg of sugar, and one box of teabags. Unfortunately, the company is less severe in empowering the community's passion, namely fishing. Many fishers are not severe to use these funds.

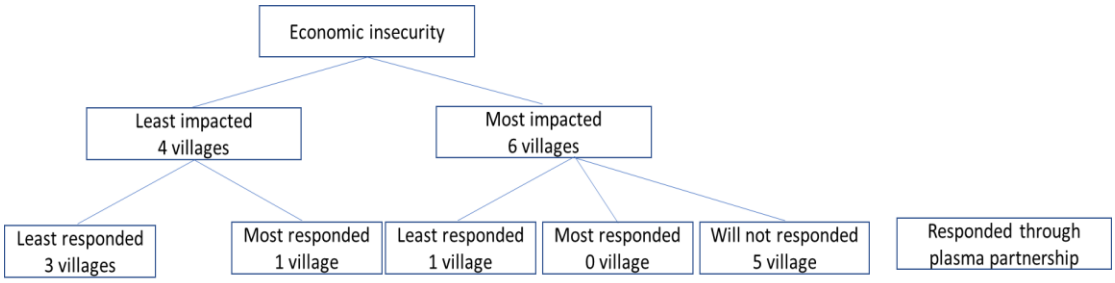


Figure 30 Unequal plasma partnership to response fish catches declining.

The sentiment towards plasma partnership as a response to the economic disparity is also different between the village. Out of five villages joining plasma partnerships due to converted fishing ground, the only village with a positive perception of distributive justice gotten from plasma partnerships is Sedulang. In contrast, Puan Cepak had negative perception, although they make the same complaint as Sedulang. In comparison, others village remains more silent than Puan Cepak and Sedulang. The majority of Puan Cepak villagers do not feel the company's positive impact because, in general, the villagers feel that the promised plasma revenue sharing is an illusion. The company dammed the rivers so that the community can no longer find fish, and income from fisheries is reduced. They hope to get a plasma profit-sharing commensurate with what they have sacrificed, but the reality is not. Those who get a positive impact are fishermen who turn professions into workers in the company, and only educated villagers can work in the company.

In some villages, plasma was adequate, but more villages felt disappointed with the arrival of plantations because the income from plasma was minimal, job opportunities in companies were minimal, and it harmed wetlands. Fishers feel a loss and do not get any benefit from that scheme. Even fishers think that that scheme is a trap, tricking and manipulating. Despite having plasma land, fishers did not experience procedural power. So, instead of minimizing inequalities, plasma increases inequalities and injustices (Sakai 2002). The loss of fishing ground implicates the loss of the next generation's opportunity to become subsistence fishers.

If we look at environmental justice, which is the main issue in society, it appears that these issues are related to the impacts caused by oil palm plantation activities that have not been responded to effectively by the government. This can be seen from the negative sentiments of most fishers in seeing the response to the issue, namely pollution control to control water quality -87.5%, compensation for fish mortality -95%, and plasma partnership -97.7% as a response to reduced fishing ground and economic insecurity (figure 12). Meanwhile, the government's lack of response to all these issues is closely related to the imbalance in viewing issues at the policy level and real and current issues in the field. This imbalance can be seen from the great attention of NGOs, government, and academia on driving factor (57.6%) compared to pressuring factor (13.3%), state (18.8%), and impact (10.3%) (Graph 1). The government's lack of response is also caused by an imbalance in viewing the issue of economic development and environmental development, the issue of large-scale project investment and the subsistence economy, and the issue of land and water. This imbalance of perspective can be seen from the greater attention to anthropogenic factors (79.3%) compared to natural factors (20.7%), the greater attention to oil palm and coal (53.2%) compared to fisheries (26.1%), and the greater attention to land issues compared to sustainability issues and water resources.

Table 18. Actor in charged to response DPSIR.

Actor in charged	Response	Negative sentiment	Problem solved	Problem contribution to DPSIR	DPSIR solved
Government	1 Pollution control	76.5%	Mass fish mortality	19.3%	State
			Water quality	19.4%	State
			Environmental security	7.9%	Impact
	2 Fishing law enforcement	32.3%	Fishing	26.1%	Pressure
			Fish catches decreasing	32.1%	State
	3 Government assistance	50%	Fish catches decreasing	32.1%	State
	4 Fish restocking	58%	Fish catches declining	32.1%	State
Company	1 Plasma partnership	57%	Economic security	30.3%	Impact
	2 CSR	36.6%	Economic security	30.3%	Impact
	3 Compensation	97.7%	Water quality changing	19.4%	State
			Mass fish mortality	19.3%	State
NGO	Social forestry	0%	Land concession	47.9 %	Driver
			Fishing ground reduction	17.2%	State

If we relate the above responses to the objectives of fisheries management, those responses are more weighted into short-term, which all related to change the state of fishery and water quality than medium-term and long-term responses. Short-term local responses that have been implemented in several villages include eradicating environmentally unfriendly fishing practices, government assistance, fish restocking, pollution control, and compensation. Nevertheless, all those responses' effectivity is low except for fishing law enforcement, in which the low effectivity is indicated by high negative sentiment (Table 14). Villages that receive pressure from pollution, destructive fishing, and seasonal factors but still maintain their fishing ground still have optimistic hopes for future fisheries' livelihoods. Unlike villages surrounded by oil palm plantations, where their fishing ground has been converted, they do not have positive expectations for fisheries' livelihoods even though they receive fishing gear and fish restocking assistance.

On the other hand, they do not simply get a substitute livelihood due to the loss of the fishing ground, which makes them insecure and vulnerable. This finding is in line with Santika'sSantika's study, which found that the move from freshwater fishing towards oil palm monoculture impacted village economic welfare. However, for the village that had chosen to embrace the palm oil sector, the socioecological debt accrued markedly higher than that village that had chosen to remain in the fishing sector. The benefit from increased economic welfare reduces dramatically after 9-11 years of transition, while a decrease in socioecological welfare becomes more pronounced (Santika, 2019).

The mid-term local response implemented in several villages is plasma partnership and CSR, although the opponent argues that the economic benefit of CSR is short-term and its effectivity to reduce environmental impact is very low except CSR (Table 14). Several villages have successfully responded to environmental changes caused by pressure from oil palm, coal, destructive fishing, and reduced fishing ground by utilizing plasma partnerships and CSR. They can tolerate and adapt to social, economic impacts, etc. This village is a village that is actively involved in the process of granting land permits and EIA. They are relatively more capable of fighting for the rights arising from losing their fishing ground, for example, the right to obtain profit sharing from plasma partnerships and CSR. In sum, the state has a

vital role in granting land use permits and extending its influence in making regulations regarding water quality, while at the same time normatively private and government initiatives in repairing environmental damage through PPP and CSR.

Meanwhile, the ecosystem-scale and long-term response that has been implemented is social forestry. The only village that has successfully implemented a social forestry scheme can better maintain its fishery system than other villages that do not run social forestry. The ability to withstand several pressures or return to the initial shape when the pressure is removed is referred to as resilience (Atkins, Burdon, Elliott, & Gregory, 2011). When viewed from the stakeholders involved in this social forestry scheme, it appears that this scheme involves local, national, and international stakeholders. The Indonesian government initiated and regulated this scheme, but the financing comes from Indonesia and REDD funds. To reach the village level, REDD is advocated by NGOs in collaboration with experts from universities at the local level.

4.2.2.3 Procedural injustice and unequal distribution of response

The unequal response to environmental changing and its impact correlates to unequal participation in environmental management planning is related to all decision-making processes in the planning step, including development planning, land use and spatial planning, land concession, and EIA. Participation in environmental monitoring is related to monitoring a project's ongoing process and environmental changes and impact through complaints, protests, or environmental justice claim-making. Two villages involved in those decision-making processes had better ability to effectively demand relevant actors to commit to prevent, respond, and reduce environmental impact and enhance fishing communities' adaptability to environmental change through the complaint, protest, or environmental justice claim-making. Therefore, the village that had a positive sentiment toward the total DPSIR is the village that has a positive perception of distributive justice (Table 11). In opposite, the other eight villages that have not been involved in those decision-making processes had a negative sentiment to the total DPSIR and had a negative perception of distributive justice.

Two villages that had a positive perception of distributive justice were Muara Siran and Sedulang. As been mentioned above, those two villages have been involved

in the decision making, have the lower pressure, state, and impact, got much more response to reduce the impact of environmental changing and got much more benefit of environmental change. Hence, these two villages have a positive perception of distributive justice. The company's activities certainly harm Muara Siran fishers, but they get more benefit than negative impact. So, the community feels benefited from the existence of the Bayan company. The Muara Siran fisher was unsure whether the company contributes to reducing fisheries resources because injustice perception arises from the internal fisheries sector, especially from predatory fish cultivation activities, and depletes wild fish from nature without leaving it for traditional fishers. Whereas Sedulang fisher feels that what the company has done is fair and benefits the community. Every decision making related to plasma management always involves the community.

Table 19. The comparison of DPSIR, protest and perception of justice.

Categories	Themes	Sedulang	Puan Cepak	Liang Buaya	Sabintulung	Kehala Ulu	Muara Kaman	Muara Siran	Sebelimbingan	Semayang	Sangkuliman	Scale of sentiment	Most (%)	Least (%)
Driver	Development Planning											0 -1	10	90
= Most participate	Land use and spatial planning											+2-1	20	80
= Least participate	Land concession											+4-6	20	80
	Environmental Impact Assessment											+2-4	20	30
Pressure	Palm oil											0-7	60	40
= Least pressured	Fishing											-1-5	70	30
= Most pressured	Coal mining											0-4	30	70
	Seasonal factor											-1-7	60	40
State													60	40
= Least changing	Fish catches declining											-3-8		
= Most changing	Fishing ground declining											0-10	10	90
	Mass fish mortality											+1-6	40	60
	Water quality											+1-6	50	50
	Water level changing											0-4	70	30
Impact	Economic security											+1-7	60	40
= Least impacted	Community security											0-4	50	50
= Most impacted	Health security											0-4	40	60
	Personal security											+1-2	30	70
	Environmental security											0-3	20	80
	Food security											+2-4	30	70
	Political security													
Response	PPP (Compensation)											+1-3	10	90
= Most responded	CSR											+4-5	20	80
= Least responded	Fish restocking											+2-3	30	70
	Pollution control											+1-2	10	90
	Fishing law enforcement											+5-4	30	70
	Plasma											+3-4	10	90
	Government assistance											+2-1	20	80
	Social forestry											+1-0	10	90

4.2.2.3 Hypothesis Confirmation

From the above finding, each village has foreign involvement in the decision-making process, different kinds and levels of pressure, different kinds and levels of state, and different kinds and levels of impact and different kinds of response. In the meantime, we also found a pattern that from Out of 10 villages, only two villages had a positive perception of the environmental decision-making process, so that they have the lowest level of pressure, state, and impact while they got the most response. Therefore, H1.4 is confirmed that decline in the fish catch led by the lack of environmental justice consideration for inland fish capture in the decision-making process along the chain of DPSIR.

4.3 JUSTICE CLAIM AND PERCEIVED JUSTICE

4.3.1 Complain or protest

Talking about environmental justice in the MMA is very complicated because the sources are cross-sectoral. Environmental impact data is data that is difficult to access because it does not only talk about the ecology itself but also talks about the disparity of the rich, poor, rural, urban, and local community-large companies, and derivative issues such as provocation, thuggery, overlapping land and the interests of the authorities. Besides appearing in the policy-making process, environmental justice also arises in how the actors respond to the likely impact of environmental damage. The ability to respond to impacts is related to how environmental good and environmental bad are distributed at the local level. Fisher's ability to respond to the impact influences social grievance and community complaints, indicating a perception of injustice. Complaints and protests reflect injustice (Sulaiman, Abdullah, et al., 2014). Community grievance indicates a justice claim (Kurtz, 2003) and indicates that the system is not working well (Higginbotham et al., 2010). Complaints that do not reach the government do not mean there are no complaints because many communication chains have broken or substantial evaluation mechanisms. People do not complain because they do not have idealism in fighting for their rights; they are opportunistic in responding to pragmatic government or military force. Pojman (2015) assumed that simply because people are silent or inactive or do not protest, people consent to be harmed. However, tacit consent represents

1. a failure to grasp the nature of the situation,
2. a lack of understanding of proper procedures, or
3. a misunderstanding about how long one must decide whether or not to dissent.

From the fisherman's point of view, they do not make a complaint because 1) They do not know the complaint mechanism, 2) some villages are not included in the company's ring. Local people called ecological boundaries the first ring and social boundaries the second ring. Ecological boundaries remark a place inside a company where companies' activities directly impact it. At the same time, social boundaries remark some villages that existed within companies' concessions. In the EIA, companies oblige merely to manage pollution impact and do CSR within its ecological boundaries, and 3) they did not know which company was guilty.

Perception of injustice would create dissatisfaction and conflict (A. Martin et al., 2014). Complaints about the death of fish entering the fisheries service because it is the primary duty of the Fisheries Department. There used to be complaints from the public regarding pollution and fish mortality cases. The community suspects and accuses the company of being the responsible party. However, after reviewing, the cause of fish death is a combination of several factors, namely high rainfall and eutrophication. Therefore, complaints received have never been processed and made a report.

Complaints regarding illegal fishing cases are addressed to the Fisheries Agency Regency at the district level and then submitted to the province for monitoring. If there were illegal fishing activities found at the time of surveillance, the supervisor confiscated evidence for the detention of the perpetrators. The punishment was sometimes in the form of a deterrent effect or given effective action and coaching.

The government has a unit under one complaint unit directly led by the Governor at the provincial level. This unit's function is to integrate and control all kinds of complaints. However, there have been no reports of land disputes between plantations, fisheries, coal, fisheries in public waters, and pollution entering the Governor's office. Maybe because the scale is still not so big, the low level of reports on citizen protests reaching the provincial level maybe because it can already be

handled at the district level because that is the district's authority. Only protests from the village of Muara Siran about coal pontoon traffic ever reached the provincial level. However, protests about pollution in public waters have never reached the province level.

At the national level, complaints about environmental damage are made through the Ministry of Environment and Law Enforcement (Gakum). The Gakum is an extension of the Ministry of Environment and Forestry with law enforcement expertise. Between Law Enforcement Agency and Environmental Agency coordinate with each other, usually before entering the Gakum, the complaint first enters the Environmental Agency then is forwarded to the Gakum.

At the local level, complaints coming into the Environmental Agency, the Forestry Service, fisheries agencies, Fire Concerned Communities at the village level, and Natural Resource Management Institute, which expected to reduce the problems of environmental damage and the decline in fisheries production that are widely complained.

In principle, the Environmental Agency accepts all types of complaints; if the complaints follow the Environmental Agency's duties, the Environmental Agency makes a complaint evidence form. If the complaint is not the domain of the Environmental Agency, Environmental Agency directs it to the authorized Agency. Thus, the settlement of pollution disputes is gradual, and if the district is unable, the province can be assisted in the center cannot assist the province.

Conditions for receiving a pollution complaint are: (1) The distance between event time and reporting time is as short as possible, (2) Include the reporter's identity, (3) Include lab test documents, (4) Complaints about pollution cases that cause fish deaths in cages must be supplemented with data on the purchases of feeds, seeds, and production (5) Events must be reported as soon as the evidence can be found because the water conditions change rapidly. Administratively, complaints should be written, but most are only verbal. The letter was addressed to the company and the district head with a copy to District Environmental Agency, Fisheries Agency, Sub-District Head, Village Head, and Police.

The procedure of complaint depends on the type of loss. In general, the pollution case is under the responsibility of the Environmental Agency at the district

level. The community must immediately report it to Environmental Agency so that Environmental Agency can immediately verify it. Environmental Agency takes water samples, and the Fisheries Service only accompanies them. If the company is proven to have committed a violation, everything is resolved administratively, and the company is obliged to correct and provide compensation to the injured party.

Pollution cases alleged to coal mining are under the responsibility of ESDM. Whereas the pollution case is related to plantation activities, the complaint letter is sent to the Plantation Office. In the case of pollution suspected to be caused by plantation activities, the Plantation Office facilitates the complaints process from the community. If there are complaints about any cases (environmental, economic, and social) related to plantations, the community can file a complaint through the Sustainable Plantation Communication Forum. In the forum, all complaints were processed, and the solution was sought by continuing to coordinate with the Forestry Service, Environmental Agency, and the Land Service what needs to be clarified when the community is disappointed with the plasma profit sharing.

Then if there are dead fish, sir, is there a report to the company? We used to be but were ignored (Fisher).

People here are ignorants. They seem to accept what they are. The term never complained about the problem of wastewater pollution (Fisher).

If people are disappointed with the pollution allegedly caused by company activities, they can communicate it collectively and in an organized manner by equipping themselves with evidence of disappointment. The government realized from the beginning that fertilizers and pesticides could cause pollution. Consequently, the government is continuously lookout toward reports of complaints concerning fish death cases from the public because the public easily politicizes pollution cases to get compensation from the company. Therefore, complaints about pollution cases are sometimes hoaxes. Because of the community's sensitivity, only the cockroach was asked for compensation, for example, by taking the company's promise to build clean water infrastructure, which would later be managed by the village government or water tendons that the company regularly filled. For the government, cases of pollution that occur once and are not repeated are not referred to as violations but are accidental. However, for the public, the case was politicized as a violation.

There are public relations from the company, so it is immediately replaced if there is an incident from the public relations in charge (Fisher).

Besides those mainstream findings, this study found striking finding that three villages of ten villages that are surrounded by many companies and are very close to companies do not always have higher complaints because of their involvement in environmental management decisions from planning to supervision, namely village development planning, and village spatial planning and EIA and or CSR and or plasma partnerships. One village whose fishing ground was converted into plantations but whose communities were actively involved in plasma partnerships also had lower complaints. Villages with effective plasma partnerships are villages that have succeeded in communicating with the company effectively, especially during public consultation and public meetings for land permit and EIA, especially during the preparation of agreements and agreements regarding royalty payments, how much capital, how much maintenance costs, length of installment payments, and fees for village development. At the beginning of the distribution of plasma proceeds, the community needed to fight to receive the royalty payment. Even the community expressed their disappointment by blocking the company's road, but communication could resolve it.

The demonstration was taken to the police. We do not dare. Yesterday it was also a demo, but it is hard. It is hard to have someone playing there. I have had a few demonstrations often. However, until now, we do not demo anymore. It is useless to do it. We demonstrated the problem of plasma deficiency. That is why the people here often protest, often just demonstrations about plasma issues. Yes, the problem of plasma, you know, here is the problem of plasma, okay. But in reality… (Fisher).

Demo often. Look at the district records in the district office. Let us look at the records. We have many demonstrations from the Office of Cooperative and Assistant 1, because there three companies in this village and all of them have problems, we are fighting for this, and now we have the right to have them. They are united to do it (Fisher).

Two villages demonstrated that the village could reject the district head's land permit plan and regulate its spatial planning using village authority to draft a constitution. With the sovereignty of regulating the space it has, the village has

succeeded in maintaining its wetland ecosystem through social forestry schemes, and therefore its fishery catches are also better than other villages. Interestingly, those two villages are intensively advocated by NGOs. NGOs' role in conducting awareness, assistance, training, and advocation is essential. However, NGOs are often rejected in some areas because there are instant public interests. In some villages, NGOs succeed in making the public awareness and capacity building, but when companies offer instant things, the public quickly changes their minds, and NGOs can no longer enter there.

4.3.2 Perceived justice

Fair and unfair depends on two points of view, whether on the side of the beneficiaries or the non-beneficiaries. Impact recipients are divided into those who are facilitated and not facilitated. Facilitated beneficiaries and beneficiaries must say that they are fair and vice versa. The community most burdened with environmental damage is the community that is not facilitated to get out of the problem. From the context of the obligation to protect the environment, the community has the right to protect the environment. If a company should rehabilitate the environment, so does the community.

According to Dharmawan et al. (2016), before determining who is responsible for environmental damage caused by investment activities whose impacts are also felt by fishermen, we need to look at investment issues starting from the upstream, namely on the politics of space and licensing. Because according to Dharmawan et al. (2016), expansive plantations are indeed "desirable" by the government. Until now, the government still relies on revenue-sharing funds from coal and palm oil. Although investments in the extraction of natural resources such as mining and oil palm could improve the welfare and absorption of labor, behind it, all take place by force seizing land under the guise of buying and selling land. Although if these lands are sold at very high prices, people who are accustomed to an agrarian mindset rarely can invest the proceeds of the sale of land in profitable investments in the long term and sustainable. Meanwhile, people who are not willing to sell their land will be surrounded by company land, which will have no choice but to sell it to the company.

Thus, the impact of an investment is like two sides of a coin. The negative impact on the fisheries sector is the pollution of rivers due to waste disposal. While

the positive impact is that coal can drive the economy of the community around companies. Community income increases because of the activities of providing the needs of mine workers. However, despite having a positive impact, the positive impact is temporary; it only occurs when mining is still operating and will stop when mining closes. According to Suharto et al. (2015), residents of Kutai Kartanegara felt more negative changes than positive changes after coal mining activities were operating in their area. In line with Suharto, Yuwana et al. (2012) also found that coal mining in Kutai Kartanegara did not benefit the local population and did not absorb many local workers because of its capital-intensive character.

Based on Muhdar's calculations (2015), the actual benefits and value of natural resources in East Kalimantan Province lost due to the exploitation of natural resources for the next 15 years and if there is no improvement and if the damage does not increase is Rp 138,454,500,000,000. The value of the loss is significant when compared to the total benefits obtained in the state budget, and it is undoubtedly the case because in the financial system in the current era of decentralization, the number of income payments from the granting of permits to use forest zones deposited to the central government is mixed with revenues from other sectors and other provinces. With this system, provinces contributing to state revenue from natural resource exploitation do not distinguish it from provinces that do not exploit natural resources. As a result, the costs of environmental recovery do not adequately formulate in the central and regional revenue-sharing funds. Moreover, the East Kalimantan Regional Budget provides the smallest budget to the Environment Agency compared to other work units, making it difficult for Environmental Agency to prepare the costs for post-mining environmental recovery (Muhdar, 2015).

The positive and negative impacts of oil palm and coal depend on their location. Oil palm plantations located in the highlands, of course, have different impacts from oil palm plantations on peatlands, and that is still different in impact between thick peat and thin peat (Heriyanto, Asrol et al. 2018). Most people consider peat in the Middle Mahakam Area to be as thin as peat in Sumatra. The peat in the Middle Mahakam Area reaches 13 - 40 meters, a very productive fishing ground. The expansion of oil palm and coal and the mainland certainly competes with agriculture, whereas the expansion in the low-lying watershed area has impacted fisheries.

Considering the thick peat soil and MMA ecosystem type where the productivity of oil palm plantations is very low, the distribution of plasma plantations of two hectares per family is very improper. In fact, with the same area, two hectares, fishers could get a decent income if the area is used for fisheries. The impact of natural resource exploitation activities for oil palm plantations in MMA is a threat to the fisheries sector. Many fishers must change professions. Even if there are fishermen survive, their life is no better than before. Those who survived being fishers felt the most negative impacts compared to those who switched professions to companies. Without a company project, local people live independently.

"The company is not fair. where is the fair in this" (Fisher)

The meaning of justice by the community as the recipient of the impact is unique. Firstly, the character of the community that prefers to allow money to make it easier for a company to get community approval if the company (both legal and illegal) is willing to give money that is distributed through the administrative leadership at the lowest level, namely RT in the initial stages before the company operates. Secondly, for the environmental damage caused by the company, the community is also more likely to get compensation in the form of cash. However, if there are damage and loss that is force major, the public shouts in protest at the company.

For companies, what they do has fulfilled the principle of justice because their main principle is to get as much profit as possible while still obeying the rules set by the government, for example, by complying with CSR rules, compensation, plasma, and environmental management. If people are disappointed with the pollution allegedly caused by company activities, they can communicate it collectively and in an organized manner by equipping themselves with evidence of disappointment.

From the perspective of the district government, oil palm has become the "prima donna" of regional economic development besides mining. For the government, the fair protects the public and investors through the enforcement of environmental rules and laws. If the government tries to foster companies to carry out environmental management following existing regulations, the government has carried out environmental justice. In addition to the impact recipients, the government has also helped and protected them. Therefore, the government considers it to be fair.

Most villagers do not feel the positive impact of the company. Only a few residents feel the positive impact, namely those who work in the company. Educated only can work in the company. At present, in general, income from fisheries is reduced. However, fishers who turn professions into laborers in their welfare are increasing. However, this is not the case with fishers who do not work in the company. In other words, not all fishermen feel the positive impact, but all fishermen feel the negative impact.

Fishers who turn professions into laborers in companies are lower in productivity than migrants, making them vulnerable to dismissal. Moreover, Fisher is accustomed to relaxed work discipline, adjust to the natural rhythm, have a hunting instinct, and have high collectivity, so that prioritizing invitations from neighbors who organize weddings on working days is difficult to adjust to the ethos and discipline of industrial work. The solution offered by the government and companies to fishers who lose their livelihoods due to the reduction in fishing areas is the plasma scheme. However, the villagers felt that the plasma profit-sharing promised initially was not following reality, and the company dammed the rivers so that the people could no longer fish. They expect to get a plasma profit-sharing commensurate with what they have sacrificed, but the reality is not. The community feels that this is a form of injustice. Therefore, the Puan Cepak villagers often protest and demonstrate to demand plasma in terms of area, location, and results that are not as promised. However, instead of helping fishers solve the problem of plasma yield sharing, the government instead says that if the community is disappointed with plasma profit sharing, what needs to be clarified is how to manage the plasma cooperative because if the cooperative is transparent, the community will get a share after the plant is three years old.

The most benefited communities are:

a. Local people who work at the company

"*For non-fishery, there are new job opportunities. For fisheries, there are also new jobs, right*. (Academia). Another academia added, "*If it is cool, it is clear that the people around there are working in coal companies, right* (Academia)." Finally, the fisherman argues, "*In fact, there are many*

negatives. If you are not a fisherman, the positives are many. Like being able to work with palm oil".

b. The second generation of young fishers. They prefer to become workers in the company because there is a certainty of income that is far more interesting. Academia stated, "*Many have converted their jobs from fishing. This generation of fishermen's children prefers to be laborers on the plantations rather than being fishermen. However, for them, the certainty of income is much more attractive".*

c. Everyone benefits from a good mine because there is a new money turnover outside the stakeholders directly involved with the company, including the community around ring 1. Even though they feel the most negative impact, but they get compensation commensurate with the loss. The government stated, "*Those who benefit are the people around the number one ring*."

The affected communities are:

a. Fisherman who are local people who receive negative impacts but do not work in the company. Fisher stated, "*We are real fishermen. Our workplace is on the river. Therefore, fishermen receive many negative*".

b. The most disadvantaged are fishermen because, first, fishers lose their fishing ground. The government stated, "*Well, If the people around ring number one are burdened, it could be people in ring 1, they are impacted directly or indirectly*. Second, they have not absorbed labor in the company. Third, they are impacted by environmental damage due to company activities. Academia mentioned, "*So there may be more fishermen in the wetlands if in the forest there are automatically people who are farmers. I see the case of the Dayak tribe. Now, they are affected. They were told to stay and given this land to be taught how to garden. It had been taught not long ago for ten years. Until then, the land was retaken to be used as plantations. Yes, how difficult is justice there*? Fourth, although they feel disadvantaged, they cannot sue the company because they also agree with the company operating there. The government stated, "*Well, if we fish, if you are a fisherman, you want to say it is a loss, it is a loss. However, if we go back to the initial documents, they are also the ones who approved the company operating there, whether you want it*

or not. So,(Hapsah and Mas'udi 2012) if there are burdens, they feel they have been harmed, like it or not, mediation is the only way".

All groups of people who live along the Mahakam River feel the negative impact from the presence of coal and palm oil operating in the upper reaches of the river, especially fishers whose fish catches are declining. However, sociologically, Middle Mahakam fishers have the potential to have a negative impact because of their cultural character:

a. Not realizing the economic value of fisheries, they do not value it with money because it used to be very abundant in nature. They wanted to eat fish, but they did not count if the fish had to be purchased. So, they are easily tempted when a company comes in and offers a salary that they think is big enough. However, if they calculate the results of their fisheries so far more than the salaries issued by the company.
b. Assuming income from the fisheries sector is uncertain because the fish harvest season is only around 3-4 months in the rainy season and one month in the dry season. The rest are unemployed. Instead, they consider the income from working in the company more satisfying. Therefore, the income from working for 3-5 months in the fisheries sector is higher than the income from working in the company for one year.

They were thinking instantaneously and undervaluing the value of the land. What they think is how to get land compensation and then spend it to buy a motorized vehicle. In line with this finding, Hapsah and Mas'udi (2012) found that East Kalimantan people, especially indigenous people, will always be in a marginal position because they feel satisfied with what they already have and tend to isolate themselves from change, and tend to have a short-term mindset and instant (Hapsah and Mas'udi 2012).

4.3.3 Hypothesis Confirmation

This study found that each village has different grievances, complaints, and protest behavior. Most villages had a negative sentiment to grievance and complaint response given by companies and government representatives in all levels because the grievance and complaint never be responded. The village that made the complaint and protests does not necessarily get companies' attention to reduce environmental

changing impact. Out of 10 villages, four villages actively convey their claim-making to the government or company, but only two villages got positive responses, namely Muara Siran and Sedulang. Whereas the other six village does not actively convey their claim-making.

Table 20 Claim of environmental justice and perceived justice

Theme/ Sentiment	Sedulang		Puan Cepak		Liang Buaya		Sabintulung		Kehala Ulu		Muara Kaman		Muara Siran		Sebelimbingan		Semayang		Sankuliman		Total	
	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-
Claim of environmental justice	1	0	0	6	0	2	0	6	0	3	0	2	4	0	0	1	0	5	0	1	5	26
Perceived environmental injustice	4	0	0	3	0	2	0	4	0	2	0	4	4	2	0	2	0	3	0	2	8	26

Out of 10 villages, only two villages that actively conveyed the grievance and complaint to the company got a positive response, namely Muara Siran and Sedulang. Village's ability to participate in the environmental monitoring through effective protest and sue relevant stakeholder obligation to reduce the impact link to the perception on environmental justice. The village that made a complaint and protests effectively had positive sentiment on environmental justice. Most villages had a negative sentiment to grievance and complaint response given by companies and government representatives at all levels. The grievance and complaint never be responded. The village that complained and protested does not necessarily get companies' attention to reducing environmental changing impact.

Muara Siran fishers complained about their anxiety over the disturbing pontoon activity. They report it through several channels, directly to the company or through the government. Complaints directly to the company are sometimes well responded. For example, if there is an incident where a pontoon has hit a fishing gear and cage, the fisherman can immediately convey it to the company's public relations. Company response fishers' complaints by compensating fisher lost and implementing CSR program. Nowadays, fishers are not too busy with conventional side jobs, such as looking for wood in the dry season. Now more alternative livelihoods, for example, working in a coal company and swallow cultivation. To further improve the economy of fishing communities that do not have side jobs, the village government is advocating and strengthening the community entrepreneurship capacity in collaboration with companies and NGOs.

In the meantime, Sedulang villagers are the people who are the most active in conducting demonstrations. The villagers do social movement to claim their rights directly to the company via telephone, even did not hesitate to carry sharp weapons, demonstrations in front of the company had blocked the company's roads and even protested to the company's center in Jakarta. The problem that is often complained by Sedulang fishers is the problem of late payment of plasma profit sharing. The complaints channel commonly used is through the Cooperative, Police, or District Police, and or directly to the company. The demands of Sedulang fishers are usually met quickly because the insistence of residents is collective, not individually.

The above qualitative finding is also proven quantitatively in which protest behavior or claim of environmental justice moderately correlate with perception of environmental justice. Thus, H1.5 is accepted that the higher the perception of environmental justice, the fewer claim/complaints/protest.

Table 21 Chi-square result of perceived justice and claim of environmental justice

Chi-square	Chi-square ratio	Exact sig. 2-sided	Exact sig. 1-sided	Contingency coefficient	Approximate significance
Perceived justice and claim of environmental justice	.000	0.000	0.000	.563	.000

4.4 JUSTICE: HOW THINGS OUGHT TO BE

Justice is a classic issue of humankind and related to the distribution problem. Along with population growth, globalization, development, and modernization, the environmental problem is increasing. How does environmental quality distribution determine inequalities between social class, gender, and race? Environmental quality distribution is determined by power relation and access to knowledge. Environmental injustice reflects unsustainability, means that social justice issue as one of sustainability pillar does not meet. Environmental justice very much talking about what should be distributed. However, what should be distributed is not the same as what should be preserved. In discussing sustainability, we must discuss what must be preserved, namely critical natural capital without which humans cannot live. So, environmental sustainability means that what element of the environment must be preserved without it, the human cannot live. If we link that definition with this study,

we must answer some questions, 1) if there is no fish, who loses? Can the lost fish biodiversity be substituted? 2) If the water is polluted, who will lose? Can polluted water be substituted? 3) if the height and volume of water decrease, who will lose? Can the water level and water volume be substituted? Moreover, 4) If the fishing ground decreases, who will lose? Can fishing ground be substituted?

The central idea behind the sustainability of fisheries is that fisheries as a renewable resource must be managed and harvested within the level of sustainable yield to meet present needs without compromising future generations' needs. Basic ideas about fisheries sustainability embedded with the concept of population equilibrium in which to maintain population balance, the number of caught fish must not exceed maximum sustainable yield or total allowable catch. The concepts of maximum sustainable yield and total allowable catch have been established on the assumption of input and output. Maximum sustainable yield only considers how to maintain single species. However, nature is a complex system. Both natural systems and human systems interact dynamically with development policies and planning, fisheries management, fisheries development programs, and fisheries research. Moreover, these three systems affect each other.

Fishery dynamics that occur in the smallest scope are a resonance of the ecosystem of life at the global level. This is the case with development policy planning. Sustainable fisheries development is the 14th agenda of SDGs, where SDGs is a development policy plan at the global level. Policy planning covers the overall objectives to be achieved, policy directions, legislation, and decisions. At this global level, policy planning is formulated from the synthesis of theories related to development which are then operationalized into key targets, priorities, and issues.

At the regional level, the key targets, priorities, and critical development issues are derived from the global level. Thus, regional development targets are set based on the selection of targets from each country, the needs assessment, the orientation of domestic or foreign fishing needs, the favor of artisanal or industrial fisheries, the role of women in fisheries, and the implementation of participatory development. At the same time, the priority of policy planning at the regional level is determined based on each country's ability to integrate development and development planning, capacity building and institutional, scientific development assessment, monitoring and

evaluation, and support to post-harvest activities. Meanwhile, critical issues of regional fisheries development include sustainable development, environmental protection issues, flexibility and innovation maintenance issues, policy process and program determination issues, and inter-institutional cooperation issues.

Development policy planning at the regional level is then translated into development programs. The translation is more determined by the pattern of the development program planning approach, whether it is top-down, bottom-up, or a combination of both (participatory). In Indonesia, development program planning has moved into a participatory approach. The development program contains a plan to implement a normative development policy plan into an implementation program. Among national fisheries development programs are watershed protection programs, fisheries infrastructure development programs, fishing gear training programs for fishers, purchasing programs or adoption of environmentally friendly fisheries technology, cooperative development programs, fisheries organizations, and post-harvest activity improvement programs.

At the local level, sustainable fisheries development programs are effective if planning from macro to mezzo is more dominated by vertical communication, then program implementation at the micro-level requires horizontal communication. How sustainable fisheries development programs are communicated affects how these micro-level fisheries actors treat fishery resources.

The response previously mentioned in the former chapter is an expected response gathered from respondents talking about fisher's claim about distributive injustice during the interview. Claims about equity and justice are about the distribution of objectives and perception of environmental benefit and burden and the mechanism and means of protection from the burden and harm. So, the expected response previously discussed does not necessarily reflect the best solution for fisheries and environmental sustainability, but it reflects fisher demand for distributional justice and fishing right. Some of them even reflect a pragmatic response to unexpected environmental change, some of them are voluntary, and some are obligatory. So, to achieve fisheries sustainability, we had to find an additional possible solution. However, although many of these responses are pragmatic, some of the best practices that have been implemented in several villages can be scaled up in

other villages to reduce inequalities between villages.

Briefly, those responses weighted most on short-term response to tackle fisheries and fish resources state changing. If we put that response in the DPSIR framework, that response weighted more on state chain than the driver (long term) and pressure chain (mid-term). In fact, according to Charles, sustainable fisheries management needs to pay attention to short-term, medium-term, and long-term management aspects. Short-term management is operational. This management is carried out if the problem is on a local scale at the fishing ground level, which is daily, seasonal, and directly contacts fishermen's behavior. One of the operational management steps that need to be carried out is to monitor fishing actions directly. Medium-term management is carried out on problems that occur at the ecosystem level. Problems at the ecosystem level are usually annual, multi-year in nature, and usually related to regional and national regulations. Problems at the ecosystem level need to be resolved through tactical management, such as determining total allowable catch and portfolio management. Meanwhile, long-term management is applied to a multi-ecosystem problem scale where the solution must be approached using a policy approach and development objectives of many countries (Charles 2008).

4.3.4 Does compensation is fair solution?

The debate on pollution in MMA was represented by four groups: fishermen, government, NGOs, and scientists. The government, in this case, includes the Fisheries Service, Environment Agency, and Mining Service. This debate extent of ecological and social boundaries defining in the EIA, polluter pays principles and CSR. Based on the polluter pays principle stated in Law no. 32 of 2009, companies that have committed pollution should provide compensation. However, the problem is that not a single company has been proven to cause pollution and mass fish mortality to date. Every time there is a report of pollution and mass fish deaths, the government follows up quickly, but the investigation results show that the company's waste did not cause the death of the fish.

The community who entitled to get compensation unable to fight for the right because of:

1. Fishers argue that there are differences between pollution caused by oil palm, coal, eutrophication, and destructive fishing. However, instead of

using scientific evidence to describe a pollution case, people use lay terms such as the color of the water to turn white. It feels slippery and smells terrible. Based on fisher's knowledge, destructive fishing impact on fishery are not as significant as pollutant and sedimentation caused by expansion of palm oil plantation based on three argumentations: a) Destructive fishing has been practiced a long time ago before palm oil and coal mining booming. However, the catch level remains stable and only influenced by the seasonal factor, b) It is localized and limited on where destructive fishing is carried out, and c) Fish are temporarily dead just after electro-fished, and it would live again. It is known that fish mass mortality often occurs in capture-based aquaculture when there is a combined effect between pollutants, eutrophication, and upwelling during flooding because fish are trapped in cages.

2. Some villages are not included in the company's ring. Local people called ecological boundaries the first ring and social boundaries the second ring. Ecological boundaries remark a place inside a company where companies' activities directly impact it. At the same time, social boundaries remark some villages that existed within companies' concessions. In the EIA, companies oblige merely to manage pollution impact and do CSR within its ecological boundaries.
3. Fishers did not know which company was guilty. The problem that arises in enforcing the Polluter Pays Principles is unclear who the polluter is because the plantation locations are side by side, and the number is very large. Tracing the sources of pollution is not easy because the cause of the occurrence is complex, cross-sectoral, and combined effects from various activities in an extended period. Moreover, mass fish death frequently occurs outside companies' concessions, and nothing of this phenomenon is scrutinized and documented. Thus, villagers cannot claim or and blame the company.

The most challenging pollution complaint requirement is that it must include lab test documents that use scientific documents. Fisher tends to use lay local ecological knowledge. All the EIA planning documents consider the impact of

pollution on water quality, and aquatic biota comprises plankton, benthos, nekton to the environmental impact management and control. The EIA document report also shows that several water quality parameters exceed the threshold. Unfortunately, the community did not get this document to substantiate their findings. Thus, scientific language in the EIA document justifies the company that its activities are scientifically correct. It is demonstrating companies' domination on pollution control and vice versa. The only companies' action is to mitigate the mass fish death and polluted water immediately after getting instructions from the government.

The community does not have a control mechanism over that, right. On the supervisory committee, his integrity was more at stake. The community does not have sufficiently strong access to participate in controlling environmental documents --- The control is weak (Academia)

Complaining, protesting and grievance concerning pollution and fish death cases either enacted individually or collectively tended to be fruitless because it is not scientifically based on evidence. The government continuously looks out on it because the public easily politicizes pollution cases to get compensation from the company. The government argues that complaints about pollution cases are sometimes hoaxes. To avoid politicizing pollution cases and increasing fairness, the government recommends companies to make clear EIA. One of the academic respondents stated that blaming only on the business world and vice versa puts the community in the position that as if the community was never wrong to make the community as the injured party and therefore are entitled to compensation and always looking for scapegoats and sue other parties as to the wrong party who must be responsible for repairing environmental damage.

Uncompensated mass fish mortality illustrates how environmental benefits and losses are disproportionately distributed. In the case of pollution in MMA, the negative impacts recipients from plantations and mining are local fishermen as the original owners of the land, while the beneficiaries are companies as producers, most of whom are foreign investors. These costs are over and above the socio, economic and environmental costs incurred. From a global economic justice point of view, the placement of plantations and mining in developing countries places negative externalities where the cost of recovery is bear by developing countries. The

imposition of externalities on the local community reflects the government's failure to apply the precautionary principle (Picazo-Tadeo and Prior 2009). According to (Muhdar, 2009) legally polluter pays principles do not regulate adequately, including procedures for claiming compensation. This may occur because the fish, water, ecosystems, and physical-chemical environment is natural capital (Charles, 2008) that is invaluable and very difficult to measure in terms of monetary value. However, the difficulty of assessing pollution does not become a basis for eliminating the factor in determining the composition of environmental compensation (Muhdar, 2009).

The mechanism for resolving environmental problems by way of compensation is not the right way, but it is better than nothing. The minimum recovery of the environment is to prevent this from happening again. Unfortunately, until now, fishers never received compensation because fishers are considered to have contributed to the death of fish from illegal fishing activities that they do by fishers. Besides, compensation for fishers is complex because they rarely have a business license, or the business is not registered or entered under the guidance of individual agencies. There has been no SOP for environmental recovery in a particular case. There are no permanent procedures and binds all parties in compensation to fishers or fish farmers. The process is often protracted. The community feels that dispute resolution through compensation does not resolve the problem because often, the community's bargaining position is fragile.

According to Yuwana et al. (2012), Resolving environmental problems should not use a cultural approach, let alone transactional. However, it should be based on environmental valuations based on the value of lease-to-use forest area leases in revegetation areas. The rent is not only for the physical rehabilitation of land (revegetation) but for the improvement of the social and economic environment. In other words, income from rent must be used to pay for revegetation and environmental improvement (Sawada and Lahjie).

4.3.5 How relation between actors reflect the process of EJ?

Based on the above finding, we identify five stakeholders who directly and indirectly influence fisheries management: NGO, academia, government, fisher, and company. Refer to the River Basin Agency document (2018). Many stakeholders are

involved in the Mahakam watershed management from different levels of governance (BWS 2017). But there only eight government agencies that directly interact with the fisheries sector are Forest Agency, Fishery Agency, Environmental Agency, Development Planning Agency, Plantation Agency, Energy and Mining Agency, District Government, and Village Government.

Table 22. Stakeholders involved in Cascade lakes

No	Stakeholders	Responsibilities
A	National Government	
	1. BWS Kalimantan III-Ditjen SDA	Water resources management
	2. BP DASHL Mahakam-Berau	Watershed management
B	East Kalimantan Province	
	1. Forestry Agency	Forest, either in water catchment area or in swamps
	2. Fisheries Agency	Culture and capture fisheries
	3. Development Planning Agency	Spatial and strategic area planner
	4. Public Work Agency	Water resources management
	5. Environmental Agency	Waste management and water quality controller
	6. Community Empowerment Agency	Community empowerment
	7. Transportation Agency	Water transportation
	8. Agriculture Agency	Agriculture development
	9. Tourism and Culture Agency	Lakes as eco-tourism area
	10. Trading Agency	Financial agency and small medium enterprises
	11. Animal Husbandry Agency	Livestock management
	12. Plantation Agency	Palm oil plantation management
	13. Education Agency	Community education
	14. East Kalimantan Police Department	Security and safety operator
	15. Energy and Mining Agency	Mining activities around lakes
	16. TK-PSDA WS Mahakam.	Coordinate water resources management
C	Kutai Kartanegara and Kutai Barat Regency	
	1. Forestry Agency	Forest, either in water catchment area or in swamps
	2. Fisheries Agency	Culture and capture fisheries
	3. Development Planning Agency	Spatial and strategic area planner
	4. Public Work Agency	Waste resources management
	5. Environmental Agency	Waste management and water quality controller
	6. Community Empowerment Agency	Community empowerment
	7. Transportation Agency	Water transportation
	8. Agriculture Agency	Agriculture development
	9. Tourism and Culture Agency	Lakes as eco-tourism area
	10. Trading Agency	Financial agency and small medium enterprises
	11. Animal Husbandry Agency	Livestock management
	12. Plantation Agency	Palm oil plantation management
	13. Education Agency	Community education
	14. East Kalimantan Police Department	Security and safety operator
	15. Energy and Mining Agency	Mining activities around lakes
	16. District Government	Coordinate water resources management
	17. Village Government	Village government
D	Community and Researcher	
	1. Forum Masyarakat Danau	Mostly, group member is fishermen who live around lakes
	2. LSM Bida Biwase	Local NGO that cares about lakes
	3. LSM Air Kaltim	Controlling water damaged power
	4. Yayasan RASI	Advisors of lakes environment and freshwater dolphin
	5. Tim GNKPA Kaltim	Community empowerment in conserving water resources
	6. Tim GNKPA Kutai Kartanegara	Community empowerment in conserving water resources
	7. Lembaga Adat	Indigenous community representatives from village level
	8. Yayasan Bumi Lestari	Community empowerment in conserving water resources
	9. Kelompok Kajian Iklim, Air dan Bencana FMIPA UNMUL.	Environmental research and education in the field of climate, water and disaster
	10. UNMUL, Unikarta, dan sebagainya.	University

Each actor has a different role in the decision-making. Government Agencies also have different roles depending on their responsibilities and government level. Most government agencies, NGOs, academia, and companies have an opportunity to meet in the public consultation at the province and Regency levels. However, only two actors are involved in the public consultation in all governance levels, from province to village level, namely the environmental agency and agency. It means that environmental agency and company are the actors who understand the whole process of environmental governance and has a close relationship to each other and community in the village level. Meanwhile, fishery agency has more roles at the village level in the context of assisting the fishing community to respond to fisheries state changing in collaboration with village government. It means that the fishery agency has a closer relationship with the fishing community.

Although all stakeholders have the right to participate and influence the decision in the public consultation, the ability to influence the public consultation is weaker than in the drafting process. Fisheries Agency and NGO are in the decision-taker except in the development planning drafting. The decision-taker is the position where an actor is involved in the public consultation only. In opposite, other relevant agencies and academia are the decision-makers to create a document for the project. The decision-maker is in the position where an actor is involved in the drafting process and must also be involved in the public consultation.

Table 23 The matrix of stakeholder involvement in the decision-making

	Decision making	Activities	Government level	Forest Dept	Fishery Dept	Environmental Dept	Land use spatial plan Dept	Development plan Dept	Plantation Dept	Energy & Mining Dept	District Government	Village Government	NGO	Academia	Fisher	Company	Total
D	Land use and spatial planning	Drafting	Province				√	√						√			3
		Public consultation	Province	√	√	√	√	√	√	√	√		√	√		√	11
	Development planning	Drafting	Province	√	√	√		√	√	√	√			√			8
		Public consultation	Province	√	√	√		√	√	√	√	√	√	√		√	11
	Land concession of palm oil	Drafting	Regency	√			√		√							√	4
		Public consultation	Regency	√	√	√	√		√	√	√		√	√		√	10
			District		√	√				√	√	√				√	6
			Village									√			√	√	3
	Land Concession of coal mining	Drafting	Province	√			√			√						√	4
		Public consultation	Province	√	√	√	√		√	√			√	√		√	9
			District						√		√	√				√	4
			Village									√			√	√	3
	EIA of palm oil	Drafting	Regency	√		√			√					√		√	5
		Public consultation	Regency	√	√	√	√		√	√	√		√	√		√	10
			District			√					√	√				√	4
			Village			√						√			√	√	4
	EIA of coal mining	Drafting	Province	√		√				√				√		√	5
		Public consultation	Regency	√		√	√		√	√			√	√		√	8
			District			√					√	√				√	4
			Village			√					√	√			√	√	5
S	Water quality monitoring		Village			√							√	√	√	√	5
	Fish production monitoring		Village		√								√	√	√		4
I	Fisheries livelihood		Village												√		1
R	Compensation	Compensation	Village							√						√	2
	CSR	CSR	Village						√	√		√				√	4
	Plasma partnership	Plasma partnership	Village						√							√	2
	Fish restocking	Fish restocking	Village		√												1
	Government aid	Government aid	Village		√							√					2
	Pollution control	Pollution control	Village		√							√					2
	Fishing law enforcement	Fishing law enforcement	Village		√							√					2
	Social forestry	Social forestry	Village	√								√	√				3
Total				12	12	15	8	4	12	12	10	14	9	12	7	22	149

The decision-maker and decision-taker position reflect the power relation between actors. The decision-maker has more control than other decision-taker actors due to its knowledge domination in document drafting. The decision taker can influence decision-making but will not alter the document already drafted except at the village government level. In this study, we found that Muara Siran, Sebelimbingan, and Semayang refused a land concession for palm oil within their villages. The village government's ability to refuse a land concession depends on the communities' consent and participation during the public consultation of EIA at the village level. In this case, fishers and village governments have the same power as other decision-makers.

Communities' consent and participation are frequently manipulated, or there is a lack of fishing communities' participation in the public consultation of EIA and land concession at the village level. Thus, the fishing community is voiceless to participate in the environmental monitoring process. In this case, it can be seen from water quality and mass fish mortality complaints. The government does not recognize people's complaints due to different sets of knowledge to judge water quality evidence and mass mortality evidence where scientific knowledge hold by the government is better than local ecological knowledge hold by fisher, so it is unresolved yet. Besides, the fishing community is voiceless to claim environmental justice because in government, understanding all environmental impacts is happening with people's consent. So, people do not deserve to make a claim.

The other scientific knowledge domination is about fisheries statistic data which is continuously increasing, although in the local community complaining about fish catches and fish diversity decreasing occur. The government neglects that the increasing trend of fisheries statistics is followed by the increase of fishing trips, fishing gear, and external pressuring factors that indicate overfishing. One academia believes there are differences in fisheries condition data. Fisheries statistics show that catches always rise based on assumptions that the more sophisticated the fishing gear (technology intensification), the higher the amount of production or the number of catches is also seen in the fishing gear assistance program, which is given every year. But data obtained from fishermen interviews show the opposite.

4.4 **Summary**

The driver of fish catches declining was decision making related to economic development, namely development planning, land use and spatial planning, land concession, and environmental impact assessment. The pressuring factors of fish catch declining were palm oil plantation, destructive fishing practice, natural factors, and coal mining activities. The present inland fish capture: water quality decreasing, fish catches decreasing, fishing ground reduction, and mass fish death. The present inland capture fisheries impacted economic security, community security, personal security, environmental security, health security, food security, and political security. The response to reduce the impact of the present inland fish capture were 1) government assistance, 2) CSR, 3) pollution control and monitoring, 4) compensation as the implementation of the polluter pays principles, 5) fish restocking, 6) plasma partnership, 7) IUU law enforcement, and 8) social forestry.

All respondent groups except the government group had sentiment negative to development planning, land use and spatial planning, land concession, and environmental impact assessment decision-making process. All those decision-making processes were lack of affected community participation, ignore affected community recognition, and lack of environmental benefit and loss distribution consideration.

The more village participation in the decision-making process related to environmental, developmental planning and the less influence the magnitude of environmental impact affect to them and the more village ability to participate in the environmental monitoring through effective protest and sue relevant stakeholder obligation to reduce the impact the more response to reduce the impact.

CHAPTER V: CONCLUSSION AND RECOMMENDATION

6.1 RECOMMENDATION: Implication to fisheries management

If we return to the purpose of this research, which is to assist fisheries managers in managing fisheries without ignoring social justice, fisheries management should not ignore the complexity of the human-nature problem. The concept of fairness is not singular and is always contested. In this study, the concept of fair problem solving refers to the concept of priority, namely the most marginalized party, namely the party who receives the most pressure, experiences environmental change, and receives environmental impacts, is the party most entitled to receive a response to reduce environmental pressures, changes and impacts even though the recipients of these impacts are outside the company's boundaries. So, the alternative responses are prioritized by: The bigger the pressure, the bigger the response. Based on the finding, more than half of the problem is exogenic factors that widen inequalities between fishing villages. Hence, it makes sense to think that fishery problems can only be solved if fishery managers can solve problems outside the fishery without ignoring endogenic factors and natural factors.

Based on the finding, things that fisheries managers can fight to protect vulnerable fishing communities from exogenic factors and reduce the inequalities between villages while integrating fisheries into the development agenda are:

1. Guarantying the right to environmental protection begins with putting more attention to the long-term management and legal action through environmental policy and regulation. In this case, fisheries governance must be improved to address the potential water use and land use between plantation, mining, and fisheries. As part of watershed management, the aquatic ecosystem depends on managing the watershed (Lynch et al., 2017). As (Charles 2008) stated that the spatial scale aspect is very urgent to be managed. Too much land concession for palm oil plantation in the wetland area, which is identified as marginal land, marginalized local fishing communities. Fishing grounds need to be protected from land concession and conversion because changes in one area may also affect the other.

2. Moreover, because the process of returning fishing ground functions is almost impossible, the process of fishing ground conversion must place in the perspective of long-term development planning and land use and spatial planning integrated with a political approach (Rustiadi 2001). In this case, Fisheries Agency cannot work alone. There must be a collaboration between the fishery agency and other policymakers, namely the governor, regent, major, The House of Representatives, and the head of the Regional Development Planning Agency. One of the possible solutions for integrating fishing ground into bigger ecosystem management through advocacy in the social forestry scheme is the Indonesian context. Social forestry grants legal status to previously unrecognized territories to officially and participatory be managed by villagers and village government. Social forestry is the possible solution for the inland fishery as the inland fishery is part of the forest ecosystem and management. Forests and fish are mutually beneficial. In floodplain ecosystems, fish populations increase as forest cover increases. Moreover, vice versa, fish populations decrease along with deforestation.
3. Preventing harm before it occurs. The function of EIA is to prevent harm before it occurs. High environmental risk projects must be stopped. This can be a mid-term tool in environmental management. Although in the past EIA'sEIA's did not consider much on distributive justice, but there is a possibility to improve it through integrating environmental justice into EIA by 1) giving a more specific emphasis on the analysis of the distribution of benefits and costs to the affected community groups, 2) identify potential mitigation options that focus on the most vulnerable groups, 3) forming an agreement between NGOs and the community on the monitoring of environmental justice issues where this agreement serves as a formal and legal guide to back up negotiations.
4. Shifting the burden of proof of contamination to polluters, not the resident, by compensating for the environmental loss. Compensation is the last alternative to redress existing inequities. We argue that strengthening fisher perception of justice on the response chain by receiving compensation is so-called pseudo recognition. It does not seek to address direct environmental burden (Walker

2010) and would not compensate for the actual water quality worsening, the loss of fish diversity, and fish abundance. Even deepen the equality gap between fishers and villages who get and do not (Bétrisey, Bastiaensen, et al. 2018).

5. Nevertheless, although the mechanism for resolving environmental problems through compensation and CSR is insufficient for achieving distributive justice not the right way (Aguilar-González, Navas, et al. 2018), it is better than nothing. In addition, because environmental problem solving through compensation and CSR is limited by the regulation that is related to company boundaries that do not allow villages outside the company ring to make claims even though the village feels the same impact as villages in the ring, for the sake of justice, the government must think about how so that villages outside the ring also get the same response. Procedurally, to get fair compensation and enable environmental justice claiming, fisher's knowledge needs to be recognized and accommodated in the future shared environmental management plan (Medeiros, Barboza, et al. 2018) and the measurement method, the EIA (Kristin Shradder, 2002). Integrating lay knowledge that site-specific, contextual knowledge gained from practicing fishing and general scientifically produced knowledge may produce dialogue and cooperation leading to innovative practices of improving the environment (Orderud, 2018), while failure to access local inequalities in environmental impact can lead to environmental justice violation (Shrader-Frechette 2002).

In the meantime, things that fisheries managers can fight to protect traditional vulnerable fishers from endogenic factors is by considering fairness and justice issue in fisheries management as an effort to achieve an optimum sustainable yield are:

1. The best possible management policy option to eradicate environmental unfriendly fishing practice is village-based management (Christensen, 1993). Each village would be developed quotas linked to a village licensing system in which each village is allocated a fixed percentage of the total catch and be implemented and monitored. To be able to run this option, locality-specific data such as species composition, relative abundance and basic biology of the fish community, the rates of maturity, growth and natural mortality of the fish

species, trophic efficiencies and response to exploitation, climate, and variety of anthropogenic factor (e.g., nutrient loading, pollution, and water turbidity) to determine sustainable harvest rates and quotas. The assessment of current fishing effort and harvest is not available. It is essential for developing a coherent management strategy. The current harvest data is important from a management perspective and for the national-level food security assessment and livelihoods.

2. Fisheries development interventions through government assistance, including boats, motor, nets, refrigeration facilities, and operational costs, must be reassessed because it could have negative consequences. After all, the increasing harvest may result in the reduced catch, increase market competition, and threaten fishing livelihoods.
3. The fish restocking program also needs to be reassessed because this program extinct native species.
4. Switching capture-based aquaculture to hatchery-based aquaculture while making efforts to improve environmental sustainability through market-based approaches and incentives such as certification schemes, product traceability, ecolabelling, and MSME marketing is needed (Pomeroy, 2016).

Lastly, natural factors and climate change are important factors to consider in future water use planning and policy. For example, if the water level continues to decrease and pathogenic diseases increase due to the combined effect of climate change and wetland hydrology regime intervention for palm oil plantations, the impact on fishery worsens.

Based on the DPSIR framework and fisheries management purpose, fisheries management should consider short-term, midterm, and long-term management.

In Short-term management, it is important to

- Eradicate environmental unfriendly fishing practice through co-management or partnership between government, fishing community, and private sector.
- Switching capture-based aquaculture to hatchery-based aquaculture
- Advocacy for claiming fair compensation for mass fish mortality and water pollution.
- Enforce fair profit sharing for plasma partnership.

In mid-term management, it is important to

- Strengthening more scientific data support for fisheries management
- To add more water quality sampling sites.
- Improve data collection to reflect fish catch.
- Rehabilitating fishing ground through dredging sediment
- Raising fishing community awareness about environmental management and decision-making process
- Empowering community through CSR

In the Long-term management, it is important to implement

- Watershed management
- Ecosystem-based management
- Protecting fishing ground through social forestry

6.2 Conclusion

In the Middle Mahakam Area, fish catches decreasing is mainly driven by land concession for palm oil expansion, leading to economic insecurity. The primary expected response to it is compensation for mass fish mortality and water quality decreasing. That phenomenon occurs due to environmental justice is less considered in the decision-making process of land concession, EIA, land use, and spatial planning and development planning along the chain of DPSIR in the MMA. If fishing communities' protests get positive response from the company or government to reduce the impact of fish catches decreasing, so that fishing communities had a positive perception towards environmental justice.

6.3 Contribution of the Research

This study is important because it can find minor issues that would not arise with the single framework. At least my findings will contribute to new concepts in the future to identify social, environmental, and economic indicators in inland capture fisheries. This research is very important for stakeholders in MMA because it can see various unique lenses due to topographical and social reasons of society. The hope is that it can be developed into a framework from local to national and Asian regions such as Thailand, which has the issue of inland capture fisheries.

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Palm Oil is a highly successful flex crop that has become a development engine in Southeast Asia and elsewhere. If the industry-led stakeholder initiative, the

Roundtable on Sustainable Palm Oil (RSPO) is to be believed, there is also a mechanism in place that can guarantee sustainable production along the supply chain. But what counts as sustainable and what does this mean on the ground in producing countries like Malaysia and Indonesia? This article argues that the form of sustainability offered by certification schemes such as the RSPO fetishes the commodity palm oil in order to assuage critical consumer initiatives in the North. This technical-managerial solution is part of a larger project: the “post-political” climate politics regime (Swyngedouw) that attempts to “green” the status quo. But certification obscures the problem that it is not the commodity itself but the social relations of nature in the production of the commodity that need to become sustainable. It will be shown that despite certification, these social relations of nature are contested in Southeast Asia. Social and political struggles over land rights, workers’ rights and environmental justice are repoliticising debates over palm oil, opening up trajectories of eco-social transformation that make alternative sustainability futures for palm oil possible.

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Appendix

I. Questionnaire for fishers

I.A Fisherfolks

A. Demographic Information of the respondents:

1. Name :
2. Type of fishers : Full time fisher/part time fisher
3. Gender :
4. Education :
5. Age :
6. Family dependent ratio :

B. General information of fisheries livelihood profile:

1. Fishing experience (years) :
2. Total catch (Kg/day) :
3. Fish species :
4. Fish size :
5. Fish price :
6. Fishing gear types :
7. Fishing boat types :
8. Operational cost (Rp/day) :
9. Fishing ground distance to palm oil or coal mining company (Km) :
10. The importance of fisheries livelihood :
    a. Not important
    b. Important
    c. Very important
11. Main livelihood
    a. Aquaculture
    b. Palm oil
    c. Coal mining
    d. Farming
    e. Small medium enterprise
    f. others
12. Alternatives livelihood :
    a. None
    b. Aquaculture
    c. Palm oil
    d. Coal mining
    e. Farming
    f. Small medium enterprise
    g. others
13. Do your family is wealth? :
    a. No
    b. Not bad
    c. Yes

C. State

1. Has the water in the river ever been polluted?
    - How was it in the past?

- How is it right now?
- Since when?

2. Has the fish ever been destructed?
    - How was it in the past?
    - How is it right now?
    - Since when?
3. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?
    a. Palm oil company
    b. Coal mining company
    c. Fisherfolks
    d. Fish farmer

D. Impact

1. Have you ever experiencing difficulties to buy the fish for family consumption?
2. Has the fisheries livelihood and monthly income ever been decreased?
3. Have your health ever been decreased?
4. Have the social cohession ever been decreased?
5. Have you ever doubt about the future livelihood of the next generation?
6. Have you ever doubt to express your political opinion?
7. Has the quality of the environment ever been decreased?

E. Response

E.1. Fisherfolks Response

1. Have you ever gained experience to increase the number of fish catch in order to increase fish for family consumption?
2. Have you ever gained experience to find alternative livelihood other than fish capturea?
3. Have you ever concerned about health that may be affected by pollution?
4. Have you ever shared a collective consciousness in your neighbor network?
5. Have you ever gained experience to protect yourself from pollution?

E.2. Companies Responses

1. Have you ever recognized and invited to CSR decision making process of coal mining or palm oil?
2. Have emerging participatory arrangements in the CSR program influenced the distribution of environmental cost and benefit?

E.3. Government Responses

1. Have you ever recognized and invited to community empowerment program (including fisheries extension) decision making process?
2. Have emerging participatory arrangements in the community empowerment program influenced the distribution of environmental cost and benefit?

E. Complaint or Protest behavior

1. Have you ever made a protest or complaint about palm oil and coal mining?
2. Have fisherfolks community ever made a protest about palm oil and coal mining?
3. How frequent you do a protest or complaint over palm oil and coal mining establishment?

a. 0 times b. 1 – 10 times c. 10 – 20 times d. more than 20 times

4. How frequent you do a protest or complaint over palm oil and coal mining establishment?
   b. 0 times b. 1 – 10 times c. 10 – 20 times
5. To whom you protest or complaint or making a claim
   a. Company b. local authorities c. NGO d. Neighbor
6. How do you protest or complaint or making a claim?
   a. Verbally b. Written c. Blockade d. Demonstration

I.B. Fish Farmer

A. Demographic Information of the respondents:

1. Name :
2. Type of fishers : Full time fish farmer/part time fish farmer
3. Gender :
4. Education :
5. Age :
6. Family dependent ratio :

B. General information of fisheries livelihood profile:

1. Fish farming experience (years) :
2. Total production (Kg/month) :
3. Fish species :
4. Fish price (Rp/Kg) :
5. Operational cost (Rp/day) :
6. Fish cages distance to palm oil or coal mining company (Km) :
7. The importance of fisheries livelihood :
   a. Not important
   b. Important
   c. Very important
8. Alternatives livelihood :
   a. None
   b. Fish capture
   c. Palm oil
   d. Coal mining
   e. Farming
   f. Small medium enterprise

C. State

1. Has the water in the river ever been polluted?
   - How was it in the past?
   - How is it right now?
   - Since when?
2. Has the fish ever been destructed?
   4. How was it in the past?
   5. How is it right now?
   6. Since when?

D. Impact

1. Has the fish for meals ever been decreased?
2. Has the fisheries livelihood and monthly income ever been decreased?
3. Have your health ever been decreased?
4. Have the social cohession ever been decreased?
5. Have you ever doubt about the future livelihood of the next generation?
6. Has the political channel to express opinion ever been hard to find?
7. Has the quality of the environment ever been decreased?

E. Response

E.1. Fisherfolks Response

1. Have you ever gained experience to increase the number of fish production in order to increase fish for meals?

2. Have you ever gained experience to find alternative livelihood other than fish farming?
3. Have you ever concerned about health that may be affected by pollution?
4. Have you ever shared a collective consciousness in your neighbor network?
5. Have you ever gained experience to protect yourself from pollution?

E.2. Companies Responses

1. Have you ever recognized and invited to CSR decision making process of coal mining or palm oil?
2. Have emerging participatory arrangements in the CSR program influenced the distribution of environmental cost and benefit?

E.3. Government Responses

1. Have you ever recognized and invited to community empowerment program (including fisheries extension) decision making process?
2. Have emerging participatory arrangements in the community empowerment program influenced the distribution of environmental cost and benefit?

F. Complaint or Protest behavior

7. Have you ever made a protest or complaint about palm oil and coal mining?
8. Have fisherfolks community ever made a protest about palm oil and coal mining?
9. How frequent you do a protest or complaint over palm oil and coal mining establishment?
   c. 0 times b. 1 – 10 times c. 10 – 20 times
10. To whom you protest or complaint or making a claim
    a. Company b. local authorities c. NGO d. Neighbor
11. How do you protest or complaint or making a claim?
    b. Verbally b. Written c. Blockade d. Demonstration

II. Interview guidance for NGO

A. Driver

1. What are the main drivers of fisheries adversely affecting the environment?
2. What are the main drivers of non-fisheries activities adversely affecting the environment?
3. To what extent is environmental justice been considered in the decision making process of development project?

B. Pressure

1. What are main pressure of change in inland fish production?
2. Which group of people were most affected by coal mining and palm oil?
3. Which sector were most affected by coal mining and palm oil?
4. To what extent is the decision making process of a) land use and spatial planning, b) land concession, c) EIA permit of palm oil and coal mining consider and address to:
    b. Equity in benefit and impact distribution?
    c. Are all relevant actors and potential affected communities include inside the process?
    d. Is there justice for inland capture fisheries sector?
    e. What, if any, are environmental justice implication of palm oil and coal mining' presence in fisheries zone, particularly for fosherfolks with small operation?

C. State

1. How long do coal mining and palm oil contaminate the river more frequetly and more dectructive during recent years?
2. What were phenomena of massive fish mortality during past years?
3. How did coal mining and palm oil change inland fisheries activities?
4. Which type of fish were substantially affected by contamination of coal mining and palm oil, particularly in the Middle Mahakam Area?

D. Impact

1. What are main impact of coal mining and palm oil on inland fishers' human security?
2. How do coal mining and palm oil effect inland fishers' human security?
3. Does coal mining and palm oil companies has beneficial effects on inland fishers' human security?

E. Responses

1. How do local government help farmers adapt to coal mining and palm oil bad impact?
2. What about the assessment of current adaptation to cope with coal mining and palm oil bad impact?
3. How do you assess diversifying economic activities next to fish capture?
4. How to reduce the negative impact of coal mining and palm oil activities?

F. Environmental Justice

1. How do inland fisher perceive environmental pollution and health, food, and economic security in the Middle Mahakam river?
2. What are community impact associated with environmental contamination?
3. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?

4. Who is responsible for inland fishers who ignore their environment and how they frame the issue of justice and equality?
5. how can justice be achieved if projects can be easily approved because of the money they will bring and the work they will create?

III. **Interview guidance for business sector**

A. For Palm Oil Company

1. To what extent is the company committed to creating sustainable palm oil?
2. What are the policies, strategies, tools and practices of environmental management and monitoring in an effort to meet the principle of sustainability?
3. To what extent is the company committed to implement Environmental Impact Assessment?
4. To what extent is the company committed to reducing the socio-economic and ecological impacts caused by the pressure of oil palm company activities?
5. To what extent is the company commited to increase affected communities in the decision making process of land compensation, company-community partnership, EIA and CSR?
6. To what extent is the company commited to the principles of justice for resolving the issue of land compensation, company-community partnership, water quality declining and fish mortality.
7. Who is the most benefitted and the most affected people of palm oil company?
8. How can justice be achieved if projects can be easily approved because of the money you bring and the work you create?
9. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?
10. What procedure can allow fisherfolks to define palm oil impact?
11. Are damages compensated?
12. To what extent is the company have procedures or mechanisms for resolving environmental disputes beyond what has been predicted in the EIA

B. For Coal Mining Company

1. To what extent is the company committed to creating sustainable coal mining?
2. What are the policies, strategies, tools and practices of environmental management and monitoring in an effort to meet the principle of sustainability?
3. To what extent is the company committed to implement Environmental Impact Assessment?
4. To what extent is the company committed to reducing the socio-economic and ecological impacts caused by the pressure of coal mining company activities?
5. To what extent is the company commited to increase affected communities in the decision making process of land compensation, company-community partnership, EIA and CSR?
6. To what extent is the company commited to the principles of justice for resolving the issue of land compensation, company-community partnership, water quality declining and fish mortality?
7. Who is the most benefitted and the most affected people of coal mining company?
8. How can justice be achieved if projects can be easily approved because of the money you bring and the work you create?
9. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?
10. What procedure can allow fisherfolks to define coal mining impact?
11. Are damages compensated?
12. To what extent is the company have procedures or mechanisms for resolving environmental disputes beyond what has been predicted in the EIA

IV. **Interview guidance for local government**

A. Plantation Agency

1. To what extent may the wet land ecosystem be privatedly owned?
2. Who has the right to decide about the local development path to be taken?
3. Who gets to decide and set rules and laws, and which parties and interest are recognized in the decision-making process?
4. By what process do they make such decision?
5. How impartial or fair are the institution, instrument, and objective involved?
6. Who makes palm oil decision?
7. Who has the power to status quo for palm oil decision making process?
8. Who benefited?
9. Who is burdened?
10. How various actors have been recognized and invited to palm oil decision making process?
11. How their abilities to participate have been ensured?
12. How emerging participatory arrangements have influenced the distribution of environmental cost and benefit?
13. How can justice be achieved if projects can be easily approved because of the money they will bring and the work they will create?
14. Who is responsible for water quality and fish productivity declining in the Middle Mahakam River?

B. Mineral and Mining Agency

1. To what extent may the wet land ecosystem be privatedly owned?
2. Who has the right to decide about the local development path to be taken?
3. Who gets to decide and set rules and laws, and which parties and interest are recognized in the decision-making process?
4. By what process do they make such decision?
5. How impartial or fair are the institution, instrument, and objective involved?
6. Who makes coal mining decision?
7. Who has the power to status quo for coal mining decision making process?
8. Who benefited?
9. Who is burdened?
10. How various actors have been recognized and invited to coal mining decision making process?
11. How their abilities to participate have been ensured?
12. How emerging participatory arrangements have influenced the distribution of environmental cost and benefit?
13. How can justice be achieved if projects can be easily approved because of the money they will bring and the work they will create?
14. Who is responsible for water quality and fish productivity declining in the Middle Mahakam River?

Environmental Protection Agency

1. To what extent may the wet land ecosystem be privatedly owned?
2. Who has the right to decide about the local development path to be taken?
3. Who gets to decide and set rules and laws, and which parties and interest are recognized in the decision-making process?
4. By what process do they make such decision?
5. How impartial or fair are the institution, instrument, and objective involved?
6. Who makes coal mining and palm oil decision?
7. Who has the power to status quo for coal mining and palm oil decision making process?
8. Who benefited?
9. Who is burdened?
10. How various actors have been recognized and invited to coal mining and palm oil decision making process?
11. How their abilities to participate have been ensured?
12. How emerging participatory arrangements have influenced the distribution of environmental cost and benefit?
13. How can justice be achieved if projects can be easily approved because of the money they will bring and the work they will create?
14. Who is responsible for water quality and fish productivity declining in the Middle Mahakam River?

C. Land Agency

1. To what extent may the wet land ecosystem be privatedly owned?
2. Who has the right to decide about the local development path to be taken?
3. Who gets to decide and set rules and laws, and which parties and interest are recognized in the decision-making process?
4. By what process do they make such decision?
5. How impartial or fair are the institution, instrument, and objective involved?
6. Who makes coal mining, palm oil and fisheries decision??
7. Who has the power to status quo for coal mining and palm oil decision making process?
8. Who benefited?
9. Who is burdened?
10. How various actors have been recognized and invited to coal mining and palm oil decision making process?
11. How their abilities to participate have been ensured?
12. How emerging participatory arrangements have influenced the distribution of environmental cost and benefit?
13. How can justice be achieved if projects can be easily approved because of the money they will bring and the work they will create?
14. Who is responsible for water quality and fish productivity declining in the Middle Mahakam River?

D. Fisheries Agency

1. To what extent may the wet land ecosystem be privatedly owned?
2. Who has the right to decide about the local development path to be taken?
3. Who gets to decide and set rules and laws, and which parties and interest are recognized in the decision-making process?
4. By what process do they make such decision?
5. How impartial or fair are the institution, instrument, and objective involved?
6. Who makes coal mining and palm oil decision?
7. Who has the power to status quo for coal mining and palm oil decision making process?
8. Who benefited?
9. Who is burdened?
10. How can justice be achieved if projects can be easily approved because of the money they will bring and the work they will create?
11. To what extent is inland capture fisheries contribute to the economic development in the Middle Mahakam Area relative to the coal mining and palm oil?
12. What are the policies, strategies, tools and program of environmental management is directed to meet the principle of sustainability and justice?
13. Who is responsible for water quality and fish productivity declining in the Middle Mahakam River?
14. Do you consider to who is the winner and the loser of current economic development in the decision making process?
    a. In the land use and spatial planning decision making
    b. In the land concession decision making
    c. In the EIA decision making
15. To what extent is inland capture fisheries to be considered in the decision making process of development:
    a. In the land use and spatial planning decision making
    b. In the land concession decision making
    c. In the EIA decision making

E. Governor and Regent

1. What knowledge, values, and experiences do you bring to policy development related to coal mining and palm oil?
2. What are the main issues related to policy development for regulating coal mining and palm oil?
    a. What are your primary concerns, or what are the primary concerns that you hear from residents/constituents?
    b. How have these issues been represented by different stakeholders?
3. How are different groups of people impacted by these issues?
    - What inequalities exist in the process of developing regulations for coal mining and palm oil?

4. Describe the current policies in place to address the issues you mentioned.
5. Where and how can interventions be made to improve these issues?
6. What spaces exist for different stakeholders to participate in the decision-making process?
    a. What key stakeholders were included in this process? Excluded?
    b. Where and how can we enhance spaces for different stakeholders to participate?
    c. What sort of power dynamics do you see across these actors and organizations?
7. What benefits or risks do you feel accompany coal mining and palm oil?
    a. How are these distributed across different groups of people?

1. What sort of policies are currently being proposed? How might they reduce inequities in terms of ability to participate in policy development for regulation coal mining and palm oil development or minimizing potential risks and impacts?
2. A large portion of the legislation moving through the East Kalimantan Congress the last six years has related to the balancing of rights between state and local governments to regulate coal mining and palm oil development. What do you think is the appropriate way their roles should be balanced in decisions related to coal mining and palm oil particularly as it relates to land use planning?
3. Who is responsible for water quality and fish productivity declining in the Middle Mahakam River?

V. **Interview guidance for academia**

A. Driver

1. What are the main drivers of fisheries adversely affecting the environment?
2. What are the main drivers of non-fisheries activities adversely affecting the environment?
3. To what extent is environmental justice been considered in the decision making process of development project?

B. Pressure

1. What are main pressure of change in inland fish production?
2. Which group of people were most affected by coal mining and palm oil?
3. Which sector were most affected by coal mining and palm oil?
4. To what extent is the decision making process of a) land use and spatial planning, b) land concession, c) EIA permit of palm oil and coal mining consider and address to:
   a. Equity in benefit and impact distribution
   b. Are all relevant actors and potential affected communities include inside the process?
   c. Is there justice for inland capture fisheries sector?
   d. What, if any, are environmental justice implication of palm oil and coal mining' presence in fisheries zone, particularly for fosherfolks with small operation?

C. State

1. How long do coal mining and palm oil contaminate the river more frequetly and more dectructive during recent years?
2. What were phenomena of massive fish mortality during past years?
3. How did coal mining and palm oil change inland fisheries activities?
4. Which type of fish were substantially affected by contamination of coal mining and palm oil, particularly in the Middle Mahakam Area?

D. Impact

1. What are main impact of coal mining and palm oil on inland fishers' human security?
2. How do coal mining and palm oil effect inland fishers' human security?
3. Does coal mining and palm oil companies has beneficial effects on inland fishers' human security?

E. Responses

1. How do local government help farmers adapt to coal mining and palm oil bad impact?
2. What about the assessment of current adaptation to cope with coal mining and palm oil bad impact?
3. How do you assess diversifying economic activities next to fish capture?
4. How to reduce the negative impact of coal mining and palm oil activities?

VI. Open coding

1. Illegal tool
2. EIA-justice consideration
3. Development budgetting
4. Government aid
5. Study boundaries – ecology boundaries – companies' responsibilities
6. Fishing ground reduction
7. Proof of the quality of the water decrease - migration of biota - catch decrease - the color of the water and the smell of water.
8. CSR
9. The impact of illegal fishing on fish catches decreasing.
10. The effects of tidal water – fish
11. The impact of oil palm and coal - fish
12. Fisheries statistic data
13. Economic security - dynamics of fishermen-farmers – livelihood
14. Sectoral ego
15. Environmental security
16. Eutrophication
17. Participation-land use and spatial planning
18. Participation-EIA
19. Influx-reflux-flood-weather
20. Division of authority
21. Development - investment - concession – district income
22. Pollution-loading and unloading of coal.
23. Pollution-pesticide-waste-water quality
24. NGO advocacy – fishery extension - community empowerment
25. Silting due to gold-coal mining
26. Supervision - environmental control-implementation-monitoring
27. Dispute resolution - NGO advocacy - government mediation
28. Dispute resolution - NGO advocacy - government mediation
29. Dispute resolution - NGO advocacy - government mediation
30. Comparison of the destructive rate between waste and chemical matter
31. Comparison of fish mortality due to electric shock and viruses
32. Planning - decision making - EIA - land use and spatial planning - land concessions.
33. government response to reduced water volume.
39. Can people's knowledge meet scientific-knowledges.
40. Introduced fish.
41. The extinct fish.
42. Destructive fishing, poison, monopoly fishing gear
43. Distance between catchment location and plantation
44. Distance between catchment location and plantation
45. Seasonal calendar
46. Complaints
47. Decision-land use and spatial planning-consideration of justice
48. Indigenous knowledge
49. Claims-protest-demo-perception-justice-confession
50. What communities are most affected by coal mining and oil palm plantations.
51. Current fishery conditions - catch trends, price, size, species.
52. Land conflicts
53. Concession-land use and spatial planning
54. Funding
55. Fish migration
56. Mismanagement
57. Development Planning
58. Fisheries are being sacrificed.
59. Fisheries are neglected.
60. Fisherman protection
61. Perceptions of injustice
62. Personal security - the future of fisheries
63. Plasma
64. Political security
65. Positioning of NGOs
66. Fishermen response to pollution
67. Fishermen response to illegal fishing
68. Fishermen respond to fish catches decreasing.
69. Government response - illegal fishing.
70. The government's response in helping fishermen adapt to environmental changes.
71. Government response in reducing and controlling pollution.
72. The village government responded to the decrease in fish.
73. District government response to reduced fish-lake rehabilitation – restocking.

34. Government-fishermen response in protecting catch-fishing areas - environmental rehabilitation. 35. Companies' responses to water pollution and fish mortality - pays for environmental losses - polluter pays principles. 36. The phenomenon of mass fish death 37. Food security 38. Health security	74. Fisheries research-Mahakam 75. Roundtable Sustainable Palm Oil, Indonesia Sustainable Palm Oil 76. Land use and spatial planning-partial - carrying capacity. 77. The most affected sector. 78. Social security 79. Local manpower 80. Water volume

VII. Thematic coding

1. Driver	1. EIA-Participation-planning EIA-consideration of justice 2. Investment-concessions - land use and spatial planning 3. Decision-participation-land use and spatial planning-Consideration of justice 4. Development Planning
2. Pressure	5. Coal mining-palm oil 6. Fisheries management 7. Natural factors
3. State	1. The phenomenon of mass fish death 2. Current fishery conditions 3. Water volume and quality
4. Impact	4. Economic security-local labour 5. Environmental security-water use 6. Food security 7. Health security 8. Personal security 9. Political security 10. Social Security-plasma partnership-land dispute
5. Response	1. Government assistance 2. CSR 3. NGO assistance 4. Supervision - Environmental control - Implementation - Monitoring 5. The response of Corporate to fish death - Paying for environmental loss - PPP 6. The response of Government & fisherman to Illegal fishing 7. The response of government & fishermen to the reduction of fish 8. The response of government & fishermen in protecting fishing areas or environmental rehabilitation
6. Environmental justice	1. Perceptions of injustice 2. Claims

IX. Analytic coding

Theme	Category	Sub category
1. Driver	1. EIA-Participation-planning EIA-consideration of justice 2. Investment-concessions - land use and spatial planning 3. Decision-participation-land use and spatial planning-Consideration of justice 4. Development Planning	
2. Pressure	5. Coal mining-palm oil	1. Coal-pontoon 2. Coal-Palm Oil-Waste 3. Coal-Palm Oil-silting 4. Palm oil-reduced fishing area

		5. Introduced fish. 6. Destructive fishing 7. Mismanagement 8. Domestic waste 9. Eutrophication 10. The ups and downs 11. Viruses
	6. Management 7. Natural factors	
3. State	1. The phenomenon of mass fish death 2. Current fishery conditions 3. Water volume and quality	
4. Impact	4. Economic security-local labour 5. Environmental security-water use 6. Food security 7. Health security 8. Personal security 9. Political security 10. Social Security-plasma-land dispute	
5. Response	1. Government assistance 2. Protection of fishermen 3. NGO assistance 4. Supervision - Environmental control - Implementation - Monitoring 5. The response of Corporate to fish death - Paying for environmental loss – Pollution pays principles. 6. The response of Government & fisherman to Illegal fishing 7. The response of government & fishermen to the reduction of fish 8. The response of government & fishermen in protecting fishing areas or environmental rehabilitation	
6. Environmental justice	9. Perception of injustice 10. Claim	
7. Other themes	1. Fishery statistical data 2. Distance between catchment location and plantation 3. Seasonal calendar 4. Fish migration 5. Comparison of the destructive power of oil palm, coal and IUU 6. Positioning of NGOs 7. Fisheries research 8. Can people's knowledge meet scientific knowledge? 9. Environmental justice - Communities most affected by coal mining and oil palm plantations	

X. Expert judgement

No	Timestamp	1	2	3	4	5	Mean Rank
1	Driving factor of fish catch decline in the MMA related to economic development, which excessively based on natural resources extraction such as palm oil, coal mining, and inland fisheries activities.	4	5	5	5	5	32.30
2	Economic development in Kutai Kartanegara based on excessive natural resource extraction is related to development planning that is top-down and not participatory.	4	5	4	4	3	19.70
3	Excessive natural resource extraction-based economic development is related to spatial planning that is not participatory and does not take into account the characteristics of the local ecosystem.	3	5	5	4	4	23.80
4	Excessive natural resource extraction-based economic development is related to the granting of inefficient land concessions because they are not following their designation.	2	3	5	4	3	15.00
5	Excessive natural resource extraction-based economic development is related to granting environmental permits that not carried out in detail.	2	4	5	4	4	20.20
6	Land clearing, topsoil stripping, coal mining, processing, and transportation, as well as coal workshop activities, cause erosion, sedimentation, increase mine acid water, and increase B3 waste in MMA.	4	5	5	4	4	26.60
7	Land clearing activities, nursery preparation, preparation of oil palm plantations, construction of plantation road networks, application of fertilizers, herbicides and pesticides, oil waste from operational workshops and transport of fresh fruit bunchs have resulted in natural surface runoff, runoff, erosion, sedimentation, and significant pollution also has an impact on decreasing water quality and aquatic biota in MMA.	5	5	5	4	4	29.30
8	The most obvious impacts of the conversion of land into palm oil plantations in the wetlands are the loss of spawning areas, destroying fish habitat, and the reduction of the volume of water in the swampy area in the MMA.	5	5	5	4	4	29.30
9	Destructive fishing practices have an impact on the decline in the diversity of fish species, which can be an ecological indicator of overexploitation in MMA.	4	4	5	4	4	24.10

10	The introduction of predatory fish carried out by the government through a restocking program or carried out independently by fishermen is dangerous to the local fish in MMA.	2	5	5	4	3	18.90
11	The decline in catches caused by the lack of inland fisheries management from planning, implementation to supervision. So that the perpetrators, spawning grounds, reservoirs, and conservation, are all not managed except fishing gear that is regulated.	4	5	4	4	4	23.50
12	Eutrophication causes an increase in the population of water hyacinth and tuber, which then reduces the amount of oxygen and living space for fish. Finally, the fish cannot breathe, faint, and eventually, die.	1	3	5	4	4	18.10
13	The fish productivity in the river, lake, and swamp are significantly affected by the pattern of flux and reflux.	5	5	4	4	3	22.40
14	Aquaculture is experiencing the loss due to a virus attack.	2	2	4	4	3	10.60
15	The phenomenon of mass mortality of fish in some segments of the Middle Mahakam Area is an initial indicator of the weakness of environmental management.	4	4	5	4	4	24.10
16	The downward trend in fish does occur in all fishing communities in the Middle Mahakam Area.	4	5	5	4	4	26.60
17	Based on the results of laboratory analysis and qualitative analysis conducted by the community, it shows that the water quality in the Middle Mahakam Area has decreased.	4	5	4	4	4	23.50
18	Since the catch continues to decrease, the fishery potential is no longer promising economically for fishers.	2	3	5	3	4	15.30
19	Since the water quality is continuously decreasing, the dweller of MMA is experiencing a lack of access to clean water.	4	4	3	4	3	15.60
20	Since the catch continues to decrease, the fish's diet will change	5	3	4	3	4	18.80
21	The water quality decreasing threat to the health security of MMA's dweller	4	5	5	4	3	22.80
22	Since the catch continues to decrease in the MMA, the crime is increasing.	3	5	2	3	3	11.10
23	Although water quality and the catch is decreasing, village communities communicate vertically both	4	3	3	3	4	14.50
24	Bottom-up and top-down with the village government, there is no human right repression and violation both politically and personally.	4	2	4	3	4	14.80
25	The fishing equipment, boat, fish seedlings, and cage assistance program by the Fisheries Service help fishers improve fish catches and improve the household economy of fishers.	4	3	4	3	4	16.10
26	The ISPO certification proclaimed by the Plantation Office increases the compliance of oil palm plantations in carrying out environmental management, employment and land legality in MMA	3	2	3	4	3	10.10

27	From fisheries, the lake, reservoir, and peatland rehabilitation program at MMA is useful for reducing sedimentation and preventing the reduction of fishing grounds.	4	4	5	4	4	24.10
28	The eradication of IUU fishing in MMA has succeeded in reducing the practice of IUU fishing and reducing the decline in fish catch.	4	1	5	2	4	16.30
29	Advocacy by NGOs is essential to increase the awareness, ability, and involvement of fishers in accessing information and planning village spatial planning and village development so that fishers are sovereign over the use of natural resources in their villages.	4	5	2	4	4	21.20
30	One way to protect fishing ground at the village level from being converted into a concession area is to propose a social forestry scheme which then integrated into the village spatial plan.	4	4	5	4	4	24.10
31	The loss caused by the mass fish death in a body of water that falls within the ecological limits of the company, the company obliged to pay for the losses incurred without the need to prove the element of error.	2	2	5	4	3	13.70
32	Based on the company's EIA document, the CSR program is estimated to potentially have a positive impact on improving the economy and environmental management.	3	2	3	4	3	10.10
33	Pollution control and supervision carried out by companies or governments are carried out following the environmental management plan contained in the EIA document.	4	2	3	4	4	16.70
34	Environmental management is useful for minimizing pollution, mass fish mortality, decreasing water quality, and decreasing aquatic biota.	4	5	5	4	4	26.60
35	Community empowerment by the government, NGOs, and companies has a positive impact on improving the economy and political security.	4	4	4	3	4	17.50
36	Plasma partnership is a form of compensation for the reduction in the traditional fishing ground owned by fishermen. Plasma income can replace lost revenue from the fisheries sector, reduce land conflicts, and improve the economy.	3	3	1	2	4	9.80
37	The involvement of fishermen in MMA in making decisions regarding development planning, spatial planning, granting land use permits and EIA is related to perceptions of fairness and lack of environmental management	4	5	5	4	4	26.60
38	The involvement of fishermen in the environmental monitoring process is related to the perception that environmental management is fair and not	4	5	4	4	3	19.70
39	The involvement of fishermen in the process of responding to environmental damage is related to the perception of fairness and lack of environmental management	4	5	4	5	4	26.50

Kendall coefficient of corcordance .357; Chi Square 67.812; df 38; Asymp. Sig 0.02.

XI. Repeating coding based on expert judgement

Driver	Economic development related decision making on: 5. EIA 6. Land use and spatial planning 7. Land concession 8. Development planning
Pressure	Palm oil Coal mining Destructive fishing practice Seasonal factors Combined effect
7. State	Fish catches declining Fishing ground reduction Water quality changing Water level changing Fish mass mortality
8. Impact	Economic security Environmental security Food security Health security Personal security Political security Social Security
9. Response	Government aids CSR Lake and river rehabilitation Polluter pays principles IUU law enforcement Plasma partnership Social forestry
10. Environmental justice	Distributive Justice 9. EIA 10. Land use and spatial planning 11. Land concession 12. Development planning 13. Destructive fishing practice Procedural justice 14. EIA 15. Land use and spatial planning 16. Land concession 17. Development planning Justice of recognition 18. EIA 19. Land use and spatial planning 20. Land concession 21. Development planning Perception of injustice Protest

XII. Second interview data result

No	Villages	Water quality decreasing		Fish catches decreasing		Economic insecurity		Community insecurity		Health insecurity		Food insecurity		Personal insecurity		Politic security		Total	
	Answer	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
1	Liang Buaya	4	0	4	0	4	0	4	0	4	0	1	3	2	2	2	2	25	7
2	Muara Kaman Ulu	4	0	4	0	4	0	4	0	1	3	2	2	3	1	1	3	23	9
3	Muara siran	3	1	4	0	4	0	2	2	1	3	1	3	2	2	1	3	18	14
4	Puan cepak	4	0	4	0	4	0	4	0	3	1	4	0	3	1	1	3	27	5
5	Sabintulung	4	0	4	0	4	0	4	0	1	3	4	0	4	0	4	1	29	2
6	Sebelimbingan	4	0	4	0	3	1	3	1	1	3	4	0	0	4	2	2	21	11
7	Sedulang	4	0	4	0	4	0	3	1	3	1	4	0	4	0	1	3	27	5
8	Semayang	4	0	4	0	3	1	4	0	2	2	2	2	2	2	0	4	21	11
9	Sangkuliman	4	0	4	0	4	0	4	0	1	3	2	2	3	3	1	3	23	9
10	Kehala ulu	4	0	4	0	4	0	1	1	3	1	2	2	1	1	2	2	21	11
	Total	39	1	40	0	38	2	35	5	20	20	26	14	24	16	15	25		

Appendix

VII. Questionnaire for fishers

I.A Fisherfolks

F. Demographic Information of the respondents:

7. Name :
8. Type of fishers : Full time fisher/part time fisher
9. Gender :
10. Education :
11. Age :
12. Family dependent ratio :

G. General information of fisheries livelihood profile:

1. Fishing experience (years) :
2. Total catch (Kg/day) :
3. Fish species :
4. Fish size :
5. Fish price :
6. Fishing gear types :
7. Fishing boat types :
8. Operational cost (Rp/day) :
9. Fishing ground distance to palm oil or coal mining company (Km) :
10. The importance of fisheries livelihood :
    d. Not important
    e. Important
    f. Very important
11. Main livelihood
    g. Aquaculture
    h. Palm oil

i. Coal mining
j. Farming
k. Small medium enterprise
l. others

12. Alternatives livelihood : h. None
i. Aquaculture
j. Palm oil
k. Coal mining
l. Farming
m. Small medium enterprise
n. others

13. Do your family is wealth? : d. No
e. Not bad
f. Yes

H. State

7. Has the water in the river ever been polluted?
   - How was it in the past?
   - How is it right now?
   - Since when?
8. Has the fish ever been destructed?
   - How was it in the past?
   - How is it right now?
   - Since when?
9. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?
   e. Palm oil company
   f. Coal mining company
   g. Fisherfolks
   h. Fish farmer

I. Impact

8. Have you ever experiencing difficulties to buy the fish for family consumption?
9. Has the fisheries livelihood and monthly income ever been decreased?
10. Have your health ever been decreased?
11. Have the social cohession ever been decreased?
12. Have you ever doubt about the future livelihood of the next generation?
13. Have you ever doubt to express your political opinion?
14. Has the quality of the environment ever been decreased?

J. Response

E.1. Fisherfolks Response

6. Have you ever gained experience to increase the number of fish catch in order to increase fish for family consumption?
7. Have you ever gained experience to find alternative livelihood other than fish capturea?

8. Have you ever concerned about health that may be affected by pollution?
9. Have you ever shared a collective consciousness in your neighbor network?
10. Have you ever gained experience to protect yourself from pollution?

E.2. Companies Responses

3. Have you ever recognized and invited to CSR decision making process of coal mining or palm oil?
4. Have emerging participatory arrangements in the CSR program influenced the distribution of environmental cost and benefit?

E.3. Government Responses

3. Have you ever recognized and invited to community empowerment program (including fisheries extension) decision making process?
4. Have emerging participatory arrangements in the community empowerment program influenced the distribution of environmental cost and benefit?

G. Complaint or Protest behavior

12. Have you ever made a protest or complaint about palm oil and coal mining?
13. Have fisherfolks community ever made a protest about palm oil and coal mining?
14. How frequent you do a protest or complaint over palm oil and coal mining establishment?
    d. 0 times b. 1 – 10 times c. 10 – 20 times d. more than 20 times
15. How frequent you do a protest or complaint over palm oil and coal mining establishment?
    e. 0 times b. 1 – 10 times c. 10 – 20 times
16. To whom you protest or complaint or making a claim
    a. Company b. local authorities c. NGO d. Neighbor
17. How do you protest or complaint or making a claim?
    c. Verbally b. Written c. Blockade d. Demonstration

I.B. Fish Farmer

F. Demographic Information of the respondents:

7. Name :
8. Type of fishers : Full time fish farmer/part time fish farmer
9. Gender :
10. Education :
11. Age :
12. Family dependent ratio :

G. General information of fisheries livelihood profile:

1. Fish farming experience (years) :
2. Total production (Kg/month) :
3. Fish species :
4. Fish price (Rp/Kg) :
5. Operational cost (Rp/day) :
6. Fish cages distance to palm oil or coal mining company (Km) :
7. The importance of fisheries livelihood :
   d. Not important
   e. Important
   f. Very important
8. Alternatives livelihood :
   g. None
   h. Fish capture
   i. Palm oil
   j. Coal mining
   k. Farming
   l. Small medium enterprise

H. State

3. Has the water in the river ever been polluted?
   - How was it in the past?
   - How is it right now?
   - Since when?
4. Has the fish ever been destructed?
   10. How was it in the past?
   11. How is it right now?
   12. Since when?

I. Impact

8. Has the fish for meals ever been decreased?
9. Has the fisheries livelihood and monthly income ever been decreased?
10. Have your health ever been decreased?
11. Have the social cohession ever been decreased?
12. Have you ever doubt about the future livelihood of the next generation?
13. Has the political channel to express opinion ever been hard to find?
14. Has the quality of the environment ever been decreased?

J. Response

E.1. Fisherfolks Response

6. Have you ever gained experience to increase the number of fish production in order to increase fish for meals?

7. Have you ever gained experience to find alternative livelihood other than fish farming?
8. Have you ever concerned about health that may be affected by pollution?
9. Have you ever shared a collective consciousness in your neighbor network?
10. Have you ever gained experience to protect yourself from pollution?

E.2. Companies Responses

3. Have you ever recognized and invited to CSR decision making process of coal mining or palm oil?
4. Have emerging participatory arrangements in the CSR program influenced the distribution of environmental cost and benefit?

E.3. Government Responses

3. Have you ever recognized and invited to community empowerment program (including fisheries extension) decision making process?
4. Have emerging participatory arrangements in the community empowerment program influenced the distribution of environmental cost and benefit?

H. Complaint or Protest behavior

18. Have you ever made a protest or complaint about palm oil and coal mining?
19. Have fisherfolks community ever made a protest about palm oil and coal mining?
20. How frequent you do a protest or complaint over palm oil and coal mining establishment?
    f. 0 times b. 1 – 10 times c. 10 – 20 times
21. To whom you protest or complaint or making a claim
    a. Company b. local authorities c. NGO d. Neighbor
22. How do you protest or complaint or making a claim?
    d. Verbally b. Written c. Blockade d. Demonstration

VIII. **Interview guidance for NGO**

G. Driver

4. What are the main drivers of fisheries adversely affecting the environment?
5. What are the main drivers of non-fisheries activities adversely affecting the environment?
6. To what extent is environmental justice been considered in the decision making process of development project?

H. Pressure

5. What are main pressure of change in inland fish production?
6. Which group of people were most affected by coal mining and palm oil?
7. Which sector were most affected by coal mining and palm oil?
8. To what extent is the decision making process of a) spatial planning, b) land concession, c) EIA permit of palm oil and coal mining consider and address to:
    b. Equity in benefit and impact distribution?
    c. Are all relevant actors and potential affected communities include inside the process?
    d. Is there justice for inland capture fisheries sector?
    e. What, if any, are environmental justice implication of palm oil and coal mining' presence in fisheries zone, particularly for fosherfolks with small operation?

I. State

5. How long do coal mining and palm oil contaminate the river more frequetly and more dectructive during recent years?
6. What were phenomena of massive fish mortality during past years?
7. How did coal mining and palm oil change inland fisheries activities?
8. Which type of fish were substantially affected by contamination of coal mining and palm oil, particularly in the Middle Mahakam Area?

J. Impact

4. What are main impact of coal mining and palm oil on inland fishers' human security?
5. How do coal mining and palm oil effect inland fishers' human security?
6. Does coal mining and palm oil companies has beneficial effects on inland fishers' human security?

K. Responses

5. How do local government help farmers adapt to coal mining and palm oil bad impact?
6. What about the assessment of current adaptation to cope with coal mining and palm oil bad impact?
7. How do you assess diversifying economic activities next to fish capture?
8. How to reduce the negative impact of coal mining and palm oil activities?

L. Environmental Justice

6. How do inland fisher perceive environmental pollution and health, food, and economic security in the Middle Mahakam river?
7. What are community impact associated with environmental contamination?
8. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?

9. Who is responsible for inland fishers who ignore their environment and how they frame the issue of justice and equality?
10. how can justice be achieved if projects can be easily approved because of the money they will bring and the work they will create?

IX. **Interview guidance for business sector**

C. For Palm Oil Company

13. To what extent is the company committed to creating sustainable palm oil?
14. What are the policies, strategies, tools and practices of environmental management and monitoring in an effort to meet the principle of sustainability?
15. To what extent is the company committed to implement Environmental Impact Assessment?
16. To what extent is the company committed to reducing the socio-economic and ecological impacts caused by the pressure of oil palm company activities?
17. To what extent is the company commited to increase affected communities in the decision making process of land compensation, company-community partnership, EIA and CSR?
18. To what extent is the company commited to the principles of justice for resolving the issue of land compensation, company-community partnership, water quality declining and fish mortality.
19. Who is the most benefitted and the most affected people of palm oil company?
20. How can justice be achieved if projects can be easily approved because of the money you bring and the work you create?
21. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?
22. What procedure can allow fisherfolks to define palm oil impact?
23. Are damages compensated?
24. To what extent is the company have procedures or mechanisms for resolving environmental disputes beyond what has been predicted in the EIA

D. For Coal Mining Company

13. To what extent is the company committed to creating sustainable coal mining?
14. What are the policies, strategies, tools and practices of environmental management and monitoring in an effort to meet the principle of sustainability?
15. To what extent is the company committed to implement Environmental Impact Assessment?
16. To what extent is the company committed to reducing the socio-economic and ecological impacts caused by the pressure of coal mining company activities?
17. To what extent is the company commited to increase affected communities in the decision making process of land compensation, company-community partnership, EIA and CSR?
18. To what extent is the company commited to the principles of justice for resolving the issue of land compensation, company-community partnership, water quality declining and fish mortality?
19. Who is the most benefitted and the most affected people of coal mining company?
20. How can justice be achieved if projects can be easily approved because of the money you bring and the work you create?
21. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?
22. What procedure can allow fisherfolks to define coal mining impact?
23. Are damages compensated?
24. To what extent is the company have procedures or mechanisms for resolving environmental disputes beyond what has been predicted in the EIA

X. Interview guidance for local government

F. Dinas Perkebunan

15. To what extent may the wet land ecosystem be privatedly owned?
16. Who has the right to decide about the local development path to be taken?
17. Who gets to decide and set rules and laws, and which parties and interest are recognized in the decision-making process?
18. By what process do they make such decision?
19. How impartial or fair are the institution, instrument, and objective involved?
20. Who makes palm oil decision?
21. Who has the power to status quo for palm oil decision making process?
22. Who benefited?
23. Who is burdened?
24. How various actors have been recognized and invited to palm oil decision making process?
25. How their abilities to participate have been ensured?
26. How emerging participatory arrangements have influenced the distribution of environmental cost and benefit?
27. How can justice be achieved if projects can be easily approved because of the money they will bring and the work they will create?
28. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?

G. Dinas Pertambangan

15. To what extent may the wet land ecosystem be privatedly owned?
16. Who has the right to decide about the local development path to be taken?
17. Who gets to decide and set rules and laws, and which parties and interest are recognized in the decision-making process?
18. By what process do they make such decision?
19. How impartial or fair are the institution, instrument, and objective involved?
20. Who makes coal mining decision?
21. Who has the power to status quo for coal mining decision making process?
22. Who benefited?
23. Who is burdened?
24. How various actors have been recognized and invited to coal mining decision making process?
25. How their abilities to participate have been ensured?
26. How emerging participatory arrangements have influenced the distribution of environmental cost and benefit?
27. How can justice be achieved if projects can be easily approved because of the money they will bring and the work they will create?
28. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?

Dinas Lingkungan Hidup

15. To what extent may the wet land ecosystem be privatedly owned?
16. Who has the right to decide about the local development path to be taken?
17. Who gets to decide and set rules and laws, and which parties and interest are recognized in the decision-making process?
18. By what process do they make such decision?
19. How impartial or fair are the institution, instrument, and objective involved?
20. Who makes coal mining and palm oil decision?
21. Who has the power to status quo for coal mining and palm oil decision making process?
22. Who benefited?
23. Who is burdened?
24. How various actors have been recognized and invited to coal mining and palm oil decision making process?
25. How their abilities to participate have been ensured?
26. How emerging participatory arrangements have influenced the distribution of environmental cost and benefit?
27. How can justice be achieved if projects can be easily approved because of the money they will bring and the work they will create?
28. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?

H. Badan Pertanahan

15. To what extent may the wet land ecosystem be privatedly owned?
16. Who has the right to decide about the local development path to be taken?
17. Who gets to decide and set rules and laws, and which parties and interest are recognized in the decision-making process?
18. By what process do they make such decision?
19. How impartial or fair are the institution, instrument, and objective involved?
20. Who makes coal mining, palm oil and fisheries decision??
21. Who has the power to status quo for coal mining and palm oil decision making process?
22. Who benefited?
23. Who is burdened?
24. How various actors have been recognized and invited to coal mining and palm oil decision making process?
25. How their abilities to participate have been ensured?
26. How emerging participatory arrangements have influenced the distribution of environmental cost and benefit?
27. How can justice be achieved if projects can be easily approved because of the money they will bring and the work they will create?
28. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?

I. Dinas Perikanan

16. To what extent may the wet land ecosystem be privatedly owned?

17. Who has the right to decide about the local development path to be taken?
18. Who gets to decide and set rules and laws, and which parties and interest are recognized in the decision-making process?
19. By what process do they make such decision?
20. How impartial or fair are the institution, instrument, and objective involved?
21. Who makes coal mining and palm oil decision?
22. Who has the power to status quo for coal mining and palm oil decision making process?
23. Who benefited?
24. Who is burdened?
25. How can justice be achieved if projects can be easily approved because of the money they will bring and the work they will create?
26. To what extent is inland capture fisheries contribute to the economic development in the Middle Mahakam Area relative to the coal mining and palm oil?
27. What are the policies, strategies, tools and program of environmental management is directed to meet the principle of sustainability and justice?
28. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?
29. Do you consider to who is the winner and the loser of current economic development in the decision making process?
    d. In the spatial planning decision making
    e. In the land concession decision making
    f. In the EIA decision making
30. To what extent is inland capture fisheries to be considered in the decision making process of development:
    a. In the spatial planning decision making
    b. In the land concession decision making
    c. In the EIA decision making

J. DPR, Gubernur, dan Bupati

4. What knowledge, values, and experiences do you bring to policy development related to coal mining and palm oil?
5. What are the main issues related to policy development for regulating coal mining and palm oil?
    c. What are your primary concerns, or what are the primary concerns that you hear from residents/constituents?
    d. How have these issues been represented by different stakeholders?
6. How are different groups of people impacted by these issues?
    - What inequalities exist in the process of developing regulations for coal mining and palm oil?

4. Describe the current policies in place to address the issues you mentioned.
5. Where and how can interventions be made to improve these issues?
6. What spaces exist for different stakeholders to participate in the decision-making process?
    d. What key stakeholders were included in this process? Excluded?
    e. Where and how can we enhance spaces for different stakeholders to participate?

f. What sort of power dynamics do you see across these actors and organizations?

7. What benefits or risks do you feel accompany coal mining and palm oil?
   b. How are these distributed across different groups of people?
4. What sort of policies are currently being proposed? How might they reduce inequities in terms of ability to participate in policy development for regulation coal mining and palm oil development or minimizing potential risks and impacts?
5. A large portion of the legislation moving through the East Kalimantan Congress the last six years has related to the balancing of rights between state and local governments to regulate coal mining and palm oil development. What do you think is the appropriate way their roles should be balanced in decisions related to coal mining and palm oil particularly as it relates to land use planning?
6. Who is responsible for water quality and fish productivity declining in the Middle Mahakam river?

XI. Interview guidance for academia

F. Driver

4. What are the main drivers of fisheries adversely affecting the environment?
5. What are the main drivers of non-fisheries activities adversely affecting the environment?
6. To what extent is environmental justice been considered in the decision making process of development project?

G. Pressure

5. What are main pressure of change in inland fish production?
6. Which group of people were most affected by coal mining and palm oil?
7. Which sector were most affected by coal mining and palm oil?
8. To what extent is the decision making process of a) spatial planning, b) land concession, c) EIA permit of palm oil and coal mining consider and address to:
    e. Equity in benefit and impact distribution
    f. Are all relevant actors and potential affected communities include inside the process?
    g. Is there justice for inland capture fisheries sector?
    h. What, if any, are environmental justice implication of palm oil and coal mining' presence in fisheries zone, particularly for fosherfolks with small operation?

H. State

5. How long do coal mining and palm oil contaminate the river more frequetly and more dectructive during recent years?
6. What were phenomena of massive fish mortality during past years?
7. How did coal mining and palm oil change inland fisheries activities?
8. Which type of fish were substantially affected by contamination of coal mining and palm oil, particularly in the Middle Mahakam Area?

I. Impact

4. What are main impact of coal mining and palm oil on inland fishers' human security?
5. How do coal mining and palm oil effect inland fishers' human security?
6. Does coal mining and palm oil companies has beneficial effects on inland fishers' human security?

J. Responses

5. How do local government help farmers adapt to coal mining and palm oil bad impact?
6. What about the assessment of current adaptation to cope with coal mining and palm oil bad impact?
7. How do you assess diversifying economic activities next to fish capture?
8. How to reduce the negative impact of coal mining and palm oil activities?

VITA

NAME	Etik Sulistiowati Ningsih
DATE OF BIRTH	10 August 1981
PLACE OF BIRTH	Lamongan, Indonesia
INSTITUTIONS ATTENDED	Mulawarman University
HOME ADDRESS	Jl. Perjuangan 1 No. 29 Samarinda Kalimantan Timur, Indonesia
PUBLICATION	No
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