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Maluku Between Blessing and Curse; Exploitation of Masela Block Oil and Gas Mining Field and the Implication

Semuel Leunufna

1. Faculty of Agriculture Pattimura University, Ambon, Maluku, Indonesia and Center for the Conservation of Maluku's Biodiversity

Abstract: The discovery and exploitation of Masela block, oil and gas mining field located at Arafura sea, part of "wallacea" biodiversity *hot spot* area, trigger hopes and concerns. This study evaluate the state of the art of preparation for Masela block exploitation and the implication on biodiversity, and indigenous community of Tanimbar Islands (-KTT) or Southeast West Maluku (- MTB) and Southwest Maluku (- MBD) Regencies. The methods implemented are of literature review, notes on audiences with decision or policy makers of central government of Indonesia, and previous field surveys and studies within the closest impact region, KKT and MBD Regencies. The exploitation of Masela block, everlasting mining of oil and gas field promises hopes for prosperity especially for local and indigenous communities, self-sufficiency in energy provision and national economic development, reduction in carbon emission and leadership in mitigating global climate change for Indonesia. A number of challenges, however, may lead Masela block exploitation to be the second curse to Maluku people after Banda Nutmeg (*Myristica fragrans* Houtt.), if not seriously taken into account.

Keywords: Oil and Gas Mining, Masela Block, CCSU, EIA, Indigenous Community

INTRODUCTION

Amitav Ghosh, a prominent Indian writer elaborated on the themes of colonialism, climate change, white domination, neo-liberalism and other issues with reference to Banda, Ternate and other areas in Maluku in his brand new book entitled Nutmeg Curse [1], written following the author's visit to Banda island, 2016. The book received many comments, reviews and discussions from different perspectives [2] [3].

From the perspective of Maluku people, the title of the book alone is enough to trigger memories, awareness, weariness and concerns especially when placed in the context of recent development in Maluku Province/islands. Somehow, a wealth, which is a blessing, a natural gift from the creator of the universe, Nutmeg (*Myristica fragrans* Houtt.) with Banda Islands as the only habitat for the crop in the 16th century, in the development became reasons for currency development, banking system establishment, great economic development in Europe and the world, establishment of world selling and trading route, development in sciences among others, yet at the same time developed into bases for intimidation, occupation, colonialism, slavery for centuries to indigenous community of Maluku. Nutmeg became a curse for its owner but a blessing for others.

The same feeling mainly occupied the hearts of most of local community in the recent state of development of Maluku, the situation where another curse is discovered coming from the sea and not of a biological resources, that is Masela everlasting oil and gas mining block, one of around 25 oil and gas mining fields in Maluku, about half of them have

been in the contract for exploitation [4] [5]. This time, it is obvious that the dominant party, determinant of laws and regulations and mostly the beneficiary is not of the white people, European but their own county men, the government, capital owners and the developing companies. Experiences in the past and on going mining activities, in addition to corruption practices in the country, which are, even though, being eradicated, new cases are still found, as well as undemocratic practices in management are the main point of justification for the concerns of community and leaders of local indigenous people.

A hope is actually seen from the instruction of former president Joko Widodo, during his presidential term, in his order for a paradigm change in the development of Masela block mining field, in which emphasize is given more into implementation of Indonesian basic constitution 1945 Chapter 33 verse 3: "earth, water and all natural richness they contain, is controlled by the state and used in the most part for the prosperity of the people" (UUD-45: "Bumi, air dan kekayaan alam yang terkandung di dalamnya dikuasai oleh negara dan digunakan untuk sebesar-besar kemakmuran rakyat."), translated into several points; mining operational should be open to public, transparent, can be accessed by community as part of education and research, implemented as on-shore and not off-shore exploitation, addition of by-product industries which enable an economic development of the community in the region and recently, addition of Carbon Capture, Storage and Usage (CCSU) facilities in the revised plan of development (PoD), which, theoretically, will mitigate carbon emission impacting climate change, meeting the international agreements including ones signed by Indonesian government on climate change. Everything described above, however, are still concepts, await implementation and the impacts.

The other side of exploitation of Masela block and other mining resources especially within the Wallacea hot-spot region of Maluku, is the exploitation and monetization of environment and biodiversity, which is equally possessing natural wealth and economic importance beside their contribution to science and world's scientific development, in addition to their uniqueness (endemism) and venerability to habitat destruction. The fact that Masela block mining field is situated within the biodiversity hot spot, Wallacea region, causing the policy and management of Masela block exploitation become very important.

Exploitation of natural biological resources may cause a small harmful implication to other natural resources including oil, gas and mineral mines. Exploitation of everlasting resources of oil and gas field, Masela block, however, will generally results in destruction and possibly wipe out ecosystem and habitat and niche and at the end biological diversity and environment surrounding the exploitation region.

Efforts to provide economic value to environmental services and potential biodiversity through bio-prospecting and development into various sectors of industry including those of biological resources present in Masela block region, which are highly promising yet has not been fully pursued is another way of economic development offered to Maluku and Indonesian people which will not cause much harmful effects to Masela block minging site and other natural resources.

Taking the policy of continuing Masela block exploitation by government and developing companies, it is necessary to be accompanied by implementation of programs of mitigation, remediation and compensation for the loss of environmental services, health, habitat and niche, erosion of biodiversity, rights of indigenous community and others.

Otherwise, Masela block , everlasting oil and gas mining will become the second curse following Banda Nutmeg to maluku people.

Objectives

The article, a critical review, asses recent dynamic of Masela block, oil and gas mining exploitation; description and history of development, implementation of plan of development (PoD) including environmental impact assessment (EIA) studies and its impact on biodiversity especially within the region of biodiversity *hot-spot*, wallacea, indigenous community of Maluku, and the program of mitigation, remediation and compensation to be implemented.

METHODOLOGY

The article is developed through literature studies, notes on discussions with numbers of Maluku community leaders, audience with high rank government leaderships in Indonesia including Coordinating Minister of Marine Affairs and Natural Resources, and Staffs, Presidential Advisory Board and other institutions, collaborating research and development projects involving national and international institutions, and previous field studies involving the author. In cases of field studies, the methodology implemented include surveys, field observations, interview, focus group discussions (FGD), data measurements, analysis etc.

RESULTS AND DICUSSIONS

Masela Block; Discovery, Chronology and Recent Development in Exploitation Project

A short description of Masela block oil and gas mining field is given in Table 1. covering history of discovery and development as well as a few important features of the project based on a number of references.

Development of Front End Engineering Design depicted in Fig. 1 indicating a certainty of achieving first production target of the year 2029.

Figure 1: Development of Front End Engineering Design (FEED) of Masela block, Condition at October, 2025 (Doc. Reuters).

Table 1: Recent Profile of Masela Block Oil and Gas Mining Field.

Item	Explanations	References
Short history of discovery and development	Contract for mining exploration was signed by Impex Corporation, Japan with Indonesian government in the year 1998. The discovery of Masela block everlasting oil and gas mining field in 2000. It is the second largest mining field of the kind in Indonesia after Mahakam block. Later in the development, Impex shared its 100% right for the development with Shell Corporation, the Netherlands to be 65% Impex and 35% Shell participating Interest (PI). First concept of Plan of development (POD I) submitted and signed by Indonesian government in 2008 PoD was revised and resubmitted in 2015 due to discovery of additional oil and gas reservoir within Masela block. Disputation arose between Coordinating Ministry of Maritime and Investment Affairs versus Ministry of Energy and Mineral Resources and Special Task Force for Upstream Oil and Gas Business Activities (SKK Migas), regarding *On-Shore* (fist party) and *Off-Shore* (second party) exploitation mode. The arguments include production budget, regional economic development, transparency and others.	[5] [6] [7] [8]

	Former President through a dally order decided on the *on-shore (not off-shore)* exploitation to be implemented in Masela block development, 2016, partly influenced by lobbies by Maluku community leaders. Shell corporation with 35% PI, decided to withdraw from the consortium of Masela block exploitation, 2022 due partly to changing in the global focus on energy provision to renewable energy and the impact of pandemic COVID-19. The replacement for Shell is taken over by Indonesian corporations. PoD II revision signed by the President General Prabowo Subianto, 2023 and Front End Engineering Development (FEED) was constructed with the plan for the first production in 2029.	
Astronomical, Geographical position, and consequences	Masela block is a region, *off-shore*, with an area of 4.291,35 Km^2 where the everlasting oil and gas mining was discovered. Astronomically, Masela block situated roughly around $9^0$2' S and $130^0$2'W (Fig. 2). A few data on the geographical position of Masela block are as follow; situated in the Arafura sea, about 800 Km east of Kupang city, Nusa Tenggara Timur province, 400 Km north of Darwin, Australia, 150 - 170 Km Southwest of Yamdena Island, more than a hundred kilometer Northeast of MBD Islands, within the depth of 300 - 1000 meter (Fig. 2 and 3). As a consequence of Masela block position outside of 12 sea miles (22. 2 Km) from the seashore, or not within the territory of Indonesia (and Maluku province), yet has the sovereign rights to explore and exploit existing natural resources within the area, the rights for 10% participating Interest, is given to provincial government by Indonesian government. MBD and MTB/KKT Regencies claim to have customary rights on Masela block since the territory has been a hunting area/ground for their livelihood for generations. Masela Island is also an island of MBD Regency nearest to Masela block.	[8] [9]
Potential reservoir/duration of productivity	Masela block posses a reservoir of 18,54 Trillion Standard Cubic Feed (TSCF) Natural gas and 225,5 Million Stock Tank Barrels (MMSTB) Condensate (Oil) targeted to produce 9,5 Million tons of Liquid Natural Gas (LNG) per year. 150 Million Standard Cubic Feet per day (MMSCFD), and 35 Thousand Barrel Condensate per day.	[9] [10] [11]

	Masela block is estimated to be productive for more than 70 Years time period.	
Estimated production year and buyers	Masela block is planned to begin the production in the year 2029. Liquid natural Gas (LNG) of Masela block will be market internally in Indonesia and for export. Potential buyers are from Japan, Malaysia, Taiwan, china and Korea.	[9]
Targeted objectives	Self sufficiency in energy for Indonesia, as one of the pillars of energy resilience. The products will be mostly used for domestic needs, sustaining Indonesian energy resilient in the era of energy transition. as a trigger for development, national and regional development engine, and become part of Indonesia's grand strategy for energy independence.	[11]
Latest Implementing Consortium	Masela block is developed by a consortium operated by Impex corporation Japan with participating interest of (PI) 65% togather with Pertamina, 20% PI, and Petronas, 15% PI. Maluku government appointed a State owned enterprise (Badan Usaha Milik Negara - BUMD) PT Maluku Energi Abadi (MEA) as the holding company for 10% PI which will be provided by Impex corporation. Following further discussions, Indigenous community of Yamdena (Lermatang and Latdalam Villages) proposed 14% PI for regional Maluku considering compensation cost for their lands. PI 10 % for regional Maluku will be divided as follow; 3% belongs to Maluku Province, 3% for KKT Regency, 3% for MBD Regency, and the rest 1% divided evenly among 9 other regencies in Maluku each with 0.11% PI. At the state of Front End Engineering Development (FEED), Impex corporation appointed PT Adhi Karya (Persero) TBK as the main contractor in collaboration with two global Engineering Procurement Construction (EPC) companies, Kellogg Brawn & Root (KBR) and Samsung Engineering & Construction, through a letter of Award on 4th of August, 2525. For the domestic affairs three companies has been appointed as the candidate for off takers; PT PLN (Persero), PT Perusahaan Gas Negara Tbk (PGN) and PT Pupuk Indonesia (Persero). Heads of Agreements (HoA) between Impex Corporation and the three companies has been signed.	[9] [12]

Concept of Development	Green field, a new oil and gas field which posses high complexity and high risks. The works will cover deep sea drilling, sub-sea facilities, Floating Production Storage and Offloading (FPSO), and On-shore LNG Plant, different than that of Brown fields which focus only on land productivity which is already mature. On land facilities of Masela block will be equipped with technology for Carbon Capture and Storage (CCS) to reduces carbon emission, so that the energy suply remain stabilized and supporting the national policy of reducing emission towards zero carbon emission. The main infrastructure consist of two train of on land facilities with a total capacity of 9.5 Million tons per year, domestic pipeline infrastructures, and LNG export facilities. Supporting facilities in Yamdena Island include access roads, electricity, and housing infrastructure for employees.	[9]
Estimated labour absorption	Masela block project is estimated to absorb more than 12.600 workers at the development state, while at the operational state, 850 workers well be required. Impex Corporation will involve local community especially Maluku endogenous. In part through vocational training programs, preparing local workers to be absorb when the construction project begin.	[9]
Operational Costs	Onshore Liquid Natural Gas (OLNG) requires as much as USD 20 billions investment, equal to 33.6 trillions IDR, assuming 16.680 IDR per 1 USD.	[13]
On shore sites of mining infrastructure	Administratively, Everlasting LNG will be centered in Yamdena Island, KKT Regency. Sites for on-shore infrastructures decided to be at Latdalam and Lermatang Villages. An area of 28.9 hectares of non-forest land has been prepared by National Land Agency (NLA) of Maluku Province (Badan Pertanahan Nasional (BPN) Wilayah Maluku) for the purpose.	[9] [14]
Environmental Impact Assessment (EIA)	Special Task Force for Upstream Oil and Gas Business Activities (SKK Migas) together with coordinated team are preparing document of Environmental Impact Assessment (EIA) estimated to be concluded in September, 2025. Following that, the Final Investment Decision (FID) will be signed in the early 2026. In the year 2024, a series of survey activities on geology, geophysics and high and low tides as well as acquisition	[9] [14]

	of coral reef data has been started. The activities involved Research Task Force of SKK Migas, Impex and a number of local personals.	

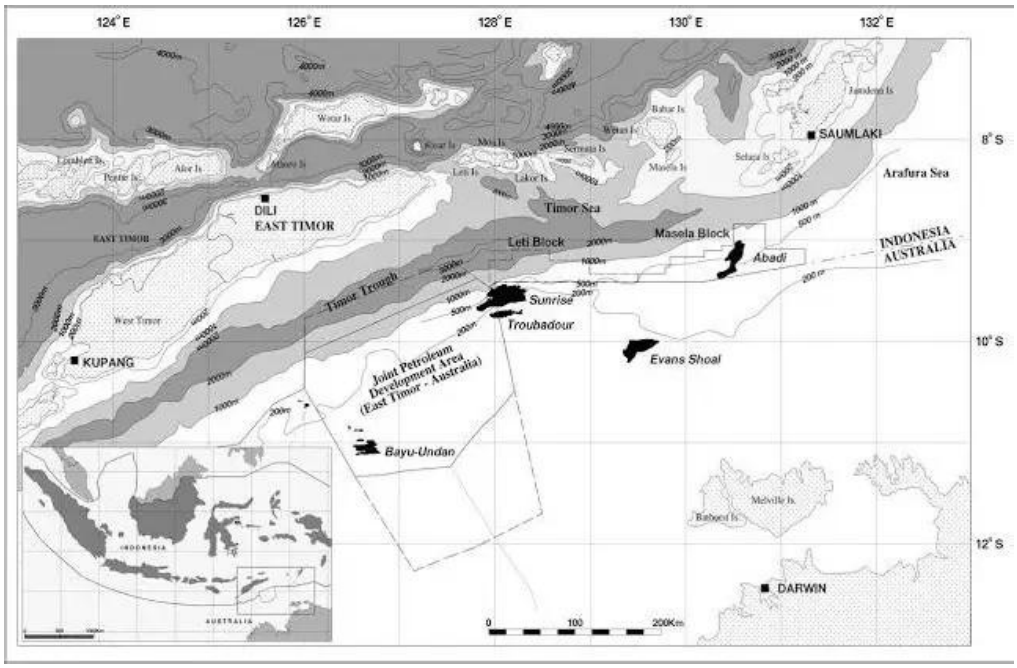

Figure 2: Map of astronomical position of Masela block, indicating a position within 9 to 9.5 South Latitude (S) and within 30 to 31 East Longitude (E) [7].

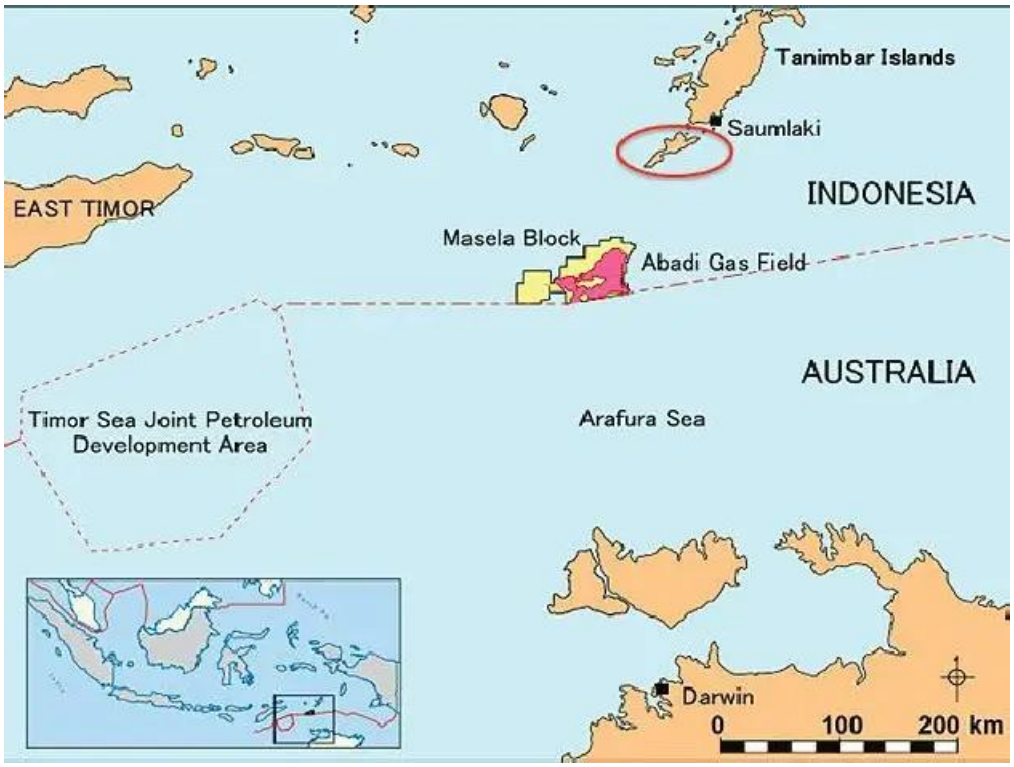

Figure 3: Map showing geographical position of Masela block [7] [8].

Criticizing Plan of Development (POD) and Its Implementation

Masela block mining exploitation, as promoted in different news media appeared very promising, as indicated on head line news such as " Masela block: strategic leap of energy, economy and decarbonation in indonesia" [15]. It should be aware, however, that a number of aspects were left out of the PoD coverage when refereeing to media coverage especially related to environment and the rights of indigenous community.

First, the latest PoD fails to elaborate on by-product industries to be established alongside oil and gas mining infrastructures such as that of petrochemical industry etc., previously narrated by the coordinating minister of marine affairs and natural resources both during the audiences with Maluku Community leaders and in the seminar presentation at the Pattimura University. PoD in the media description did not mention or provide hints on the development and management of the industries which enable economic development for local and indigenous community; instead the description went or indicating only on establishment of on-shore and off-shore mining infrastructures, housing for the employee while leaving the economic development of especially indigenous community flows within the complexity and competitive economic development of diverse community. The situation is a disadvantage for indigenous community, which is lacking the experience in free competitive modern economic development.

A community which will later develop within the Masela block oil and gas mining region is presumably of migrants quipped with enough technical, know-how ability in various professional aspects to benefit from the regional economic development, shifting aside indigenous community; the first occupant, owner and guardian of the region who have been protecting and make a living from present natural resources. Research findings [12] indicated the need to pay attention on a number of points within the exploitation region such as pricing for indigenous community's land, shifting in values of customs and culture, indigenous knowledge, ability to mastering modern technology, environmental impact, food security including that of vegetables, sharing of participating interest among the regencies and the province.

Training solutions offered by developing parties [16] [17] fails to indicate when and how (if it is periodical or one time), professional area of training, curriculum offered (whether it is mining techniques, petrochemical industry, administrative management, oil and gas minging business, etc.). Furthermore, the outcome of training programs generally will occupy the positions which are mostly of technical or ordinary employee; indigenous employee, however, demand also positions at management or executive level, which require higher degree of educations; undergraduate, masters or doctorate degrees, previously indicated by the government yet has not been elaborated and implemented.

A certificate of joint work (memorandum of Understanding- MoU) between Pattimura University and developing company indicating scholarship provision for selected students, was posted on the wall of the Rector's office room, signaling a continuation of the President's pledge, in which Pattimura University i.e. Polytechnic Faculty to be responsible for the preparation of such candidates. Until recently, only 4 years left (2029) before the first production of Masela block mining site, however, there has not been any discussions nor reports of the advancement on the topics. Maluku community deserve to have follow ups on questions such as number of students who have been in the educational program, how was the selection procedure implemented, how will they be placed in the job position,

what are the study programs they are enrolling in, in which countries and universities they are studying, who are the funding providers and how high is the scholarship, when will the studies ended and other such reports.

Second, even though there is an additional facilities of Carbon Capture, Usage and storage -CCUS, which means a good image for Indonesia to the world with regards to climate change as well as increasing the market niche for Masela block products, PoD fails to indicate and elaborate on the implication of Masela block sites situated within the Wallacea biodiversity *hot-spot* region especially on those, which will severely impacted and steps and programs to be implemented anticipating the consequences. Mentioning of Environmental Impact Analysis (EIA) was brief and expected to be quickly completed giving the impression of rushing and of less necessity on the scale of importance in the PoD, as if the environmental impact is an economic burden to the huge benefits which will be profiting the developing parties.

Research on EIA by the the Special Task Force for Upstream Oil and Gas Business Activities (SKK Migas) of Indonesia and Impex Corporation involving indigenous community and academia from the Pattimura University Ambon reported on sampling of coral reef and receiving the community statements on Masela block exploitation [14]. The study certainly will also provide initial data for further monitoring of sustainability of the environment pertaining to additional facilities, CCUS. However, there was no further explanations on the results and the whole coverage of EIA for masela block as well as prediction of what may occurs in the future, which supposed to be covered in an EIA report, meanwhile the date for signing of final investment decision is only days to come, targeted to be early 2026. As well, Conducting EIA after the signing of PoD and establishment of Front End Engineering development (FEED) is certainly not online with the spirit of implementing EIA.

Third, PoD fails to inclusively introduce or explain maluku region (province) as a legitimate parties possessing the rights for Masela block exploitation; Participating Interest (PI) of 100% has been divided only to three member of consortium or the owner of Masela block mining site which are Impex corporate with 65% PI, Pertamina Hulu Enegy with 20% PI and Petronas Masela with 15% PI. Ten percent (10%) PI belongs to maluku region according to the regulations [18] [19] was never mentioned, in other words PoD fails to include Maluku Region in the discussions and systematically giving appropriate attention in the development of Masela block [5].

Technically [20] PI 10 % will be offered by Impex corporate to the regional corporate appointed by the Maluku provincial government following the exploitation at the operational stage of development, in which the income on PI (10%) will not be received in full amount (100%) due to the obligation to bear the operational cost (exploration and exploitation) as one of the owner of masela block mining site. Furthermore, with the freedom of Regional implementing Corporate to delegate its operational rights to subsidiary companies (as indicated in the revised regulation) clearly will result in lowering the contribution to regional income due to increase in dividing number.

Studies on the on-shore site of masela block, on Lermatang and Latdalam villages of Yamdena Island [12] found that development in the economic aspects within masela block region, in this case all economic indicators with allocated funding as high as 400 trillion, with possibility to increase due to environmental impact, was manage by Impex as indicated in the PoD. Appointed Maluku Regional Corporate responsible for implementing 10% PI has

no knowledge and has no access to the PoD [5]. This situation is not understandable, because even though theoretically impex corporation has the capacity to understand and manage the problems related to economic indicators within Masela block mining region, specific problems related to indigenous community, however, belongs to indigenous community and therefore deserve an opportunity to take part in the discussions.

A Short Review on Implementation of Environmental Impact Assessment (EIA)

Environmental Impact Assessment (EIA) generally covered three main points; description, prediction and prescription with a structured and systematic working progress from a number of environmental perspectives including that of economic, politics, social, culture, defence and not only physical (nature) generally covered [12] [21].

Implementation of EIA in Indonesia most often utilizing Indonesian Environmental Impact Assessment, which deemed to be less beneficial for the sustainable development in Indonesia due to the absent of coverage on ecosystem services, labourer, soil water, landscape and visual impact, cultural heritage, security and community safety, and unusual activities as that covered on Environmental and Social Impact Assessment (ESIA) and therefore urged for adjustments [22].

From the technical perspective of environmental hazard, should be indicated that part of the the problems has been accommodated in the PoD through the addition of CCSU. CCSU is able to capture 85-95% of CO_2 [23] out of mining products, which place Indonesia in the front line among Asian countries in the area of carbon mitigation and the impact on global warming, attain certain international agreements including joint statements such as that of Science 20 (S20) South Africa, 2025 [24], in addition to further uses of CCSU and possibility of implementing carbon pricing, which provide more economic benefits [25].

However, other hazardous chemicals contain in the oil and gas mining produced, in addition to 5%-15% CO2 not captured by CCSU system as well as waste of established biochemical industries are still potentially contaminate air, water, soil including agricultural lands and harm human health and biodiversity. Possibility of spilling out of products both through human error and/or catastrophic events will result in similar effects to environment and required to be elaborated of where about the CCSU facilities will be located and if the environmental safety has been taken into consideration. Those aspects are failed to be elaborated and/or communicated in the coverage of PoD.

Possibility of environmental hazardous conditions such as that of acid rain, increasing water acidity including that of sea water and the impact on life and movement of surrounding marine biodiversity, degradation of forest, green area and agricultural lands, soil and fresh water contamination through wastes of by-product industries as well as other human activities will still threatening food security of indigenous community, human health, and the existence of biodiversity. Studies on a number of oil mining sites in different parts of the world and the impacts on Soil, air, and water pollution was discussed comprehensively by Dehkordi et al., 2024 [26] and concluded that soil contamination with heavy metal ions from mining activities poses a significant environmental challenge, necessitating the implementation of diverse monitoring, assessment, and mitigation measures to safeguard human health and ecosystem integrity. The impact is illustrated in Fig. 4.

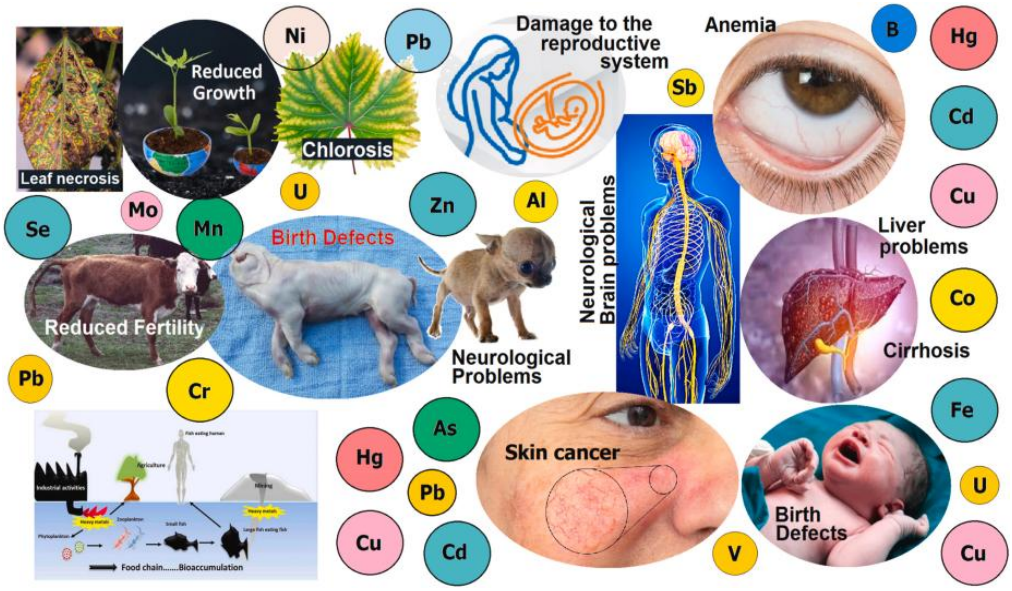

Figure 4: Heavy metals product of mining activities and the impact on environment, biodiversity and human health [26].

Political and Governance Influence

Oil and gas mining exploitation practices in Indonesia including those in Maluku region until recently provide no positive marks supporting the decision for Masela block oil and gas mining exploitation, when basing EIA on the politics, governance as well as economics aspects. Out of around 25 blocks of oil and gas mining in Maluku Region, about half of them are being exploited or signed to be exploited, non have contributed to the prosperity of the region (Province). Maluku provinve for many years is among the view highest poverty level, rank 3-4 poorest among 34 provinces in Indoensia, recently rank 8 out of 38 provinces due to the division of poor provinces (in Papua) [27]. Taking the example of Bula block, Seram Island, Central Maluku, oil production is shipped and marketed out of the mining region leaving no benefits for the prosperity of the mining region. Indigenous community even has no access and observe the mining site.

Corruption practices and mismanagement in many different aspects of governance in Indonesia, including that in mining exploitation signaling a negative impact and presumably will increase in different sectors of block masela mining block development [28]. Corruption case of hundreds of Trillions IDR in Pertamina Corporation is one of the prominent example [29] [30]. Another example is Asset forfeiture Bill to criminalized elicit enrichment of a corrupter demanded by executive government of Indonesia to be ratified, yet has not been completed until recently by the parliament [31] [32] and has become one of the reasons for a massive demonstration ended with burning of the houses of several parliament members and the ministry of finance, Dr. Sri Mulyani, causing her resignation (replacement) [33] [34]. Floods and landslides causing more than a thousand lives in three provinces; Aceh, North and West Sumatera as a result of permits provided by the government to cut down and replacement of the forest with oil coconut plantation [35] is one of the very recent development justifying the assumption of future impact on masela block exploitation.

Implication of Masela Block Position Within Wallacea Biodiversity Hot-Spot

The position of Masela block oil and gas mining site in the wallacea biodiversity hot-spot (Fig. 5), one of only 35 hot spots in the world, causing it to become a concern not only to Indonesian especially indigenous community, but also to the world. Biodiversity hot-spot is established based on the amount of endemic organisms (minimum 15%) and degree of habitat destruction (about 70%); aiming at concentrating resources (expertise and funding) in efforts on research and conservation [36].

Figure 5: Masela block exploitation region of *on-shore* and *off-shore* sites (Red circle) situated within the Wallacea biodiversity hot-spot [37].

Wallacea hot-spot, a region of 33,8 Million Ha, covers 3 bioregions; Maluku, where Masela block situated (Fig. 5 red circle), Lesser Sunda and Sulawesi, and two countries; Indonesia and East Timor. It is a habitat for 10.000 species of plants (among them more than 1500 endemic) , 2.112 species of marine fishes (110 endemic), 711 species of birds (274 endemic), 450 species of corals (few endemic), 250 species of fresh water fishes (50 endemic), 222 species of reptiles (99 endemic), 222 species mammals (127 endemic) and others. Among all taxonomic groups distributed within Wallacea hot spot, a total of 560 species are on the Red list of international Union for Conservation of Nature and Natural Resources (IUCN), 303 of them are of Maluku bioregion, Table 2. (gray area) [37].

Based on the red list of IUCN, 35 species of biodiversity within the Wallacea region are classified as Critically Endangered (CR) (Table 2.), 26 species of them are endemic to the hot spot and out of them 13 species are only known from one site. One hundred eight species are classified as Endangered (EN) consisted of 83 terrestrial species include 23 species of mammals, 20 of birds, 15 of shrimps and crabs and 7 of plants, and 25 marine species include 3 of whales, 2 of marine turtles and 9 of corals. Out of the Endangered

species, 77 are endemic to wallacea and 24 of them are known only from a single Key Biodiversity Area (KBA) [37].

Table 2: List of Globally Threatened Species in Wallacea, highlight on Maluku bioregion (gray colour)

		IUCN Red List Status			Species Distribution by Bio-region			Species Distribution by Country	
Taxonomic group	CR	EN	VU	Total	Sul	Mal	LS	IND	T-L
Amphibian	0	4	4	8	6	1	1	8	0
Birds	12	20	29	61	29	16	20	61	6
Calanoida	0	0	1	1	1	0	0	1	0
Decapoda	1	15	16	32	32	0	0	32	0
Freshwater Fish	4	4	29	37	37	0	0	37	0
Freshwater Gastropods dan Bivalves	1	1	1	3	3	0	0	3	0
Lepidoptera	0	5	14	19	10	4	6	19	2
Mamnals	5	23	36	64	40	13	15	64	2
Odonata	2	1	4	7	4	2	1	7	0
Plants	5	7	54	66	36	23	18	66	4
Reptiles	2	3	5	10	6	2	7	10	2
Corals	0	9	167	176	171	172	168	176	168
Marine fish	2	6	46	54	51	48	45	54	46
Marine mammals	0	3	2	5	5	5	5	5	5
Marine mollusk	0	0	2	2	2	2	2	2	2
Marine reptiles	1	2	2	5	5	5	5	5	5
Sea cucumber	0	5	5	10	10	10	9	10	9
	35	108	417	560	448	303	302	560	251

Legend: CR = *Critically Endangered*; EN = *Endangered*; VU = *Vulnerable*; Sul = Sulawesi; Mal = Maluku; LS= Lesser Sunda ; IND = Indonesia; T-L = Timor-Leste [37]

Agricultural biodiversity within the bioregion of Maluku, the region which will be intensively afected by the Masela block exploitation, notably vary between Central Maluku and South East Maluku (including KKT and MBD Regencies) generally caused by differences in climatic elements, mainly of rainfall and temperature (Fig. 6) [37], in which high temperature coupled with relatively low rainfall occur in KKT (South East West - MTB) and MTB Regencies in comparison to those of Central Maluku Regency especially Seram island except Buru island [37] [38]. Food crops commodity in the region of KKT and MBD regencies are relatively less diverse [38], dominated by major food crops ubi (*Dioscorea alata* L) and Gembili (*D. esculenta* (Lour.) Burk.), taro (*Colocasi esculenta* L.), coco yam (*Xanthosoma sagittifolium* (L.) Schott and corn (*Zea Mays* L.). Surveys in 1989 collected 40 cultivars of

yams (*D. alata and D, esculenta*) in Yamdena island [39] [40], a great number of cultivars of *Xanthosoma and Colocasia* are known to be cultivated intensively in the small islands around Yamdena (Tanimbar) such as Selaru [41], while around 50 cultivars of corn were found in the MBD Regency [42].

Table 3 provides data on diversity of commodity, planting area, harvest area, production and productivity of food crops in KKT and MBD in the year 2021. The highest production of food crops for MBD Regency is given by corn and cassava (*Manihot esculenta Crantz*), while that for KKT/MBD are tuber crops and rain fed rice (*Oryza sativa* L.). Corn in MBD and tuber crops in MTB/KKT have cultivated for generations in the two Regencies beside a few other commodities such as pulses, sago (*Metroxylon sago* Rott.) and rice [43] [38].

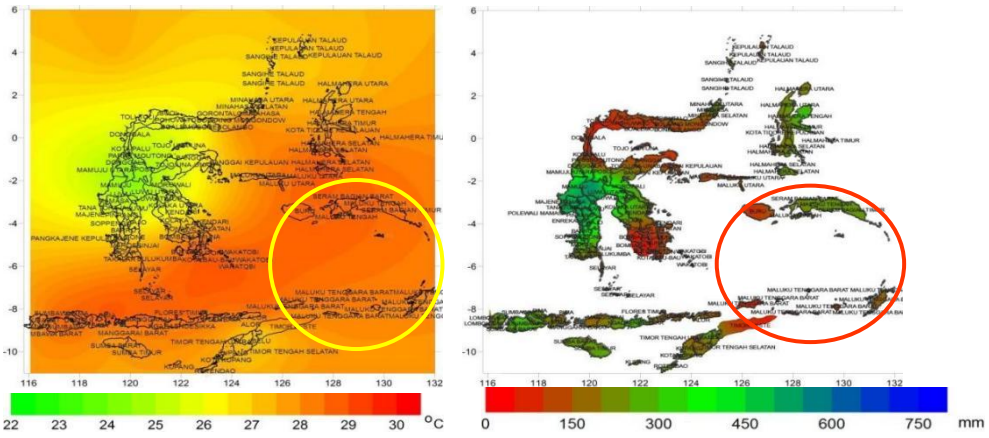

Figure 6: Temperature and Rainfall Projections for Wallacea [37]. Wallacea bioregion of Maluku (Yello and Red circles) with reddish orange temperature indication, an average temperature of 280-290C, while rainfall indication of greenish blue color of Seram island indicated a relatively higher average rainfall (450-550 mm) and reddish green color of Yamdena/Tanimber island indicating a relatively lower rainfall (150-250 mm).

"Ternate paper", "On The Tendency of Varieties to Depart Indefinitely from the Original Type", was completed by R. A. Wallace during his illness of contracting Malaria in the Island of Halmahera, North Maluku, prepared following his research visits to different islands in, now called Wallace hot-spot region, and sent from Ternate island to Charles Darwin in London [44]. This 'Ternate Essay" was then combined with the results of studies by Charles Darwin, giving birth the article " On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties by Natural Means of Selection". The combined article was read by three reviewers; Asa Gray, Joseph Dalton Hooker and Charles Lyell, accepted and published in the Journal of Linnean Society of London, printed version, on august 20th, 1858, and referred to as the theory of evolution through natural selection by Darwin-Wallace [44] [45] [46]. The history of the evolution theory origination was also marked with a rigorous evaluation on the honesty (integrity), especially plagiarism in the scientific publication [47] which hold true up to recent development.

Table 3: Planting area, Harvest area, production and Productivity of food crops in MTB/KKT and MBD in 2021.

Commodity		South West Maluku (MBD)			South East West Maluku (MTB) /Tanimbar Islands Regency (KKT)			
	planting area (ha)	harvest area (ha)	Production (ton)	productivity (t/ha)	Planting area (ha)	Harvest area (ha)	Production (ton)	Productivity (t/ha)
Rain-fed Rice	671	443	485	1,09	1.209	963	867	0,90
Corn	10.404	7.062	9.163	1,30	919	793	713	0,90
Cassava	675	298	2.054	6,89	413	340	2.040	6,00
Sweet potato	533	303	1.515	5,00	373	320	1.638	5,12
Ground nuts	603	494	595	1,20	645	580	521	0,90
Green bean	63	53	58	1,09	625	589	529	0,90
other pulses	157	125	119	0,95	524	518	395	0,76
other tuber crops	457	278	1.946	7,00	850	779	4.674	6,00

Source: Central Biro of Statistics (BPS) South East West Maluku Regency (MTB), 2011; BPS South West Maluku Regency (MBD), 2011. [43]

On his study, R. A. Wallace observed sample cases of survival of the fittest on Maleo Senkawor bird (*Macrocepalon maleo* S. Mueller) endemic to Sulawesi Island and Maluku Gosong bird (*Eulipoa wallacei* Gray), endemic to Maluku Islands. Equip with proper body organs and other abilities to dig into the soil and built their nests, laying eggs at night time and placing the eggs in the right depth for a suitable incubating temperature either through sun light, geothermal or litter decomposition, producing a huge egg size providing plenty of nutrition enabling the newly hatched eggs to grow strong, fast move and able to fly to avoid predators causing them to survive. Within the Wallcea hot spot seven species of Maleo from three genus, among them is Tanimbar megapode or Tanimbar Schrubfowl (*Megapodium tanimbarensis* P. L. Sclater), endemic to Tanimbar Island [48] with the conservation status of ”vulnerable” according to International Union for the Conservation of Nature and Natural Resources (IUCN) Red List [49] similar conservation status to that of Gosong Maluku (*E. wallacei*) [50] while Maleo Senkawor (*M. maleo*) is “critically endangered” according to IUCN Red List [51].

Wallacea hot spot posses a highly important value to the local indigenous community, Indonesia and the world community in various aspects including biodiversity and endemism, conservation, regions of bio-geography, scientific research and development, history of science development including theory of evolution and the heritage, continuation of research and studies of evolutionary process, knowledge and practices of indigenous wisdom, food security, local community health and for economic development and prosperity of the community in sustainable manner.

Experiences in research and conservation activities within the Amazon and Congo River Basin revealed the importance of integrating every aspects of management and every stake holder in efforts of sustainable conservation of environment and biodiversity. The inclusion covers promoting the coexistence of human and wild life for a mutual health benefit, policy with proper combination of to-down and bottom-up practices, food security, local knowledge and wisdom, provision of rules and regulations and the implementations involving social organizations, community, donor institutions, local and indigenous community, foresters, even the rebels living within the forest, miners, researchers, conservation practitioners, environmental activists, government and leaderships with good vision and other aspects and stake holders [52].

Mitigation, Remediation, Compensation

Mitigating excessive negative impacts of Masela block exploitation on surrounding environment is supposedly completed through implementing the prescriptions proposed following the studies of EIA continued by monitoring the impact sustainably. These may include insuring the quality of materials of on-shore and off-shore facilities and infrastructures, securing and observing possible hazardous effects, including prediction of catastrophic events, monitoring the impact of various acclivities and environmental degradation related to CCUS, and on soil, fresh water and marine water especially at Key Biodiversity Area (KBA) and biodiversity corridors on land and marine areas [37], in addition to preparation and selection of highly competent employee for technical operation and management, establishing, strengthening and implementing rules, laws and regulations, and others.

In the context of conserving wild and domesticated crop-plants for their continuous presence and for their function as genetic reservoir for research and crop improvement supporting agricultural activities and food security within surrounding impact areas of Masela block (Wallacea biodiversity hot-spot region), it is appropriate to establish an institution for research and development with a gene bank as the center, accompanied by laboratories and field experimental stations to studies, develop and exchange collected germpalsm resources [53]. Such an institution has been indicated and promoted by the President of Indonesia to be established following discussions with the head of National Economic Council [54]. Technically, the gene bank should be completed with the collection system of based collection or long-term collection (a hundred years or more), medium-term collection and short-term or active collection or research and exchange collection systems, storing accessions in the form of seeds (orthodox seeds such as maize, soybeans etc.) and in the form of explants (such as *in-vitro* shoots of yams) as well as living field collections implementing appropriate conservation methods and techniques [55] [56]. The materials will then be objects to research on different scientific disciplines and development especially in agricultural sectors; organic, conventional and biotechnology.

In efforts of natural resources development in any parts of the world, recognizing and acknowledging the existence and rights of indigenous community has been an obligation as indicated in the convention on biological Diversity (CBD) Rio de Jeneiro, in 1992 [57], in part Article 8, In-Situ Conservation, point J., which regulate the recognition to rights of local and indigenous community. Recognizing the rights of local and indigenous community of MBD and KKT Regencies may be executed by implementing various programs including

strengthening of village institutions such as kings or village leaderships, kewang institution, which in charge of forest protection, security, regional borders, and natural resources present within the forest, straightening of administration and social-cultural institutions for the conservation of indigenous wisdom (knowledge and practice) for the sustainability of community and surrounding natural resources, establishing groups of community gene banks as living collections of agricultural crop- plants germpalsm and maintaining local food security and other programs, in addition to establishing and strengthening new and existing *in-situ* conservation areas (national parks etc.), implementing rules, laws and regulations within the areas.

Many such programs indicated above have been, in fact, implemented by Impex corporate as parts of Impex's social responsibility programs. For example collaborations in many aspects with aboriginal community of Torres straight islands, recognized as a culture existed and developed for thousands of years and is the owner of land and water where liquid natural Gas (LNG) Ichtys mining land facilities are established [58] [59]. Similar collaborations with the community of KKT and MBD Regencies and surroundings may be continued.

Hope for improvements in the context of politics and governance related to corruption and mismanagement especially in mining management in Indonesia lays on the leadership of the President, General Prabowo Subianto, with his proactive policy on corruption eradication, with support of president's cabinet as well as legislative leadership at national level and Maluku provincial level. Execution of the rule of laws in the context of corruption and abuse of power especially within the mining exploitation considered to be intensified in recent years and with increasing performance and support of Indonesian people, it is hoped that the Masela block mining exploitation will achieve its objectives; independence in energy, environmentally friendly, and prosperity for Indonesia and eastern Indonesia specifically Maluku.

CONCLUSION

Development of mining infrastructure of everlasting oil and gas mining Masela block reaching the final stages towards first production of 150 (MMSCFD) and 35 thousand barrel condensate dally in 2029. The everlasting oil and gas mining exploitation promising an energy independence, carbon mitigation and economic development of eastern region of Indonesia especially Maluku and indigenous communities of KKT and MBD. The hopes and dreams, however, are faced with a rushed EIA implementation, POD which is not clearly (meticulously) elaborated, geographical position of the mining site within the wallacea biodiversity hot spot, past experiences in mining practices which were unsuccessful in building the economy of local indigenous community, corruption and mismanagement especially in state own oil company (Pertamina), Indonesia. In this situation, Maluku community place its trust on the leadership of the Presiden, Jend. Prabowo Subianto on his commitment to eradicate corruption and criminalized elicit enrichment with supports of cabinet and legislative government including provincial government.

As well, Impex corporation with previous experiences of collaboration for development with indigenous community within the exploitation sites, to be able to implement such programs within the regions of Masela block oil and gas mining exploitation. Between those existing negative and positive points, Indonesian and Maluku community

especially indigenous communities of KTT and MBD Regencies wish that the Masela block will became a blessing and not a curse as that of Banda nutmeg (*Mysrirtica fragrans* Houtt.), as depicted by Amitav Ghohs, to Maluku.

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