BASELINE ESTIMATES OF RPOA-IUU PARTICIPATING COUNTRIES

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EXECUTIVE SUMMARY

Recognised as an essential 'life-support system', the ocean and its natural resources have immense value in terms of their capacity to sustain lives and livelihoods on land. The United Nations Convention on the Law of the Sea (UNCLOS) adopted the concept of humankind's common concern as the basis to regulate the seas, which includes obligations for all states to protect the ocean. Thus, the extraction and conservation of all ocean resources must be conducted sustainably, with responsibility shared among all stakeholders. Illegal, unreported, and unregulated (IUU) fishing, with all the various overlapping actions and behaviours it represents, is a significant threat to ocean ecosystems worldwide. IUU constitutes a severe crime against people and the environment, in both developed and developing countries.

IUU fishing persists because it is a high-profit activity, enabled by ineffective legal governance and insufficient enforcement. This issue stems from a lack of resources, along with logistical problems related to Monitoring, Control and Surveillance (MCS) and the complexity of management issues due to the enormous volume and variety of fishing vessels. This situation is exacerbated by corruption and the practice of fishing subsidies. Anomalies or grey areas between geographical borders and each nation’s ability to control its territory are exploited by perpetrators of IUU fishing, presenting a major challenge for law enforcement, particularly in developing countries. The capacity for control in these areas is relatively low when compared to developed countries.

The impacts of IUU fishing are multifaceted, combining environmental, social and economic problems. Unregulated harvesting of fish, combined with destructive fishing practices such as bottom trawl, blasting and others, has significantly damaged the reproductive cycle of ecosystems and physically destroyed coral reefs and other vulnerable marine habitats that ordinarily serve as breeding and feeding grounds. In the long term, as marine ecosystems cease to function, fish stocks will become increasingly scarce. These impacts are most keenly felt by small-scale and artisanal fishers, whose livelihoods depend on the continued viability of natural resources. These impacts also threaten food security on land, as this sector is an essential protein source and provides a remedy for persistent hunger and malnutrition in many areas. With the global population increasing, the question of food security is more pertinent than ever. Another social impact caused by IUU activities is the undermining of legitimate fishermen's efforts by the irresponsible extraction of fishery resources. The cumulative effect of these stressors causes states and local fishers to suffer economic losses from the reduced catches and lost income through avoidance of landing fees, licensing fees, taxes, duties and other levies closely related to corruption. Additionally, countries with a high level of IUU fishing will most likely experience trade sanctions from major export destination countries, including members of the European Union.

The clandestine nature of IUU fishing activities hinders the data collection processes needed to provide a detailed analysis of fishery countries’ vulnerability, exposure and responsiveness to the problem. Reliable data and information of the national baseline estimates of fishery sectors are scattered and scant, significantly limiting any potential scenarios for development of the industry. Just as IUU is difficult to monitor, its effects are also challenging to predict. In the worst

case scenario, without the knowledge of such estimates, management authorities may be unaware that fish stocks are in danger until irreversible damage has already been done. Current global estimates still rely on data published in 2009 by Agnew et al. Therefore, updated and detailed estimates for certain countries or regions must be conducted, in order to serve as a bridge between tailored data management and improvements in fisheries governance, thereby curtailing unsustainable fishing practices and combating corruption. As each country's geographical condition and existing fisheries governance may have developed over the years, processing and examining baseline estimates is an essential first step in this process.

The Arafura and Timor Seas (ATS) region is a semi-enclosed sea, surrounded by Australia, Indonesia, Papua New Guinea and Timor-Leste. The area is home to an abundance of natural resources, meaning sustainable fisheries management schemes are needed to regulate the use of these shared resources. The Regional Plan of Action to Promote Responsible Fishing Practices, including Combating Illegal, Unreported and Unregulated Fishing (RPOA-IUU), in which the four countries are participating members, serves as a forum through which these nations can work collaboratively to manage the ATS. Despite the project's focus being limited to the ATS region, this study also takes a wider look at data relating to a total of 11 participating countries, namely Australia, Brunei Darussalam, Cambodia, Indonesia, Malaysia, Papua New Guinea, the Philippines, Singapore, Thailand, Timor-Leste and Vietnam. However, the implementation of such cooperation still presents many challenges, which must be addressed if we are to collectively curtail the widespread issue of IUU fishing. As mentioned previously, a lack of data is one of the main obstacles to progress for policymakers; an inability to devise and implement effective regulations and policies is one of the main factors contributing, albeit inadvertently, to the ongoing success of IUU activities in the ATS region.

This study offers a unique approach to quantifying law enforcement capabilities, by calculating losses avoided through the apprehension of both domestic and foreign vessels. Covering a period spanning five years (2015-2019), these data relate to apprehended vessels (whether processed by the court or subsequently released), while also touching on various other relevant issues besides IUU fishing in RPOA-IUU-participating countries. To ensure reliability, data was collected in line with official government statements included in the RPOA-IUU Coordination Committee Meetings (CCM) Country Report. For Cambodia, data was acquired from the Fisheries Administration (FiA), as mentioned in the working paper by the International Institute for Environment and Development (IIED); in Indonesia, this information came directly from all four stakeholders, namely the Ministry of Marine Affairs and Fisheries (MMAF), the Indonesian Coast Guard (BAKAMLA), the Indonesian Navy and the Indonesian Marine Police.

Despite the scarcity of data available in several countries, estimates were made in this study regarding volume and loss of value. From the data acquired, Indonesia and the Philippines lead the estimations of loss, with US$70,258,776 and US$70,150,800, respectively. Conversely, the lowest estimates belong to Brunei Darussalam (in 2015) and Timor-Leste, with only one vessel apprehended and US$63,000 in losses estimated from the available data (disregarding the slot where it is written 0 (zero), as no data was provided).

According to the available data, the number of apprehended vessels fluctuated over the years of the study. In some countries like Australia, the number is steadily decreasing. This may be due to

the MCS mechanisms already in place, which appear to be working well. Meanwhile, Indonesia's is able to secure potential highest loss which came in 2016, an estimated 10,264 tonnes, valued at US$20,527,704. Elsewhere, improved MCS performance led to a significant increase in the number of vessels apprehended. For example, in Papua New Guinea, 100 more vessels were captured in 2018-2019 than in 2016. Additionally, countries with limited capacity to enforce the law may present relatively steady numbers, such as Brunei Darussalam and Timor-Leste. The same can be said for countries with extensive jurisdiction.

Three remaining estimates still need to be calculated: Singapore, Thailand and Vietnam; along with countries where data is only available for a limited number of years. It should be highlighted that there is a critical need to fill the existing data gaps for more evidence-based regulations and policies for RPOA-IUU-participating countries. However, across the 11 countries, it is estimated that the total loss saved is US$165,595,176, or the equivalent volume of 82,798 tonnes.

Due to the global Covid-19 pandemic, Indonesia was the only place where a case study was completed for an estimation specific to the ATS region. This showed very limited apprehension within Fisheries Management Area (WPP) number 718, where Indonesia overlaps with the ATS region. The study found that only four vessels were apprehended between 2015-2019, although this prevented economic losses estimated at US$685,200, or equivalent to 343 tonnes.

Country	Year	Apprehended Vessels/Year	Value Loss (Tonnes)	Volume Loss (Tonnes)
Australia	2016-2019	18	US$1,144,800	572
Brunei Darussalam	2015-2019 (except 2016)	8	US$508,800	254
Cambodia	2018	228	US$14,500,800	7,250
Indonesia	2015-2019	1.088	US$70,258,776	35,130
Malaysia	2015	2	US$127,200	64
Papua New Guinea	2016, 2018-2019	139	US$8,840,400	4,420
Philippines	2016 -2019	1.103	US$70,150,800	35,075
Singapore	2015-2019	-	US$0	0
Thailand	2015-2019	-	US$0	0
Timor-Leste	2017	1	US$63,600	32
Vietnam	2015-2019	-	US$0	0
TOTAL			**USD 165,595,176**	**82,798**

As the only case study due to the global pandemic of COVID-19, Indonesia for the estimation on ATS region-specific has very limited apprehension within the Fisheries Management Areas of 718 (*Wilayah Pengelolaan Perikanan*/WPP) where it is overlapped with the ATS region. The study found that only four vessels apprehended within the last five years with an estimated prevented economic loss at US$685,200 or equivalent to the 343 tonnes.

RINGKASAN EKSEKUTIF

Laut dan sumber daya alamnya merupakan sumber daya bersama dengan nilai yang melimpah untuk menunjang kehidupan manusia di darat yang diakui sebagai 'sistem pendukung kehidupan'. Konvensi PBB tentang Hukum Laut (UNCLOS) mengadopsi konsep Tanggung Jawab Bersama namun Berbeda (*Common But Differentiated Responsibilities)* sebagai dasar dalam mengatur laut, yang menghasilkan kewajiban bagi seluruh negara untuk melindunginya. Pengambilan sumber daya di bawah laut, seperti ikan, juga akan menimbulkan tanggung jawab bersama untuk melestarikan dan menangkap ikan secara berkelanjutan. Penangkapan ikan ilegal, tidak dilaporkan, dan tidak diatur (IUU) ditambah dengan kewenangan dalam menanggulanginya tumpang tindih menjadi ancaman yang signifikan bagi ekosistem laut di seluruh dunia. Hal ini secara kolektif dapat dikategorikan sebagai kejahatan baik bagi negara maju maupun berkembang.

Faktor pendorong utama kegiatan penangkapan ikan IUU kerap terjadi karena aktivitas ini menghasilkan keuntungan tinggi ditambah dengan lemahnya tata kelola dan penegakan hukum di laut. Masalah tersebut bersumber dari kurangnya sumber daya dan hambatan logistik dalam implementasi Pemantauan, Pengendalian, dan Pengawasan (MCS) dan kompleksitas masalah pengelolaan wilayah laut karena volume dan keragaman kapal penangkap ikan yang sangat besar dan diperburuk oleh praktik korupsi dan subsidi penangkapan ikan. Kesenjangan antara kondisi geografis dan kemampuan untuk menguasai wilayah masing-masing negara dimanfaatkan oleh para pelaku sehingga menimbulkan hambatan untuk menegakkan hukum, khususnya bagi negara berkembang dimana kemampuan penguasaan kawasan maritimnya relatif lebih rendah dibandingkan negara maju.

Dampak penangkapan ikan IUU pun beragam yaitu dalam bidang lingkungan, sosial, dan ekonomi. Penangkapan ikan yang tidak terkendali ditambah dengan praktek penangkapan ikan yang merusak seperti pukat-hela (*bottom trawl*) udang, peledakan, dan lain-lain, membawa kerusakan signifikan pada siklus reproduksi dan merusak terumbu karang dan ekosistem laut rentan lainnya tempat dimana ikan berkembang biak dan mencari makan. Dalam jangka panjang, ikan akan menjadi langka karena menipisnya stok dan ekosistem laut tidak dapat lagi menyokong fungsi ekosistem bagi ikan untuk bereproduksi. Dampak tersebut berdampak besar kepada nelayan skala kecil dan *artisanal* yang mata pencahariannya bergantung pada sumber daya alam di lepas pantai. Hal tersebut juga mengancam ketahanan pangan karena sektor ini merupakan sumber protein esensial untuk memenuhi kebutuhan makan sehari-hari dan malnutrisi yang berkepanjangan di berbagai daerah. Kebutuhan akan permintaan konsumsi terus meningkat seiring dengan populasi yang terus tumbuh. Dampak sosial lain yang ditimbulkan oleh kegiatan IUU adalah melemahkan upaya nelayan yang taat aturan. Hal ini terjadi karena kegiatan tersebut mendorong pengambilan sumber daya perikanan yang tidak bertanggung jawab. Akhirnya, dampak ini terakumulasi dan menyebabkan negara kerugian ekonomi dari pengurangan biaya penangkapan dan pendaratan, biaya perizinan, pajak, bea, dan pungutan lain yang terkait erat dengan promosi korupsi serta berkurangnya hasil tangkapan bagi nelayan lokal. Selain itu, negara dengan tingkat penangkapan ikan IUU yang tinggi kemungkinan besar akan mendapatkan sanksi perdagangan dari negara tujuan ekspor utama seperti Uni Eropa.

Sifat aktivitas penangkapan ikan IUU yang sulit untuk terekam menghalangi pengumpulan data yang diperlukan untuk memberikan analisa rinci tentang kerentanan, keterpaparan, dan respon oleh negara-negara. Data dan informasi terkait perhitungan estimasi kerugian yang dapat diandalkan mengenai sektor perikanan tersebar dan relatif sedikit. Hal ini secara signifikan membatasi skenario potensial untuk mengembangkan industri perikanan. Akibat sulit untuk diamati, efek dari IUU jadi sangat menantang untuk diprediksi. Dalam kasus terburuk tanpa adanya estimasi yang memadai, pihak yang berwenang mungkin tidak mengetahui bahwa stok sumber daya alamnya telah dalam keadaan terancam hingga terbukti bahwa stok tersebut sudah kritis dimana kemungkinan besar tidak dapat kembali seperti semula. Estimasi kerugian global masih mengandalkan data yang dipublikasikan pada tahun 2009 oleh Agnew, dkk. Dengan demikian, perhitungan estimasi secara khusus untuk suatu negara atau wilayah tertentu harus dilakukan untuk dapat menjembatani pengelolaan data untuk meningkatkan tata kelola perikanan serta mengurangi praktik penangkapan ikan yang tidak berkelanjutan dan bahkan korupsi. Karena keadaan geografis negara dan tata kelola perikanan saat ini mungkin telah berkembang selama bertahun-tahun, pemrosesan dan pembaharuan estimasi sangatlah penting.

Kawasan Arafura dan Laut Timor (ATS) sebagai laut semi tertutup yang berbatasan dengan Australia, Indonesia, Papua Nugini, dan Timor-Leste memiliki sumber daya alam yang melimpah, khususnya perikanan. Oleh sebab itu, kawasan ini memerlukan skema pengelolaan perikanan untuk mengatur sumber daya Bersama. Rencana Aksi Regional dalam Mempromosikan Praktek Penangkapan Ikan yang Bertanggung Jawab termasuk IUU (RPOA-IUU), di mana keempat negara tersebut merupakan negara partisipan. RPOA-IUU berperan sebagai platform bagi keempat negara untuk bekerja sama secara kolaboratif mengelola ATS melalui Sub-Regional Laut Arafura-Timor. Meskipun fokus proyek ini terbatas pada ATS, namun studi ini juga melakukan estimasi bagi 11 negara partisipan RPOA-IUU, yaitu Australia, Brunei Darussalam, Kamboja, Indonesia, Malaysia, Papua Nugini, Filipina, Singapura, Thailand, Timor-Leste dan Vietnam. Namun, implementasi kerja sama rencana aksi tersebut masih dihadapi oleh banyak tantangan untuk membatasi meluasnya penangkapan ikan IUU. Kurangnya data menghalangi pembentuk kebijakan untuk memberlakukan peraturan dan kebijakan yang efektif merupakan salah satu faktor utama yang membuat kegiatan IUU berkembang pesat.

Studi ini menawarkan pendekatan unik untuk mengukur kemampuan penegakan hukum dengan menghitung kerugian yang dihindari dari masing-masing usaha penangkapan kapal baik kapal domestik maupun asing. Data penangkapan kapal yang digunakan (baik diproses ke pengadilan atau kemudian dilepaskan) dari negara peserta RPOA-IUU antara lima tahun terakhir (2015-2019) berarti fokus studi ini hanya pada penangkapan ikan secara ilegal. Data yang dikumpulkan merupakan pernyataan resmi pemerintah terutama berasal dari Laporan Tahunan Negara dalam Rapat Komite Koordinasi (CCM) RPOA-IUU. Sedangkan untuk Kamboja, data yang diperoleh adalah data tidak langsung oleh *Fisheries Administration* (FiA) yang tercantum pada *Working Paper* oleh *International Institute for Environment and Development* (IIED) sedangkan data Indonesia berasal dari keempat pemangku kepentingan yaitu Kementerian Kelautan dan Perikanan (KKP), Badan Keamanan Laut (BAKAMLA), TNI AL, dan Korps Kepolisian Air dan Udara Republik Indonesia secara langsung dari masing-masing institusi.

Terlepas dari kelangkaan dan tidak tersedianya data dari beberapa negara, beberapa perkiraan dibuat dalam studi ini terkait kerugian yang di estimasi berdasarkan volume dan nilai ekonomi. Dari data yang diperoleh Indonesia dan Filipina memiliki estimasi tertinggi dengan masing-masing sejumlah US$70.258.776, dan US $ 70.150.800. Sebaliknya, estimasi terendah terjadi pada Brunei Darussalam pada tahun 2015 dan Timor-Leste dengan hanya 1 (satu) kapal yang ditangkap dengan estimasi US$63.000. Patut dipahami bahwa temuan estimasi mengenyampingkan data yang tertulis 0 (data tidak ditemukan).

Menurut data yang tersedia, kapal yang ditangkap cenderung fluktuatif selama bertahun-tahun, sedangkan untuk Australia terus menurun. Ini mungkin disebabkan oleh mekanisme Pemantauan, Pengendalian, dan Pengawasan (MCS) yang bekerja dengan baik. Sementara itu, Indonesia menyelamatkan potensi kerugian tertinggi pada 2016 dengan estimasi kerugian 10.264 ton senilai US$20.527.704 karena tersedianya data komprehensif per wilayah. Di sisi lain, peningkatan kinerja MCS menyebabkan Papua Nugini secara signifikan meningkatkan penangkapan lebih dari 100 kapal (2018-2019) dibandingkan tahun 2016. Selain itu, negara-negara dengan kapasitas terbatas untuk menegakkan hukum relatif memiliki jumlah yang stabil, seperti Brunei Darussalam dan Timor-Leste. Begitu juga dengan negara dengan yurisdiksi yang luas, seperti Indonesia dan Filipina.

Terdapat tiga perkiraan tersisa masih perlu dihitung yaitu untuk Singapura, Thailand dan Vietnam, dan negara-negara dengan tahun data yang tidak lengkap. Harus digarisbawahi bahwa ada kebutuhan kritis untuk melengkapi kesenjangan data yang ada untuk peraturan dan kebijakan yang lebih efektif untuk negara-negara partisipan RPOA-IUU. Diperkirakan dari 11 negara ini, estimasi total nilai kerugian mencapai US$165.595.176 ekuivalen dengan 82.798 ton.

Negara	Tahun	Kapal yang Ditangkap/Tahun	Kerugian Ekonomi (Ton)	Kerugian dalam Volume (Ton)
Australia	2016-2019	18	US$1.144.800	572
Brunei Darussalam	2015-2019 (kecuali 2016)	8	US$508.800	254
Kamboja	2018	228	US$14.500.800	7.250
Indonesia	2015-2019	1,088	US$70.258.776	35.130
Malaysia	2015	2	US$127.200	64
Papua Nugini	2016, 2018-2019	139	US$8.840.400	4.420
Filipina	2016 -2019	1,103	US$70.150.800	35.075
Singapura	2015-2019	-	US$0	0
Thailand	2015-2019	-	US$0	0
Timor-Leste	2017	1	US$63.600	32
Vietnam	2015-2019	-	US$0	0
TOTAL			**USD 165.595.176**	**82.798**

Dalam studi ini, Indonesia sebagai satu-satunya negara yang dijadikan studi kasus akibat pandemi global COVID-19 (pembatasan perjalanan) memiliki estimasi spesifik wilayah yang masuk dalam ATS yaitu Wilayah Pengelolaan Perikanan (WPP) 718. Dalam studi tersebut ditemukan bahwa hanya 4 (empat) kapal yang berhasil ditangkap dalam 5 (lima) tahun terakhir dengan perkiraan kerugian ekonomi yang dapat dicegah sebesar US$685.200 atau setara dengan 343 ton.

SUMÁRIU EZEKUTIVU

Tasi ho nia rekursu naturál sira maka rekursu hafahe-uza ho valór bo'otliu ne'ebé sustenta ita nia moris iha rai no rekonese nu'udár "sistema tulun moris" ida. Lei Konvensaun Nasaun Unida nian kona-ba Tasi (LNUT) adopta konseitu ba kestaun komún umanidade nian nu'udár baze hodi regula tasi, ne'ebé rezulta obrigasaun ba estadu hothotu atu proteze. Nune'e hasai rekursu sira iha tasi okos, hanesan ikan, mós tenke hamoris responsabilidade hafahe-uza atu konserva no ka'er ikan ho sustentabilidade. Haka'er-ikan ho ilegál, la ho relatóriu, no la regula (IRR) ho asaun no hahalok hatodan oioin reprezenta ameasa signifikante ba ekosistema tasi nian iha mundu tomak. Hirak ne'e hotu koletivamente konstitui krime grave hasoru ambiénte no ba ema iha paíz dezenvolvidu nomós paíz ne'ebé dezenvolve a'an hela.

Fatór prinsipál ba haka'er-ikan IRR nian kontinua la'o basá atividade ne'e iha lúkru bo'otliu hasusar liutan hosi governasaun no kontrolu lei ne'ebé fraku iha tasi. Sira hahuu hosi falta rekursu no bareira lojístika ba Monitoriamentu, Kontrolu, no Vizilánsia (MKV) no komplesidade ba kestaun jestaun tanba volúme ne'ebé bo'ot no variedade ró haka'er-ikan no hafraku liutan hosi prátika korupsaun no subsídiu haka'er-ikan. Suut entre kondisaun jeográfika no abilidade atu kontrola teritóriu Estadu idaidak nian hetan explorasaun hosi perpetradór no kria obstákulu ba haforsa lei ruma, partikularmente ba paíz hirak ne'ebé dezenvolve a'an hela. Abilidade atu kontrola nia área relativamente kiikliu kompara ho paíz dezenvolvidu sira.

Impaktu hosi haka'er-ikan IRR iha oioin maka hanesan iha ambiénte, sosiál, no ekonomia. Haka'er-ikan ne'ebé la iha kontrola hamutuk ho prátika destrutivu haka'er-ikan hanesan rede-besi ka'er-ikan, expulzivu, no seluktan, lori estragu signifikante ba síklu reproduzaun no fizikamente estraga ahu-ruin no ekosistema marina vulnerável siraseluk ne'ebé sai fatin reprodusaun no fatin moris nian. Ba tempu-naruk, ikan sai menuz basá iha reduzaun ba ikan-knuuk, maibé ekosistema marina sei labele la'o tuir funsionamentu ekosistema típiku ba ikan nia reprodusaun. Impaktu ida ne'e diriji ba peskadór artejanál no ho eskalaun-kiik ne'ebé sira nia maneira buka moris depende ba rekursu naturál tasi-klaran. Ida ne'e mós ameasa ba seguransa aihan desde setór ida ne'e sai fonte proteina esensiál ba hamlaha persistente no má-nutrisaun iha área oioin. Nesesidade atu fó-han kresimentu populasaun sa'e ba beibeik. Impaktu sosiál seluk kauza hosi atividade IRR maka hamihis peskadór nia esforsu lejítimu, ne'ebé sei promove explorasaun iresponsável ba rekursu peska nian. Ikusmai, impaktu hirak ne'e akumula no kauza estadu no peskadór lokál sira sofre ba lakon ekonómiku hosi osan ba haka'er-ikan no dezembarke, osan ba lisensiamentu, taxa, knaar, no taxa siraseluk ne'ebé relasiona ho promosaun korupsaun. Liutan ida ne'e, paíz sira ne'ebé ho nível peska IRR a'as provavelmente sei hasoru sansaun komérsiu hosi paíz destinatáriu ba exportasaun bobo'ot sira hanesan Uniaun Europeia.

Natureza atividade peska IRR hasatan halibur data ne'ebé paíz ida presiza hodi fornese análize detaillu kona-ba peska nia vulnerabilidade, revelasaun, no resposta. Data no informasaun konfiável ba estimativu lina-baze kona-ba paíz nia setór peska ne'e kiik no natoon, signifikativamente limita senáriu potente hodi dezenvolve indústria ida ne'e. Ho nia dezafiu ba monitoriamentu, nia efeitu mós difísil atu halo predisaun. Iha kazu a'atliu, la-hó konesimentu ba estimativu sira ne'e, autoridade jestaun nian sei labele hatene katak estóke ne'e iha perigu laran to'o bainhira sai auto-evidente ho situasaun ida mukit no provavelmente sai ireversível liu.

Estimativu globál sei depende ba data ne'ebé publika iha tinan 2009 hosi *Agnew* no ekipa tomak. Nune'e, estimativu espesífiku ba paíz ka rejiaun espesífiku balun tenke hala'o hodi serbi nu'udár ponte ida atu hadada jestaun ba data no hadi'ak governasaun ba peska no limita prátika peska la'ós sustentável nomós korupsaun. Nu'udár sirkunstánsia jeográfiku no governasaun ba peska atuál ne'ebé karik hala'o tiha ona durante ne'e, prosesamentu no ezaminasaun ba estimativu lina-baze maka esensiál tebtebes liu siraseluk.

Rejiaun Arafura no Tasi Timor (ATT) nu'udár tasi taka-sorin, besik ba Australia, Indonézia, Papua Nova Guiné no Timor-Leste, ho rekursu naturál ne'ebé barak, espesífikamente peska, tenke iha eskema jestaun peska hodi regula rekursu hafahe-uza. Planu Asaun Rejionál hodi Promove Prátika Peska Responsável, inklui Kombate peska ilegál, la relata no la regula (PAR-IRR), iha ne'ebé paíz haat sai membru partisipante, nu'udár plataforma ba paíz haat atu serbisu kolaborativamente hodi jere ATT liuhosi Sub-Rejionál Arafura-Tasi Timor. Mezmu projetu foka ba ATT de'it, estudu ida ne'e kompostu estimasaun ba paíz partisipante 11, hanesan Australia, Brunei Darussalam, Cambodia, Indonézia, Malaysia, Papua Nova Guiné, Filipina, Singapura, Tailándia, Timor-Leste no Vietname. Maske nune'e, implementasaun ba kooperasaun ida ne'e sei hasoru dezafiu oioin atu limita peska IRR nia habelar. Falta data hasusar makfoti desizaun atu hamoris regulamentu no polítika efetivu maka sai mós fatór kontribuinte prinsipál ba atividade IRR ne'ebé buras daudaun.

Estudu ida ne'e oferese abordázen úniku hodi kuantifika abilidade haforsa lei liuhosi halo kalkulasaun ba lakon ne'ebé evita hosi respetivu haforsa lei liuhosi apreensaun ba ró, tantu ró doméstiku no rai-li'ur. Data kona-ba apreensaun ró (tantu haruka to'o tribunál ka hasai híkas) ne'e iha paíz partisipante PAR-IRR laran entre tinan lima ikus ne'e (2015-2019), signifika katak ida ne'e foku ba de'it peska ilegál. Data ne'ebé halibur hosi deklarasaun ofisiál governu nian kona-ba konfiabilidade nian maioria mai hosi Relatóriu Paíz Reuniaun Komité Koordenasaun (RKK) PAR-IRR nian. Hanesan ba Cambodia, data hetan hosi data Administrasaun ba Peska (Apes) ne'ebé hatete kon-ba Dokumentu Traballu hosi Institutu Internasionál ba Ambiénte no Dezenvolvimentu (IIAD) no Indonézia nian diretamente hosi parte-interesada haat hothotu, maka hanesan Ministériu ba Asuntu Marina no Peska (MAMP), Guarda Kosteira Indonézia (BAKAMLA), Forsa Navál Indonézia, no Polísia Marina Indonézia.

Tanba falta data no la disponível hosi paíz balun, estimativu balun maka hala'o ona iha estudu ida ne'e ba volume no lakon valór nian. Hosi data ne'ebé maka hetan, Indonézia no Filipina lidera respetivu estimativu ho dolar Amerikanu 70,258,776, no dolar Amerikanu 70,150,800. Iha sorin seluk, estimativu kiikliu hasoru hosi Brunei Darussalam iha tinan 2015 no Timor-Leste ho de'it apreensaun ró ida ho dolar Amerikanu 63,000 hosi data ne'ebé disponível (la-hó konsiderasaun ba fatin ne'ebé hakerek 0 (zero), katak data la disponível).

Bazea ba data ne'ebé disponível, ró ne'ebé hetan apreesaun hatudu tendensia flutuante liuhosi intervalu tinan, ba paíz hanesan Australia ne'ebé tuun konstantemente. Ida ne'e bele mós kauza hosi mekanízmu Monitoriamentu, Kontrollu no Vijilánsia (MKV) ne'ebé serbisu ho di'ak tebtebes. Iha biban hanesan, Indonesia nia lakon a'asliu iha tinan 2016 ho estimasaun tonelada 10,264 ho valór dolar Amerikanu 20,527,704 ho data kompreensivu ne'ebé disponível iha rejiaun idaidak. Iha sorin seluk, dezenpenu di'ak hosi MKV lori Papua Nova Guiné signifikativamente sa'e iha apreensaun ba ró liu 100 (2018-2019) kompara iha tinan 2016. Liutan ida ne'e, paíz ho kapasidade

limitadu ba haforsa lei nian relativamente mantein númeru, hanesan Brunei Darussalalm no Timor-Leste. Nune'e mós ho paíz sira ho jurisdisaun ekstensivu, hanesan Indonézia no Filipina.

Estimasaun tolu seluk sei presiza hala'o kalkulasaun: Singapura, Tailándia no Vietname, no paíz ho data limitadu tinan nian de'it. Presiza iha énfaze katak iha nesesidade krítiku hodi hakonu suut data ezistente ba regulamentu no polítika baze evidensia ba paíz partisipante PAR-IRR. Maske nune'e, iha estimasaun katak hosi paíz 11, totál valór lakon maka dolar Amerikanu 165,595,176 ka ho volume ekivalente tonelada 82,798.

PAÍS	TINAN	RÓ-APREENSIVU /TINAN	VALÓR LAKON (TONELADA)	VOLUME LAKON (TONELADA)
Australia	2016-2019	18	US$1,144,800	572
Brunei Darussalam	2015-2019 (haketak 2016)	8	US$508,800	254
Cambodia	2018	228	US$14,500,800	7,250
Indonézia	2015-2019	1,088	US$70,258,776	35,130
Malaysia	2015	2	US$127,200	64
Papua Nova Guiné	2016, 2018-2019	139	US$8,840,400	4,420
Filipina	2016 -2019	1,103	US$70,150,800	35,075
Singapura	2015-2019	-	US$0	0
Tailándia	2015-2019	-	US$0	0
Timor-Leste	2017	1	US$63,600	32
Vietname	2015-2019	-	US$0	0
TOTÁL			**USD 165,595,176**	**82,798**

Nu'udár estudu kazu ida de'it iha ámbitu pandemia globál COVID-19, Indonézia ba estimasaun iha rejiaun espesífiku ATT nian iha apreensaun ne'ebé limitadu tebtebes iha Área Jestaun ba Peska ho totál 718 iha ne'ebé nia hatidin ho ATT. Estudu ida ne'e deskobre katak iha de'it ró 4 (haat) maka hetan apreesaun durante tinan 5 (lima) ikus ne'e ho prevensaun estimativu lakon ekonómiku ho totál dolar Amerikanu 685,200 ka ekivalente ho tonelada 343.

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List of Abbreviations

AFMA	Australian Fisheries Management Authority
AFPIC	Asia-Pacific Fishery Commission
AIS	Automatic Identification System
AMAF	ASEAN Ministers on Agriculture and Forestry
APFIC	Asia-Pacific Fishery Commission
ASEAN	Association of Southeast Asia Nations
ASTUIN	*Asosiasi Tuna Indonesia*/Indonesian Tuna Association
ATS	Arafura and Timor Seas
ATSEA	Arafura and Timor Seas Ecosystem Action
AVA	Agri-Food & Veterinary Authority
BAKAMLA	*Badan Keamanan Laut*/Indonesian Coast Guard
BFAR	Bureau of Fisheries and Aquatic Resources
CBD	Conservation of Biological Diversity
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCM	Coordination Committee Meetings
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CITES	Convention on International Trade in Endangered Species
CMS	Conservation of Migratory Species
COFI	FAO Committee on Fisheries
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CV	Carrier Vessel
DAWR	Department of Agriculture and Water Resources, Australia
DFW	Destructive Fishing Watch
DGP	Directorate of Fisheries
DoF	Department of Fisheries
EC	European Commission
EEZ	Exclusive Economic Zone
EU	European Union
FAO	Food and Agriculture Organization
FiA	Fisheries Administrator
FMP	Fisheries Management Plan
GATT	General Agreement on Tariff and Trade
GDP	Gross Domestic Product
GMDSS	Global Maritime Distress and Safety System
GPS	Global Positioning System
GRI	FAO Global Record Initiative
GT	Gross Tonnage
HNSI	*Himpunan Nelayan Seluruh Indonesia*/ Indonesian Fishermen Association
HSVAR	High Seas Vessels Authorization Record

IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
ILO	International Labor Organization
IMO	International Maritime Organization
IOTC	Indian Ocean Tuna Commission
IPOA	International Plan of Action
IUU	Illegal, Unreported, Unregulated
KNTI	*Kesatuan Nelayan Tradisional Indonesia*/Indonesian Traditional Fishermen Union
MAF	Ministry of Agriculture and Fisheries, Timor-Leste
MCS	Monitoring, Controlling and Surveillance
MMAF	Ministry of Marine Affairs and Fisheries, Indonesia
MSC	Marine Stewardship Council
MT	Metric Tonnes
NAS	Northern Australia Shelf
NCU	National Coordination Unit
NFA	National Fisheries Authority, Papua New Guinea
NGO	Non-Governmental Organization
NPOA	National Plan of Action
PeskAAS	Automated Analytics System for Small Scale Fisheries in Timor-Leste
PNG	Papua New Guinea
POKMASWAS	*Kelompok Pengawas Masyarakat*/Community Surveillance Group
PPATK	*Pusat Pelaporan dan Analisis Transaksi Keuangan*/Indonesian Financial Transaction Reports and Analysis Centre
PPN	*Pelabuhan Perikanan Nusantara*/Archipelago Fishing Port
PSDKP	*Direktorat Jenderal Pengawasan Sumber Daya Kelautan dan Perikanan*/Directorate General of Marine and Fisheries Resources Surveillance
PSMA	FAO Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing
RAV	Records of Authorised Vessels
RFLP	Regional Fisheries Livelihoods Programme for South and Southeast Asia
RFMO	Regional Fisheries Management Organizations
RFVR	Regional Fishing Vessels Record
RPOA	Regional Plan of Action
SEAFDEC	Southeast Asian Fisheries Development Centre
SESCS	Southern and Eastern of the South China Sea
SFP	Senoko Fishery Port
SIOFA	Southern Indian Ocean Fisheries Agreement
SoW	Scopes of Work
SPOT	Personal Tracker
SPRFMO	The South Pacific Regional Fisheries Management Organisation
SSS	Sulu-Sulawesi Seas

UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UNEP	United Nations Environment Programme
UNFSA	United Nations Fish Stock Agreement
UNGA	United Nations General Assembly
USAID	United States Agency for International Development
VIIRS	Visible Infrared Imaging Radiometer Suite
VMS	Vessel Monitoring System
WCPFC	The Western and Central Pacific Fisheries Commission

CHAPTER 1. INTRODUCTION

1.1 IMPORTANCE OF COMBATING IUU FISHING

Illegal, unreported and unregulated (IUU) fishing represents a significant threat to ocean ecosystems worldwide with more than just a single illegal activity. It is a set of multiple, overlapping actions and behaviours collectively constitute severe crimes against the environment and people. It affects similarly for both developed and developing countries. As a global fishing industry, which produced 79,3 million tonnes from marine waters in 2016,[1] it is crucial to understand what IUU fishing is and the importance of combating it.

The definitions of "Fishing" and "Fishing Vessels" may not be found in IPOA-IUU. However, they were further developed in the succeeding international fisheries regulatory instruments. Both terms do not have any uniformity in national legislation, hence it creates conflicting interpretation and application across the jurisdiction.[2] "Fishing" was early defined in the Convention for the Prohibition of Fishing with Long Driftnets in South Pacific in 1989 (Wellington Convention), and since then, the definition has been widely used.[3] Meanwhile, based on the FAO Compliance Agreement, fishing vessels are defined as "any vessel used or intended for commercial exploitation of living marine resources, including mother ships and any other vessels directly engaged in such fishing operations."[4] Further, this definition was expanded by the FAO Model Scheme on Port State Measures to Combat IUU fishing by including support ships and carrier vessels.[5] To date, the most explicit description of the term "fishing vessels" were provided by the European Union Regulation on IUU fishing of 2008 (EC Regulation No 1005/2008) by inserting the clause "including support ships, fish processing vessels, vessels engaged in transhipment and carrier vessels equipped for the transportation of fishery products, except container vessels.[6]

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[1] UNCTAD, *Advancing Sustainable Development Goal 14: Sustainable Fish, Seafood Value Chains, Trade and Climate*, *Sustainable Development Knowledge Platform*, 2019.
[2] Mary Ann Palma, Martin Tsamenyi, and William Edeson, 'Legal Aspects of Sustainable Development', in *Promoting Sustainable Fisheries* (Leiden: Martinus Nijhoff Publishers, 2010). p.26
[3] Convention for the Prohibition of Fishing with Long Driftnets in the South Pacific, Wellington, New Zealand, concluded on 24 November 1989, and its Protocols, Noumea, New Caledonia, concluded on 20 October 1990, in force 17 May 1991, 1899 UNTS 3; 29 ILM 1454 (1990). Hereinafter referred to as the Wellington Convention, Art. 1(c).
[4] Food and Agriculture Organization (FAO), *Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas*, Rome, Italy, concluded on 24 November 1993, entered into force 24 April 2003, 33 ILM 968. Hereinafter referred to as FAO Compliance Agreement, Art. 1(a).
[5] Food and Agriculture Organization (FAO), *Model Scheme on Port State Measures to Combat Illegal, Unreported and Unregulated Fishing* (Rome: FAO, 2007), Hereinafter referred to as FAO Port State Measures, para. 1.2.
[6] European Union, "Council Regulation (EC) No 1005/2008 of 29 September 2008 Establishing a Community System to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing," 2008. Hereinafter referred to as EC IUU Regulation.

Prior to understanding the chapter's objective on the importance of combating IUU fishing, further perception of the concept of IUU fishing, the drivers of the crime, and impacts on environmental, social and economic, particularly to states that heavily depend on fisheries will be fundamental.[7]

Concept of IUU Fishing

IUU fishing concept was formally recognized in the international discussion through its formal inclusion in the IPOA-IUU in 2001.[8] It was first addressed on the Twenty-third Session of the FAO Committee on Fisheries (COFI) in February 1999, the need to prevent, deter, and eliminate IUU fishing drafted by Australia.[9] Series of discussion emerged since the early 1990s when UNCED in 1992 was held, resulting in an Agenda 21 which mentioned "unregulated fishing, overcapitalization, excessive fleet size, vessel reflagging to escape controls, insufficiently selective gear, unreliable databases and lack of sufficient cooperation between States." It may not explicitly define IUU fishing, however, it does cover most of the critical elements of IUU fishing in IPOA-IUU. The instrument is made for voluntary purposes that apply to all states and entities and all fishers. In 1999, IUU fishing was mentioned in the UNGA as one of the most severe problems affecting world fisheries and defined as "often undertaken by fishing vessels of States or entities that are not members of fisheries organizations or arrangements and do not consider themselves bound by the restrictions imposed by those management organizations and arrangements."[10]

IUU fishing terminology is a way to galvanize international efforts to address the existing fisheries management concern and problems.[11] The term IUU fishing is extensive due to its complexity, therefore IPOA-IUU refers to i) Fishing by 'Stateless' vessels; ii) Fishing in convention areas of Regional Fisheries Management Organizations (RFMOs) by non-party vessels; iii) Fishing activities that are not regulated by States and cannot be easily monitored and accounted for. To some extent, it is also concerning poaching misreported.

IPOA-IUU defines three elements as a benchmark for states to refer to Illegal Fishing, Unreported Fishing, and Unregulated Fishing. In practice, IUU fishing may be associated with other illegal activities in which FAO identified IUUF consisted of activities as follows:[12]

- Fishing in restricted zones or during closed seasons
- Unauthorized transhipment or landing in unauthorized ports

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[7] Food and Agriculture Organisation (FAO), 'Combating and Eliminating Illegal, Unreported and Unregulated (IUU) Fishing in the Asia-Pacific Region' (2019): 12.
[8] Food and Agriculture Organization (FAO), *International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing*, adopted on 23 June 2001 at the 120th Session of the FAO Council. Hereinafter referred to as IPOA-IUU.
[9] Food and Agriculture Organization (FAO), "Illegal, Unreported and Unregulated Fishing: A Proposal for a Draft International Plan of Action, Committee on Fisheries, Twenty-Fourth Session, Rome, Italy, 26 February–2 March 2001" (Rome, 2001).
[10] United Nations (UN), Fifty-fourth Session, Agenda Items 40(a) and (c), Oceans the Law of the Sea; Law of the Sea; Results of the Review by the Commission on Sustainable Development of the Sectoral Theme of "Oceans and Seas", Oceans and the Law of the Sea, Report of the Secretary-General, A/54/429, 30 September 1999, para. 249
[11] Mary Ann Palma, Tsamenyi, and Edeson, 'Legal Aspects of Sustainable Development'.
[12] Food and Agriculture Organisation (FAO), 'Combating and Eliminating Illegal, Unreported and Unregulated (IUU) Fishing in the Asia-Pacific Region'.

- False of altered licenses
- Failing to report or falsifying catch data
- Neglected or unmanaged fisheries
- Using prohibited gear and unlicensed gear
- Taking juvenile and protected species, CITES species
- Engaging in illicit activities such as human or drug trafficking or smuggling of goods
- Stateless vessels and flags of convenience
- Using dangerous harmful, or banned methods and substances
- Forced labour, unfair, substandard or abusive working conditions

Illegal Fishing

Profoundly illegal fishing is fishing activities or taking of aquatic living resources conducted in contravention of the existing national, regional and international laws. The generally accepted definitions of illegal fishing are:[13]

- Fishing activities conducted by either national or foreign vessels in waters under the jurisdiction of a State without the permission of that State, or in contravention of its laws and regulations
- Fishing activities conducted by vessels flying the flag of States that are parties to a relevant regional fisheries management organization but operate in contravention of the conservation and management measures adopted by that organization and by which the States are bound, or relevant provisions of the applicable international law; or
- in violation of national laws or international obligations, including those undertaken by cooperating States to a relevant regional fisheries management organization.

Unreported Fishing

Unreported fishing based on the FAO definition is one of the two elements. Either a fishing activity that has not been reported or misreported to the relevant national authority, in contravention of national laws and regulations, or the activity takes place in the area of competence of a relevant RFMO that fails to adhere to the said organization's reporting procedures.[14]

Unregulated Fishing

The fishing activities included in this definition are as follows:

- in the area of application of a relevant regional fisheries management organization that is conducted by vessels without nationality, or by those flying the flag of a State not a party to that organization, or by a fishing entity, in a manner that is not consistent with or contravenes the conservation and management measures of that organization; or

[13] IPOA-IUU, art.3.1.
[14] Ibid, art.3.2

- in areas or for fish stocks with no applicable conservation or management measures and where such fishing activities are conducted in a manner inconsistent with State responsibilities for the conservation of living marine resources under international law.[15]

The High-Level Panel of Sustainable Ocean Economy identified several modus operandi used commonly by the perpetrators. From moving the catch from one vessel to another at sea (transhipment), using flags of convenience or non-compliance, using ports of convenience that offer little inspection, deactivating vessel monitoring or automatic identification and tracking systems, using a complex network of ownership, carrying fraudulent ship's documents and maintaining poor conditions for the ship's crew.

Causes and Impacts of IUU Fishing

The main drivers of IUU fishing persist as it is a high-profit activity compounded by weak law governance and enforcement at sea. They stem from a lack of resources and logistical barriers of Monitoring, Control, and Surveillance (MCS) and the complexity of the management issue due to the enormous volume and variety of fishing vessels.[16] Meanwhile, the absence of regulatory measures in high seas to manage the fishing activities offered a more significant opportunity for the perpetrator to conduct unsustainable practices.

IUU fishing produces two different economic advantages sourced from the catch and the reduction on expenses incurred if the catch was legal.[17] It is relatively inexpensive from cheaper vessels, which are recorded to be less than US$1.2M for a longline and lower running costs since wages and conditions are compared to the legitimate vessels.[18] It is mainly due to the no-fee needed for licenses and safety checks. The only additional cost they need is forfeit of catch, punitive fines, imprisonment, loss of vessel and blocklisting, however the probability of being caught was relatively low due to lack of law enforcement at sea. Further, corruption practices among the value chain, from fishers, processors, distributors, and negotiators, may undermine the good governance development within a country.[19] All these have one thing in common, the crimes triggered by poverty with often lack of alternative employment choices and access to seafood and/or fisheries-related wages.

Subsidies given by the respective Government expected to address the low employment served as a boomerang which drives IUU fishing to flourish. A desire for greater profits also drives fishing capacity and mixing illegal catch with legally obtained catches which goes under the unreported element of IUU fishing activities.[20] According to the UNCTAD, FAO, and UNEP Joint Statement, out of $35 billion in fishing subsidies worldwide, $20 billion directly contributes to

[15] Ibid, art. 3.3
[16] Sjarief Widjaja et al., *Illegal, Unreported and Unregulated Fishing and Associated Drivers* (Washington, DC, 2019), www.oceanpanel.org/ iuu-fishing-and-associated-drivers.
[17] FAO, *The State of World Fisheries and Aquaculture 2016 - Contributing to Food Security and Nutrition for All*, 2016.
[18] David J. Agnew and Colin T. Barnes, *Economic Aspects and Drivers of IUU Fishing: Building A Framework," Organisation for Economic Cooperation and Development (OECD)*, 2004.
[19] Melda Kamil Ariadno, *Governance Analysis of the Arafura and Timor Seas* (Jakarta, 2011).
[20] FAO, *The State of World Fisheries and Aquaculture 2016 - Contributing to Food Security and Nutrition for All.*

overfishing.[21] The subsidies play a role as a stimulus to the fishing fleet, making the activities cost-effective and financially viable for both fishermen and investors. This condition certainly increases the fishing capacity and significantly depletes the fish resources.

The gaps between the geographical conditions and ability to control each State's territory are exploited by the perpetrators and create obstacles to enforce any law, particularly for developing countries where the ability to control the area was much lower compared to developed countries. Fragmented stakeholders to manage a different part of fisheries management sectors were also mentioned as a contributing factor for the weak governance at sea.[22] In addition, the insufficient ability to fish on other grounds due to the lack of high technology resulted in many fishers remaining close to the shore and ending up overexploit the area.

The fundamental legal framework in the international sphere has been established in UNCLOS however, the implementation of fisheries management and flag states responsibilities become severe concerns. The absence of states to participate and inadequate implementation to the existing multilateral instruments becomes the main challenge to curtail the widespread of IUU fishing. Even if the regulation were provided, the enforcement was lacking due: 1) lack of political will; 2) logistical difficulties such as inadequate facilities to conduct MCS and reaching vast areas of the ocean, and; 3) minor sanctions imposed by the court compared to the value of poached fish creates easier access than by complying with the laws. UNCLOS has also introduced the prompt release procedure to balance the coastal State's sovereign rights, and flag states maritime activities that affected ongoing procedures at the national level.[23] Thus, Article 73 UNCLOS's enactment has proven to be a hindrance to compel and deter enforcement measures for IUU fishing.[24] It posed as a driving force to the perpetrator of the non-deterrent effect. Some enforcement is also hampered by the unwillingness of states to enforce the law against their fishing fleets.

The IUU fishing activities' nature hinders the data collection needed to provide a detailed analysis of fishery countries' vulnerability, exposure, and responses. As the data is scarce, the scale of IUU fishing globally relies on the data in 2009, which stated that the activities account for 20% of the world's catch and up to 50%, with poorer coastal states disproportionately affected.[25] The study estimated that economic loss experienced globally is between $10 billion to $23 billion. Therefore, the impact level of IUU fishing is challenging to assess still, the extent of the consequences to each State may vary depending on several factors, namely: 1) contribution of the fishing and its related business to the GDP; 2) the proportion of the workforce employed within the industry and marine-based ecotourism; 3) the contribution of exports of fish products to foreign

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[21] UNCTAD-FAO-UNEP, 'UNCTAD-FAO-UNEP Joint Statement Regulating Fisheries Subsidies Must Be An Integral Part of the Implemantation of the 2030 Sustainable Development Agenda', 2016, https://unctad.org/en/Pages/DITC/Trade-and-Environment/Regulating-Fisheries-Susidies.aspx.
[22] Global Ocean Commission, 'From Decline to Recovery: A Rescue Package for the Global Ocean.', *Summary Report* (2014): 48.
[23] Seline Trevisanut, 'Twenty Years of Prompt Release of Vessels: Admissibility, Jurisdiction, and Recent Trends', *Ocean Development & International Law* 48, no. 3–4 (October 2, 2017): 300–312, https://www.tandfonline.com/doi/full/10.1080/00908320.2017.1325694.
[24] Valentin J Schatz, 'Combating Illegal Fishing in the Exclusive Economic Zone', *Goettingen Journal of International Law* 7 (2016): 383–414.
[25] David J. Agnew et al., 'Estimating the Worldwide Extent of Illegal Fishing', ed. Stuart A. Sandin, *PLoS ONE* 4, no. 2 (February 25, 2009): e4570, https://dx.plos.org/10.1371/journal.pone.0004570.

exchange earnings; 4) the proportion of the population dependency on fishing for subsistence purposes; 5) the availability of alternative employment opportunities; and 6) the sensitivity of the marine environment to IUU fishing activity.[26] However, this report notes on closely linked three dimensions that are affected regardless of direct or indirect effects: the environment, social, and economic impacts.

Environmental Impacts

The most direct impact of IUU fishing is related to the environmental dimensions, as the rampant level of IUU fishing threatens the existing marine species and their ecosystems. Through the 2018 report, FAO stated that 33.1% of the assessed fish stocks had been over-exploited globally, which previously reached 90.1%.[27] While Asia Pacific Fishery Commission (APFIC) mentioned that out of 33 hotspots identified in the Asia region, six of these account for over 80% of illegal fishing, making it one of the most significant contributors to IUU fishing.[28] These overexploited areas caused the states and local fishers to suffer losses from the reduced catches and potential state revenues.

Uncontrollable fish harvesting combined with destructive fishing practices such as bottom trawl, blasting, and others, brought significant damage to the reproduction cycle and physically destroyed the coral reef and other vulnerable marine ecosystems where it is breeding and feeding grounds. Such notorious fishing activities are well-known as destructive fishing.[29] Further, the fishing practices in protected grounds and catching juveniles also threaten biodiversity as these practices decreased fish stock viability. It increases new levels of pressure on stocks. It is further exacerbated with the discards of unwanted and endangered fish left dead at sea, causing irreversible damage to the species. In the longer term, fish are scarce due to the depletion of fish stocks, and marine ecosystems can no longer compromise typical ecosystem functioning for fish to reproduce. Thus, it may not be possible to quantify environmental impacts. However, it is clear that IUU fishing contributes to marine ecological degradation affecting the social and economic impacts.

Social Impacts

FAO recorded that the world fishing fleet consisted of about 4.5 million vessels, of which 75% of all vessels were reported to be in Asia.[30] Fisheries provide employment in various forms — harvesting, processing, distribution, and marketing — for at least a quarter of the country's population. Around 59.7 million people were engaged in the primary sector of capture fisheries.[31] Thus, the impacts were directed to many people due to the decrease in the number of small-scale and artisanal fishers whose livelihoods relied heavily on offshore natural resources. For example,

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[26] Frank Meere and Mary Lack, *Assessment of Impacts of Illegal, Unreported and Unregulated (IUU) Fishing in the Asia-Pacific, Prepared by Sustainable Fisheries Management for the Asia-Pacific Economic Cooperation*, 2008.
[27] FAO, *The State of World Fisheries and Aquaculture 2018 - Meeting the Sustainable Development Goal* (Rome, 2018).
[28] AFPIC, *Seventy–Sixth Session of the Executive Committee of APFIC: FAO Actions Support Member Countries Combat IUU and Implement the FAO PSMA* (Manila, 2017).
[29] FAO, *FAO Yearbook: Fishery and Aquaculture Statistics 2017* (Rome, 2017).
[30] Ibid.
[31] FAO, *Complementary Support to the Cambodia Programme for Sustainable and Inclusive Growth in the Fisheries Sector: Capture Component*, 2019.

as one of the countries with the longest coastline and highest small fishers, Indonesia stated that during 2003-2013 fishers decreased by 44,9% due to the depletion of fish stocks.[32] It has affected the community due to the change in species composition due to the damaged marine ecosystem, which threatens food security since this sector is an essential source of protein for the world's population. It approximately provides 20% of rich nutrient protein for 2.9 billion people.[33] Particularly for developing countries as a major stakeholder in this industry that provided 50% of global fish trade.[34] The persistent problem of hunger and malnutrition in various areas and the need to feed the growing population rises, thus placing the effort to eradicate IUU fishing has become part of work towards improving food security as it will eventually hamper development in general.

The following impact of IUU fishing includes undermining efforts from legitimate fishermen, promoting irresponsible extraction of fishery resources. Due to the low safety standards in vessels engaged in IUU activities encourage inadequate working conditions with low wages, long hours, and little regard for safety and food. These will also impede sea safety while promoting criminal actions and human rights abuse such as slavery onboard. Illegal trawlers also dramatically impacted the access to fish for traditional fishers, which sometimes deadly conflicts arise.[35]

Economic Impacts

The economic impacts of IUU fishing heavily influence coastal communities who solely work as fishermen and national income from fisheries industries directly. An estimate by UNEP in 2014 suggested that IUU fishing results in lost annual revenues of between US$11 and US$30 billion globally.[36] Overexploited areas caused the states and local fishers to suffer losses from the reduced catches and landings fees, licensing fees, taxes, duties, and other levies closely related to the promotion of corruption. The global Initiative report in 2015 reiterated Van Dijk and Spapen's statement that IUU fishing is closely associated with various illicit practices that can lead to the promotion of these harmful practices, namely extortion, laundering, bribery, human exploitation, drug trafficking, and murder.[37]

Countries with a high level of IUU fishing will most likely experience trade sanctions, such as the Philippines and Thailand, imposed by major export destination countries like the EU through the EU Regulation to prevent, deter and eliminate illegal, unreported and unregulated fishing (IUU).[38] In the worst case, countries that do not improve the effort to eradicate IUU fishing products will be banned throughout the EU. Particularly for the Asia-Pacific region as major traders in seafood

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[32] Ministry of Marine Affairs and Fisheries (MMAF), *"Combating IUU Fishing in Indonesia," in Consultative Forum of WPEA-SM Project* (Boracay, 2010).
[33] FAO, *The State of the World Fisheries and Aquaculture: Opportunities and Challenges* (Rome, 2014).
[34] Margot L. Stiles et al., *Stolen Seafood: The Impact of Pirate Fishing on Our Oceans* (Washington D. C., 2013).
[35] Meere and Lack, *Assessment of Impacts of Illegal, Unreported and Unregulated (IUU) Fishing in the Asia-Pacific*.
[36] United Nations Environment Programme (UNEP), *Nairobi and Arendal: United Nations Environment Programme and GRID-Arendal*, 2014, http://www.unep.org/unea/docs/rracrimecrisis.pdf.
[37] Teale N. Phelps Bondaroff, Wietse Van Der Werf, and Tuesday Reitano, *The Illegal Fishing and Organized Crime Nexus: Illegal Fishing as Transnational Organized Crime*, 2015; Jan Van Dijk and Toine Spapens, 'Transnational Organized Crime Networks Across the World', in *Transnational Organized Crime: An Overview from Six Continents*, ed. Jay Albanese and Philip Reichel (Sage, 2013), 7–28.
[38] EC IUU Regulation, par.34-35.

products, the surplus plays a pivotal role in foreign exchange earnings in some economies. It will result in indirect impacts by reducing income and employment both from the fishing and its associated industries such as food processing and packaging. In addition, depleted biodiversity and destroyed marine ecosystems due to IUU fishing will also negatively impact the tourism sector, which smaller island countries rely on.

Thus, understanding how humans are heavily reliant on ocean natural resources to sustain our life on earth through food and livelihood and the significance of the three dimensions' impacts has brought to light an essential urge to combat IUU fishing.

1.2 IUU FISHING AS COMMON CONCERN

Ocean and its natural resources are a shared resource with immense value for sustaining our lives on land and recognized as a 'life-support system.' People relied not only on food and clean air but also medicine, energy, water, mineral resources, pleasure, income, transportation routes, scientific data, and peace of mind.[39] It means the regulatory approach to set rules may not be limited to one particular State and sector. Based on the UNCLOS, the concept of humankind's common concern has been adopted to regulate the seas that yield obligations to protect by all States.[40] Thus, the extraction resources beneath the ocean, such as fish, shall also generate shared responsibility to conserve and sustainably use them.

Each State may hold power to regulate their territorial waters and their vessels,[41] however fishing practices have expanded to the areas beyond national jurisdiction, which account for over 45% of the planet, driven by fish migration and technology advancement. Thus, unsustainable fishing practices will hamper the allocation of natural resources that consider the need of other states, which eventually may lead to the tragedy of the common. The ocean's two-thirds economic value relied on a healthy ocean, and consumption over fish reached 153 million tonnes, increasing as the population grew.[42] Consequently, global cooperation is urgently needed to prevent such a catastrophe.

IUU fishing has been detrimental to fish stocks and marine biodiversity loss, which is vital for food security, economic development and broader regional security. The international community has been concerned about this issue, given the highly migratory nature of fish and crossing borders without respecting countries' maritime boundaries. The management over the fisheries resources shall sustain a healthy fisheries resource, ensure food security, alleviate poverty, and optimize the economic value for the people's benefits.

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[39] United Nations Convention on the Law of the Sea, *UNCLOS at 30* (New York, November 2012).
[40] Judith Schäli, 'Intergenerational Justice and the Concept of Common Concern in Marine Resource Allocation and Ocean Governance', in *Intergenerational Equity: Environmental and Cultural Concerns*, ed. Thomas Cottier, Shaheeza Lalani, and Clarence Siziba (Leiden: Brill Nijhoff, 2019).
[41] United Nations Convention on the Law of the Sea, Montego Bay, Jamaica, concluded on 10 December 1982, in force 16 November 1994, 1833 UNTS 3; 21 ILM 1261 (1982). Hereinafter referred to as UNCLOS. Art. 2.1
[42] FAO, *FAO Yearbook: Fishery and Aquaculture Statistics 2017*.

1.3 SMALL-SCALE FISHERIES AND IUU FISHING

The majority of small-scale fisheries are located in developing countries with open access in nature and remain unrestricted for fisheries activities. Previously fishing was destined for community consumption rather than economic activities, where 32 million fishers usually are among the poorest.[43] Furthermore, the high number of small-scale dominated the respective fisheries sector. For instance, in Brunei, small-scale fisheries are 1,925 compared to 37 commercial fishing, which contributed to B$ 60.24 million.[44]

The definition of small-scale fishers among Southeast Asian countries is varied by the gross tonnage of the vessels and/or operation zones. Below is a compilation of small-scale classification: [45]

Table 1. Compilation of Classification of Small-Scale Vessels in Southeast Asia

Countries	Small-Scale Fisheries Definition
Brunei Darussalam	Small-scale/artisanal fisheries: Operating in all zones but concentrating in Zone 1 (0-3 nm)
Cambodia	Coastal fisheries, small-scale fisheries with/without engine (from 5-50 Hp) operating in Zone 1
Indonesia	Fisheries that its operation either without using a boat or powered boat with a maximum of 10 GT[46]
Lao PDR	-
Malaysia	Traditional fisheries: small-scale fisheries using traditional fishing gears (i.e. other than trawls and purse seines) with vessels less than 40 GRT operating in all zones concentrating in Zone 1
Myanmar	Coastal fisheries: vessels of less than 30 ft or using less than 12 Hp engine operating in Zone 1
Philippines	Municipal fisheries: small-scale fisheries with vessels of less than 3 GT operating in Zone 1 and 2[47]
Singapore	Small-scale fisheries with vessels of less than 3 GT operating in Zone 1
Thailand	Small-scale fisheries: vessels of less than 5 GT operating in Zone 1
Viet Nam	Small-scale fisheries: vessels with no engine and with an engine but less than 40 Hp

[43] World Bank, 'Hidden Harvest : The Global Contribution of Capture Fisheries', *The World Bank. Economic and Sector Work*, no. 66469 (2012): 92.
[44] Department of Fisheries, *Brunei Darussalam Fisheries Statistics in Brief 2018* (Bandar Seri Bengawan, 2018).
[45] SEAFDEC, 'Classification of Small-Scale and Commercial Fisheries', accessed September 12, 2020, http://map.seafdec.org/NewBulletin/classscfishery.php.
[46] Indonesia, *Law No. 7 2016 on Protection and Empowerment of Fisherman, Fish Cultivators, and Salt Harvester*, 2016.
[47] Philippine, *Republic Act No . 8550 Development Management and Conservation of the Fisheries and Aquatic Resources, Integrating All Laws Pertinent for Other Purposes*, 1998.

Some countries manage small-scale fishers through license, some are not. For example, in Cambodia, free licensing is given to medium-scale fishing in both marine and freshwater,[48] while in Thailand, fishing vessels for artisanal purposes have a license in M 174.[49] However, the absence of an adequate enforcement scheme and the ever-increasing demand for fish leads to the rapid depletion of natural resources through IUU fishing practices.[50] By ignoring the existing regulation and control mechanism amidst the COVID-19[51] some industrial-scale fishing were found operating illegally in other than designated fishing zones that impact the resources and the small-scale fishers.[52] Also, most developing countries hardly have any regulation specifically to govern this community. It is scattered without any specific landing sites makes it difficult for the authority to regulate its activities and even harder for countries with extensive maritime jurisdiction.

Generally, GDP values are the sole indicator of the economic welfare of a country. As the world order developed, taking into account GDP only may be irrelevant to the current ever-changing world. It is also applying to the role of the GDP contribution of the fisheries sector as it does not necessarily reflect the sector's potential. Therefore, various productivity indicators, paired with its economic and environmental sustainability, such as the level of fish stocks, long-term profitability, and governance, shall be appended. [53] As a result, standard fishery production mainly fails to consider the small-scale contributions, which adds to the list of reasons why the government often neglects to regulate them.

Eventually, small-scale fisheries develop into activities that can generate significant economic revenues and serve as a social engine at the grassroots level in the context of food security and poverty alleviation.[54] Thus, the fish competition and lack of governance provide a wide opportunity for illegal fishing practices to flourish in a small-scale sector, especially without any government monitoring until a conflict between two parties has arisen. Therefore, to prevent the rampant IUU fishing practices in small-scale fisheries, there is an urgent need to facilitate these fishers with a mechanism to verify their catch and provide landing documentation for individual vessels.

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[48] Camille Bann and Lieng Sopha, *FishCounts – Increasing the Visibility of Small-Scale Fisheries in Cambodia ' s National Planning*, 2020.
[49] Department of Fisheries, 'List of Fishing Boats That Have a Fishing License, M 174 in Thailand', last modified 2020, accessed September 11, 2020, https://fel.fisheries.go.th/pages/index.php?pages=Artisanalfishingvessel&pages=Artisanalfishingvessel.
[50] Ousman K. L. Drammeh, *Illegal, Unreported & Unregulated Fishing in Small-Scale Marine and Inland Capture Fisheries* (Gambia, 2000).
[51] COVID-19 or SARS-CoV-2 is a novel virus first reported by official in Wuhan, China in December 2019 and it is categorized as global pandemic by World Health Organization on 30th January 2020.
[52] Nathan J. Bennett et al., 'The COVID-19 Pandemic, Small-Scale Fisheries and Coastal Fishing Communities', *Coastal Management* 48, no. 4 (2020): 336–347, https://doi.org/10.1080/08920753.2020.1766937.
[53] World Bank, 'Hidden Harvest : The Global Contribution of Capture Fisheries'.
[54] Food and Agriculture Organisation (FAO), *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries*, *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication*, 2015, http://www.fao.org/docrep/field/003/ab825f/AB825F00.htm#TOC.

1.4 LEGAL RESPONSE TO IUU FISHING

The development of the regulatory framework for IUU fishing was triggered by the lack of adequate UNCLOS measures as the international fishing regime's dynamics have emerged. FAO established the Code of Conduct for Responsible Fisheries[55] , and the IPOA-IUU[56] remains a crucial framework for states. This chapter establishes international legal grounds on the global effort against IUU fishing and promotes sustainable fisheries briefly to comprehend the existing legal responses to which later elaborate further in the 2nd report of the series (Refer to: Review of National Policies and Regulations in Combating IUU Fishing, July 2021).

The legal responsibility of IUU fishing stretched to extensive rules of international law, namely the UN Fish Stocks Agreement,[57] the FAO Compliance Agreement,[58] the World Trade Organization (WTO), and International Maritime Organization (IMO) agreements[59]. The trade-related such as the General Agreement on Tariff and Trade (GATT),[60] meanwhile environment-related such as the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES),[61] Convention on the Conservation of Migratory Species of Wild Animals (CMS),[62] Agenda 21,[63] and the Convention on the Conservation of Biological Diversity (CBD).[64] The complexity of IUU fishing also influences other fields of law, such as transnational crime, labour[65], and shipping regulation.

The legal development of IUU fishing turning point from the FAO is the IPOA-IUU in 2001 where it poses as an all-in-one guideline to deter IUU fishing and relevant measures. Several prior significant agreements, such as the FAO Compliance Agreement[66] and the FAO Code of Conduct

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[55] FAO, Code of Conduct for Responsible Fisheries, Adopted at the 28th Session of the FAO Conference, Rome, Italy, 31 October 1995. *Hereinafter referred to as* FAO Code of Conduct.
[56] FAO, International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing, adopted on 23 June 2001 at the 120th Session of the FAO Council. *Hereinafter referred to as* IPOA-IUU.
[57] Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, concluded on 4 September 1995, in force 11 December 2001, 34 ILM 1542 (1995); 2167 UNTS 88. Hereinafter referred to as UNFSA.
[58] FAO, Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, Rome, Italy, concluded on 24 November 1993, entered into force 24 April 2003, 33 ILM 968. Hereinafter referred to as the FAO Compliance Agreement
[59] IMO, International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel, adopted on 7 July 1995, in force 1 February 1997. Hereinafter referred to as STCW-F
[60] General Agreement on Tariffs and Trade 1994, concluded on 15 April 1994, in force 1 January 1995, 1867 UNTS 187; 33 ILM 1153 (1994), in the *Final Act Embodying the Results of the Uruguay Round of Multilateral Trade Negotiations*, Annex 1A, 15 April 1994, Art. III(4). *Hereinafter referred to as* GATT 1994.
[61] *Convention on International Trade in Endangered Species of Wild Flora and Fauna,* Washington D.C., USA, concluded on 3 March 1973, in force 1 July 1975, 27 UST 1087; TIAS 8249; 993 UNTS 243. Amended at Bonn, on 22 June 1979 and Gaborone on 30 April 1983. *Hereinafter referred to as CITES*.
[62] *Convention on the Conservation of Migratory Species of Wild Animals*, Bonn, concluded on 23 June 1979, in force 01 November 1979, 19 ILM 15 (1980); ATS 1991/32; BTS 87 (1990), Cm.1332.
[63] United Nations Conference on Environment and Development (UNCED), Agenda 21, Chapter 17, *Protection of the Oceans, All Kinds of Seas, Including Enclosed and Semi-enclosed Seas, and Coastal Areas and the Protection, Rational Use and Development of their Living Resources*, Rio de Janeiro, Brazil, 03–14 June 1992. *Hereinafter referred to as* Agenda 21.
[64] *Convention on Biological Diversity*, Rio de Janeiro, Brazil, concluded on 5 June 1992, in force 29 December 1993, 1760 UNTS 79; 31 ILM 818 (1992).
[65] International Labour Organization (ILO), Convention Concerning Work in the Fishing Sector (C188), Geneva, Switzerland, adopted on 14 June 2007. Hereinafter referred to as *Work in Fishing Convention.*
[66] William Edeson, David Freestone, and Elly Gudmundsdottir, *Legislating for Sustainable Fisheries. A Guide to Implementing the 1993 FAO COmpliance Agreement and 1995 UN Fish Stocks Agreement*, *The World Bank Law, Justice and Development Series*, 2001.

for Responsible Fisheries has formed a catalyst for the development of international regulations to address IUU fishing including the UN Fish Stocks Agreement addressed measures on high seas and the EEZ regarding straddling and highly migratory fish stocks which facilitate the UNCLOS provisions in binding form.[67] Since then, FAO has formed several technical guidelines to complement the application and implementation to the IPOA-IUU as well as the notable FAO Port State Measures in 2009.

Besides IPOA-IUU, the concept of these measures has also been adopted to the regional and national levels though it generates different application forms. Unlike IPOA-IUU and NPOA-IUU, Regional Plan of Action to Promote Responsible Fishing Practices including Combating Illegal, Unreported and Unregulated Fishing (RPOA-IUU) embodiment is a regional fisheries management cooperation consisting of eleven participating countries and four advisories' bodies.

1.5 IMPORTANCE OF DATABASE TO COMBAT IUU FISHING

Recognition of the need for multilateral and regional action against IUU fishing has received wide acceptance as a tool to eradicate these practices. However, efforts also need to be put in place for data collection mainly the baseline estimates and compilation regarding the IUU vessels and development that has been going on in recent years. Reliable data and information of the baseline estimates on countries' fisheries sector are scattered and scant, significantly limiting potential scenarios for developing the sector. As it is extremely difficult to monitor, its effect is also challenging to predict. In the worst case, without the knowledge of such estimates, the management authority may not know the stock is in danger until it is self-evident that it is already in a poor state that is most probably irreversible.

The up-to-date datasets are pivotal in tackling IUU fishing by exploiting technologies to establish a single, effective, public global or regional fisheries information tool. Thus, it serves as a bridge for tailored data management and improves fisheries governance and curtail unsustainable fishing practices and even corruption.[68] If better data systems and outputs were available, understandable, and correctly interpreted, will guide to a sounder policy. Global estimates of economic value loss may have been conducted from the public agency data, such as the UN's FAO capture fishery dataset. The first attempt to undertake a worldwide estimate of illegal fishing is found between US$10 billion to US$23.5 billion, which represents 11 to 26 million tonnes catch. To date, this finding is still relevant and has become the worldwide baseline estimate as a basis to curb IUU fishing.

Additionally, we have identified several global or regional attempts for loss estimates with different methodology and scope of the subject prior to 2016. There is no standardized method to calculate the value and volume loss estimates of IUU fishing, for example Agnew, et al[69] only

[67] Ibid.
[68] Miren Gutierrez, Alfonso Daniels, and Guy Jobbins, 'Fishing for Data The Role of Private Data Platforms in Addressing Illegal ', (2018), https://www.odi.org/sites/odi.org.uk/files/resource-documents/11992.pdf.
[69] Agnew et al., 'Estimating the Worldwide Extent of Illegal Fishing'.

calculated illegal only while Wagey, et al[70] calculated all elements of illegal and unreported (including discarded fish). The approach of the study also shall be taken into account when comparing the estimates. Another example, CSIRO method[71] for estimates study in 2021 and its predecessor, FAO Unpublished Study in 2016, has the same approach of media source. However, in CSIRO study of fisheries officers from Asia and Pacific countries also contributed to the dynamic of the study. The difference in multiplying the value of the fish is also important to note, such as in Sumaila, et al[72] which uses US$3 per kg of fish instead of the usual US$2. Including, the scope of the study whether it is specific region (see Table 2) and country calculation (see Table 3) made from various stakeholders. Details on the following table:

Table 2. Compilation of Global or Regional IUU Fishing Loss Estimates Prior 2016

Study	Year	Method & Element	Volume Loss (Tonne)	Value Loss
Marine Resources Assessment Group[73]	2005			Between US$4,2 billion and US$9,5billion
Journal: Estimating the Worldwide Extent of Illegal Fishing (Agnew, et al)[74]	2009	Geospatial algorithm and catches reported to EEZ (Illegal and Unreported)	11 to 26 million tonnes of fish 3,4 to 8,1 million tonnes (Asia-Pacific)	US$10 billion to $23,5 billion
A study of Illegal, Unreported and Unregulated (IUU) Fishing in the Arafura Sea, Indonesia (G.A. Wagey, et al) [75]	2009	Catch and Fishing Effort as baseline and review regulations (discarded, unreported and illegal catch)	1,274,553 tonnes	Rp 11 trillion to Rp 17 trillion
Bay of Bengal Large Marine Ecosystem Project – Bay of Bengal[76]	2015	Review documents and media report	4,5 to 14.4 million tonnes	US$6 billion to $21 billion/annually
FAO Report to APFIC (unpublished)[77]	2016	Review and media report (illegal)	2 to 2,5 million tonnes	US$3.1 billion to $5.2 billion

Despite the above attempt, a significantly more focused approach and area are needed to serve as a backbone for the respective country's policymakers to consider instead of global estimates. As the country's geographical circumstances and current fisheries governance may have developed over the years, examining the baseline estimates is essential than ever. The estimates are expected to raise the awareness and disenchant of all RPOA-IUU states to effectively prevent, deter, and

[70] G.A. Wagey et al., *A Study of Illegal, Unreported and Unregulated (IUU) Fishing in the Arafura Sea, Indonesia* (Jakarta, 2009), http://eprints.uanl.mx/5481/1/1020149995.PDF.
[71] Chris Wilcox et al., *A Review of Illegal, Unreported and Unregulated Fishing Issues and Progress in the Asia Pacific Fisheries Commision Region* (Bangkok, 2021).
[72] U. R. Sumaila et al., 'Illicit Trade in Marine Fish Catch and Its Effects on Ecosystems and People Worldwide', *Science Advances* 6, no. 9 (2020): 1–8.
[73] MRAG, 'Review of Impacts of Illegal, Unreported and Unregulated Fishing on Developing Countries', *FINAL REPORT* (2005): 16–21, http://www.dfid.gov.uk/news/files/illegal-fishing.asp.
[74] Agnew et al., 'Estimating the Worldwide Extent of Illegal Fishing'.
[75] Wagey et al., *A Study of Illegal, Unreported and Unregulated (IUU) Fishing in the Arafura Sea, Indonesia*.
[76] BOBLME, *Review of Impacts of Illegal, Unreported and Unregulated Fishing on Developing Countries in Asia*, *Review of Impacts of Illegal, Unreported and Unregulated Fishing on Developing Countries in Asia. BOBLME-2015-Governance-15*, 2015, http://www.boblme.org/documentRepository/BOBLME-2015-Governance-15.pdf.
[77] Wilcox et al., *A Review of Illegal, Unreported and Unregulated Fishing Issues and Progress in the Asia Pacific Fisheries Commision Region*.

eliminate IUU fishing within the region. It also urges an integrated legal response, develops national assessment and evaluation, and identifies the gaps from participating country's best practices. This report's limited data availability may stimulate fisheries stakeholders to collect standardized and accurate data from every vessel seeking to offload fish in their port, which is then shared with international authorities on a near real-time basis. Although the transition towards digital methods such as utilization of the Vessel Monitoring System (VMS) has been progressive, the transparency over such data remains a challenge. Thus, this paper attempts to quantify the estimated volume and value loss within 11 participating countries of RPOA-IUU through the best availability and our efforts to collect such data. Indonesia will serve as a case study as the data acquired are mostly fulfilled within this study method.

In addition, authors compiled the table below as a point of reference between each country's previous loss estimation and our calculation of the estimates focused on the best available data obtained from various sources, though not all RPOA-IUU participating countries were mentioned in the following table.

Table 3. Annual Estimates from Country's Statement or Previous Study

Country	Institution	Year	Volume Loss (Tonne)	Value Loss
Indonesia	West, et al	2012		US$2 billion
	John Pearce, et al[78]	2015		US$1.1 million to US$2.5 million
	Krisnafi, et al	2017		US$7 billion
Malaysia	DOF Statement in 2017 - Datuk Ismail Abu Hassan		980,000 tonnes	RM6 billion
PNG	Marine Resources Assessment Group[79]	2005		US$35 million
Thailand	Draft of Thailand NPOA-IUU[80]	2015		$230 million
Timor-Leste	Marine Megafauna Surveys in Timor-Leste: Identifying Opportunities for Potential Ecotourism – Final Report[81]	2012		$20 million

Notable loss estimates study for the ATS region was conducted in 2009 by Wagey, et al. The method used in the study are the combination of the Catch and Fishing Effort and review regulations which can be used as a reference in establishing "anchor points" and influence factors"[82] with the baseline from the statistical catch data for the Arafura Sea derived from the

[78] John Pearce et al., *Review of Impacts of Illegal, Unreported and Unregulated Fishing on Developing Countries in Asia*, 2015.
[79] MRAG, 'Review of Impacts of Illegal, Unreported and Unregulated Fishing on Developing Countries'.
[80] Thailand, 'DRAFT Thailand National Plan of Action to Prevent, Deter and Eliminate Illegal Unreported and Unregulated Fishing', 2019.
[81] Edyvane K Dethmers K, Chatto R, Meekan M, Amaral A, de Cunha C, de Carvalho N, *Marine Megafauna Surveys in Timor-Leste: Identifying Opportunities for Potential Ecotourism* (Darwin, 2012).
[82] Tony J Pitcher et al., 'Estimating Illegal and Unreported Catches from Marine Ecosystems: A Basis for Change', *Fish and Fisheries* 3, no. 4 (December 2002): 317–339, http://doi.wiley.com/10.1046/j.1467-2979.2002.00093.x.

National Fisheries Statistics between 1976-2004. Interviews with several related stakeholders during the 1970s to 1990s also provided the element of unrecorded data and information.[83] The period of the subject of study ranges from 1976-2005 with upper and lower limits for the estimations using the following formula:

Baseline catch = Statistical Data + (Discards + Misreported + Illegal)

Validation of the results was conducted through various workshops that verified the combined three gears (Shrimp Trawl, Fish Trawl, and Bottom Long Line) estimations that IUU levels at 1,274,553 tonnes between 2001-2005, high and low limits over the same period are 1,454,550 and 1,161,591 tonnes respectively. Equivalent to the average losses from 1991 to 2005 is estimated at around IDR 11 trillion to Rp 17 trillion based on an assumed value of US $1 per kilogram of fish. In which these outputs served as a reference for this study.

In February 2021, we noted that CSIRO issued a similar report regarding the update of unpublished FAO findings in 2016 on the illegal fishing estimates and listed specific loss estimates on the three hotspots identified in the ATS region. The method used in this study comprised four different approaches: media reports, literature review, interviews, and fisheries officer surveys (structured surveys). Unlike Wagey et al., this study only focused on the illegal element in the Asia Pacific region consisting of subregion estimations. The subregion ATS, Banda Sea, and Savu Sea estimated quantity and value of illegal fishing at 2,572,300 tonnes or equivalent to US$880,3 million.[84] Meanwhile, for each loss estimates of Timor-Leste, Indonesian (Arafura Sea), and Papua New Guinea (Dogleg) EEZ are listed below:

Table 4. Compilation of IUU Fishing Loss Estimates for Arafura and Timor Sea Littoral States Derived from the FAO and CSIRO Study Published on February 2021

Country	Area of Interest	Hotspot	Volume Loss (Tonne)	Value Loss
Timor-Leste		24	Less than 10,000 tonnes	US$20 million
Indonesia	Arafura Sea	25	99,000 tonnes	US$118,8 million
Papua New Guinea	Dogleg	26		

The study also updated the following hotspots map areas, numbers 24, 25, and 26 are located in the ATS region remained consistent on both 2016 and 2021 studies.[85] However, this shall be highlighted that the update of these hotspots is based on each fisheries officers' surveys. Such an approach creates certain bias when naming the area as hotspots become subjective instead of data-driven reasoning. In addition, survey outreach only limited to certain agencies or persons and did not consider the multistakeholder approach. For example, the Ministry of Marine Affairs

[83] Wagey et al., *A Study of Illegal, Unreported and Unregulated (IUU) Fishing in the Arafura Sea, Indonesia*.
[84] Wilcox et al., *A Review of Illegal, Unreported and Unregulated Fishing Issues and Progress in the Asia Pacific Fisheries Commision Region*.
[85] Ibid.

and Fisheries of the Republic of Indonesia (MMAF) represented Indonesia despite fisheries issues responsibilities also under the authority of the Indonesian Coast Guard, Navy, and Marine Police.

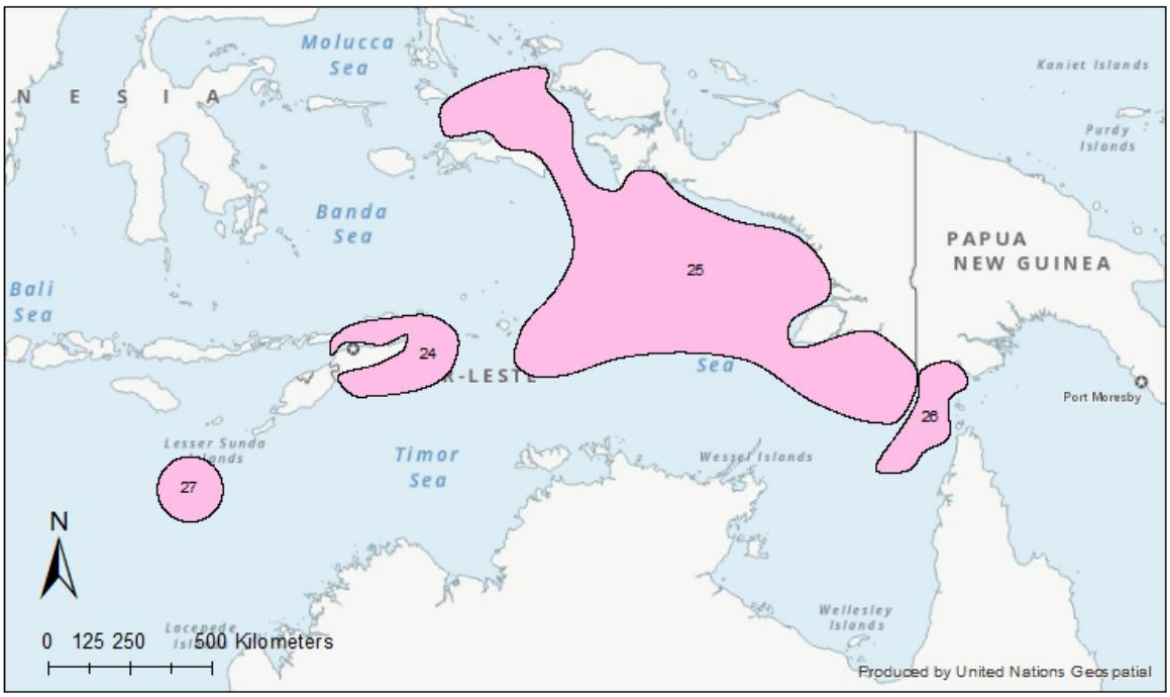

Figure 1. *Hotspots in the Arafura and Timor Sea region as indicated in the 2015 FAO study on illegal fishing in the APFIC region and sustained by the 2021 FAO and CSIRO updated study*

Meanwhile, Sumaila, et al journal titled "Illicit trade in marine fish catch and its effects on ecosystem and people worldwide" estimated a loss of US$3,8 billion to $7,5 billion equivalent to 3.6 and 6.6 million tonnes in the Asian region (2005-2014),[86] do highlight that there are differences that attributed to the different outputs namely prices of the fish, distinct method of approach, subject of the study, and scope of IUU activities involved.

[86] Sumaila et al., 'Illicit Trade in Marine Fish Catch and Its Effects on Ecosystems and People Worldwide'.

CHAPTER 2. AREA OF FOCUS

Asia and the Pacific region play an essential role in the fishery industry, as the region accounts for over 70% of the marine fisheries catch worldwide.[87] This research will only focus on the RPOA-IUU participating countries and further will estimate specifically for the ATS region.

2.1 RPOA-IUU

The Regional Plan of Action to Promote Responsible Fishing Practices including Combating Illegal, Unreported and Unregulated Fishing (RPOA-IUU)[88] is the embodiment of the IPOA-IUU in the regional level through Indonesia proposal in the Joint Ministerial Statement in 2007. Eleven participating countries of the document, namely Australia, Brunei Darussalam, Cambodia, Indonesia, Malaysia, Papua New Guinea, Philippines, Singapore, Thailand, Timor-Leste, and Vietnam. Thus, the subject of focus for this study will be limited to these states.

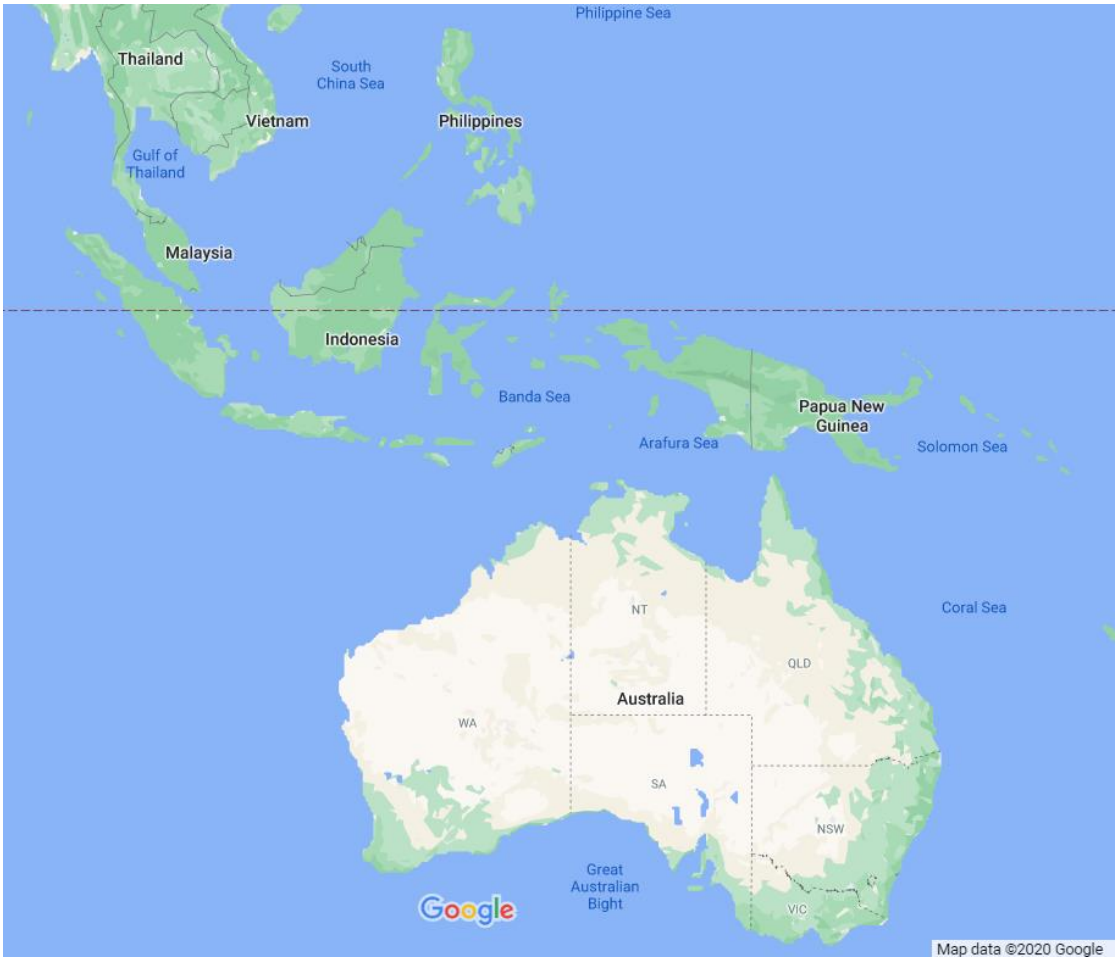

Figure 2. *RPOA-IUU Area of Implementation*

[87] FAO, *The State of World Fisheries and Aquaculture 2018 - Meeting the Sustainable Development Goal*.
[88] *Regional Plan of Action (RPOA) to Promote Responsible Fishing Practices including Combating IUU Fishing in the Region*, Bali, Indonesia, 04 May 2007. *Hereinafter referred to as* RPOA-IUU.

Not only states involved, there are also four regional fisheries organizations that serve to assist the participating countries, namely FAO/Asia-Pacific Fishery Commission (APFIC), Southeast Asian Fisheries Development Centre (SEAFDEC), InfoFish and Worldfish Center.[89] According to paragraph 3, the objective of this RPOA is "to enhance and strengthen the overall level of fisheries management in the region, sustain fisheries resources and the marine environment, and optimize the benefit of adopting responsible fishing practices."[90]

The RPOA-IUU actions include combating IUU fishing in the three areas: Sub-Regional Southern and Eastern of the South China Sea and Sulu-Sulawesi Seas (SESCS SSS), Sub-Regional Gulf of Thailand, and Sub-Regional Arafura-Timor Seas (ATS).[91] The secretariat provides reporting illegal fishing mechanisms and IUU vessel lists to accommodate the participating countries.

2.2 ARAFURA AND TIMOR SEAS (ATS) REGION

Four littoral countries share the semi-enclosed Arafura and Timor Seas (ATS) linking the Indian and Pacific Oceans surrounding the region: Indonesia, Timor-Leste, Papua New Guinea (PNG) and Australia. As it is in the Coral Triangle, known to be the richest bodies of water with tropical marine biodiversity with the highest density of species, where the Northern Australia Shelf (NAS) waters collide with the Indonesian Sea, thus recognized as the most pristine yet the most threatened marine ecosystems in the world.[92]

The sea extends from the Timor Sea to the Torres Straits, including the Arafura Sea and Gulf Carpentaria, covering nearly 800,000 km^2. Based on the FAO Major Fishing Areas, the waters were within the Eastern Indian Ocean (Major Fishing Areas 57, Western Australia Subarea 57.5.1) and a small part of Western Central Pacific (Major Fishing Areas 71).[93]

[89] RPOA-IUU, par.4
[90] RPOA-IUU, par.3
[91] RPOA-IUU Secretariat, *The 1st Coordination Committee Meeting on the RPOA-IUU* (Manila, 2008).
[92] DM Alongi et al., *Biophysical Profile of the Arafura and Timor Seas, Report Prepared for the Arafura Timor Seas Ecosystem Action (ATSEA) Program.* (Jakarta, 2011). p.1
[93] FAO, "FAO Major Fishing Areas," accessed September 2, 2020, http://www.fao.org/fishery/area/search/en.

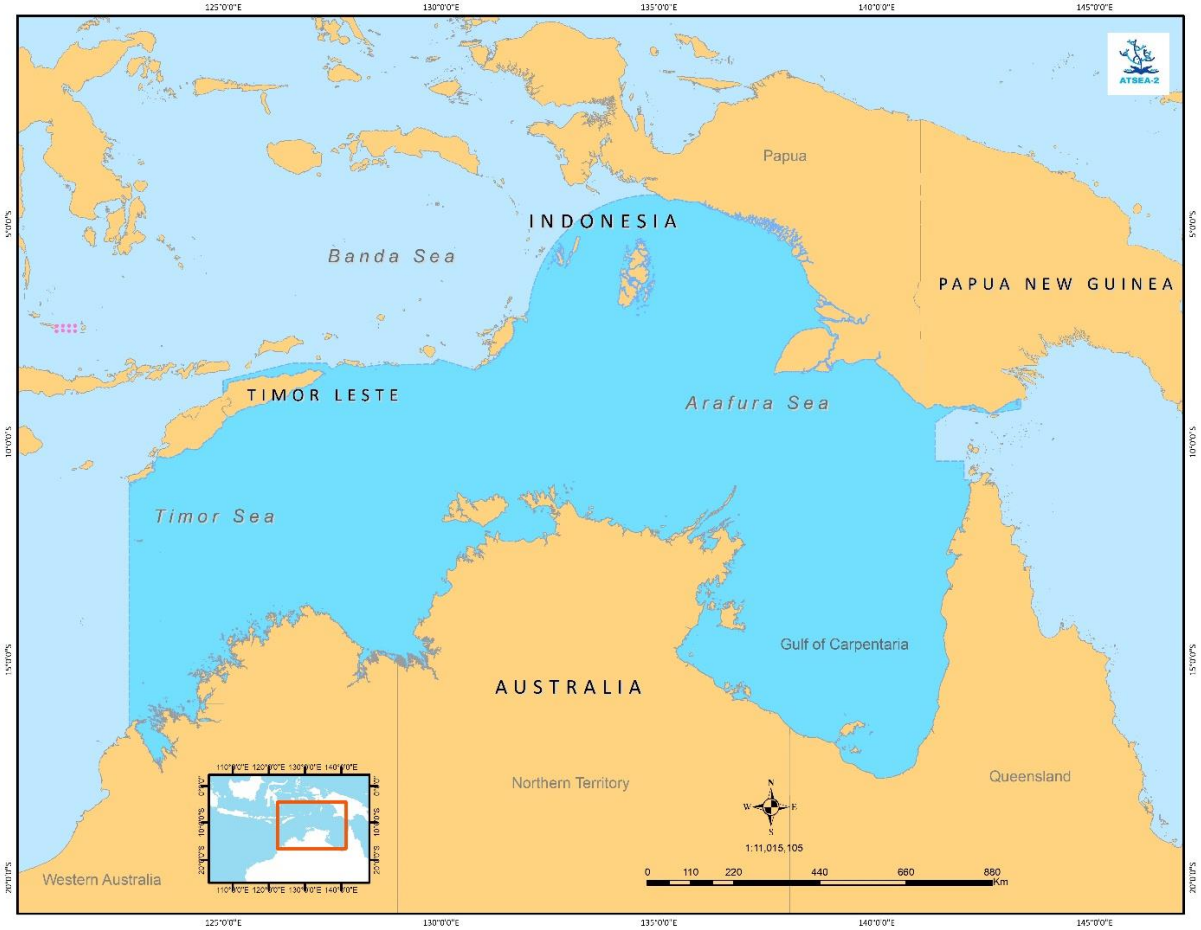

Figure 4. *Map of the Arafura and Timor Seas*

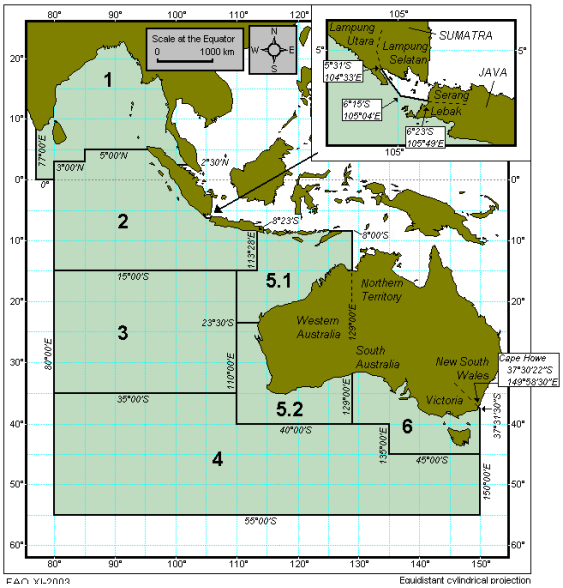

Figure 3. *FAO Major Fishing Area 57 Eastern Indian Ocean*

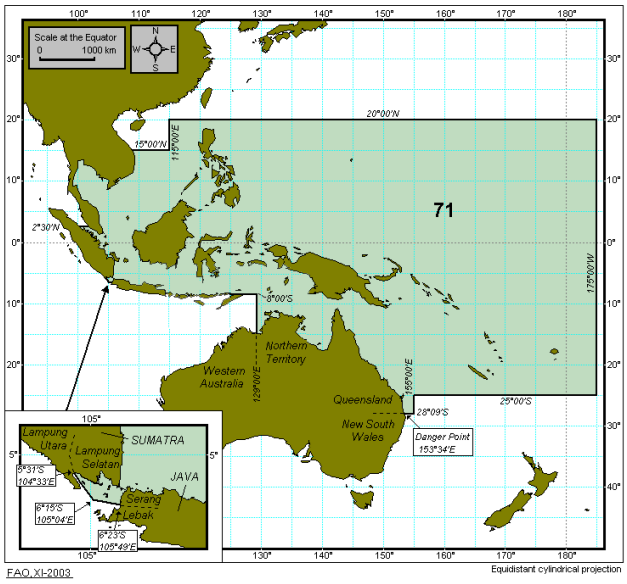

Figure 5. *FAO Major Fishing Area 71 Western Central Pacific*

As a vital warm pool for the global ocean circulation, the ATS has a high productivity ecosystem where most diverse mangrove is sheltered. The mangroves act as breeding sites for marine

species that complement a high degree of biodiversity and make perfect fishing activities a livelihood. Living natural resources beneath the waters consisted of highly migratory and pelagic species such as sharks and rays, red and gold band snappers, billfish, trepang, prawns/shrimps, tuna, and salmon, which has a high market value. Meanwhile, other types of fish such as sardines, anchovy, mackerel, barramundi, and even crab and clams are also found abundant in the area. The diversity within the ATS waters also includes notable migratory protected species, such as sea turtle, dugong, sawfish, and *elasmosbranchs* as the region connected the Indian and Pacific Oceans.[94]

Based on the FAO statistics in 2017, both Eastern Indian Ocean and Western Central Pacific are among the highest producers at 6,966,875 and 12,530,652 tonnes, respectively.[95] As most of the ATS area within the Fisheries Management Area (*Wilayah Pengelolaan Perikanan*/WPP 718), Indonesia has estimated the fish potency within the area are 2,637,564 tonnes with all seven types of big pelagic, small pelagic, demersal fish, lobster, crabs, and squid are categorized fully exploited while reef fish has been over-exploited.[96] There are 6 (six) landing sites within the ATS region in Indonesia, which are located in Maluku Province (*Kalar-Kalar* and *Merauke* port) and Papua (*Sumuraman, Dobo, Omor* and *Poumako* port).[97]

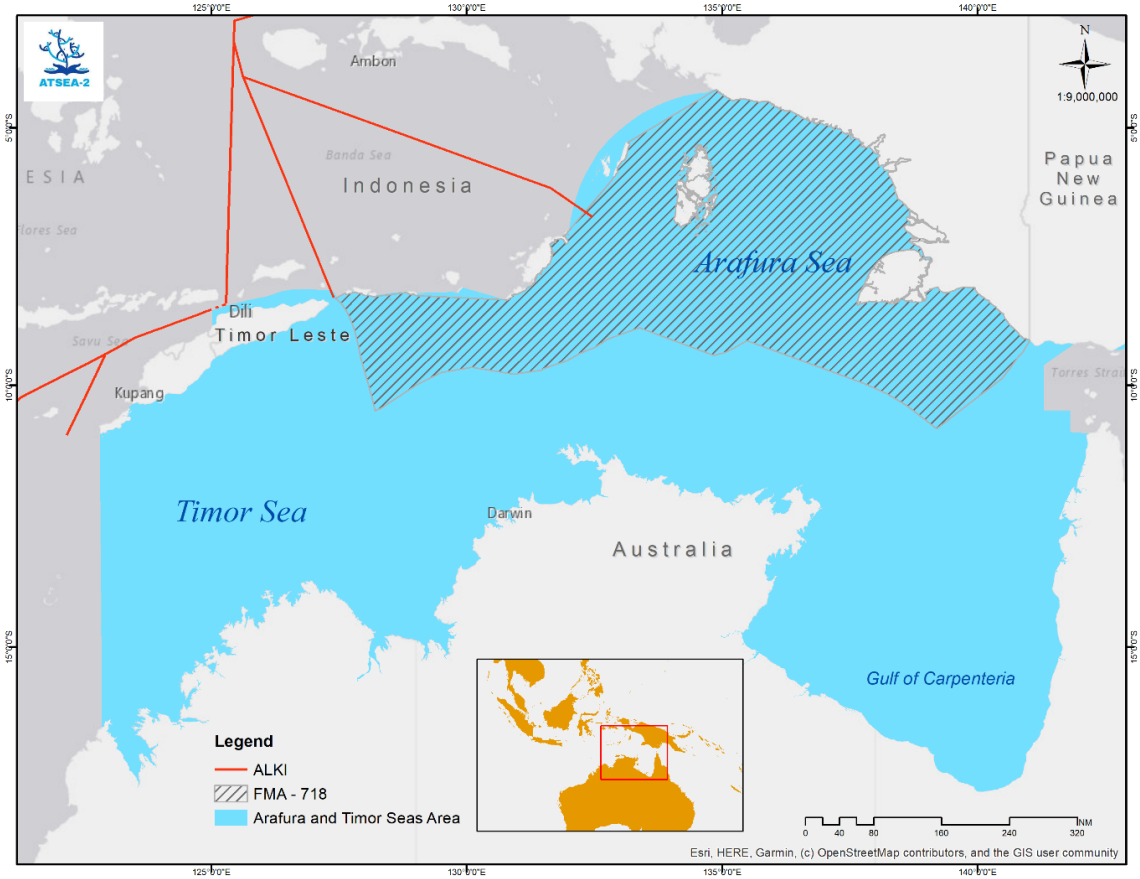

Figure 6. *WPP-718, Indonesian Sea Lanes (Alur Laut Kepulauan Indonesia/ALKI), and Arafura and Timor Seas Maps)*

[94] S Wirasantosa et al., *ATSEA Thematic Reports on the Arafura and Timor Seas Region* (Jakarta, 2011).
[95] FAO, *FAO Yearbook: Fishery and Aquaculture Statistics 2017*.
[96] MMAF, *Marine and Fisheries Affairs in Figures 2018* (Jakarta, 2018).
[97] Ibid.

Despite the abundant living natural resources within the regions, the high number of people and industries combined with poorly managed resources has resulted in an unprecedented impact. The limited capability of technology and vessels has made littoral nations to overexploit the coastal zone. Although most fish catch is artisanal, industrial fisheries considerably contribute more since they target high-value shrimp and tuna stocks.[98] In addition, the indigenous harvest of Dugongs contributes to the decline of the protected species. However, fishing activities are pivotal for people's food and livelihoods, especially industrial harvest with substantial economic value.

The analysis conducted on species composition of caught fish of *Sciaenidae* group, dominant fish caught within the Aru Sea, in 1991, 1997 and 2003 deteriorated sharply and so did other types of fish. Despite the rise in shrimp's small size due to banana and tiger shrimp production, *crustaceans* and *molluscs are almost* fully exploited. It is reported that the key causal factors of the ATS priority environmental concerns, namely decline and loss of living marine resources, degradations and loss of marine habitats, and decline and loss of key marine species, are mostly due to unsustainable fishing practices, IUU fishing.[99]

Since this report will limit its elaboration for the Arafura and Timor Sea (ATS) region, which is located in Western Central Pacific and Eastern Indian Ocean, the value loss is predicted between US$707 million to US$1,557 billion and between US$421 million to US$874 million respectively from 2000 through 2003.[100] However, it needs to be highlighted that the high number presented on the FAO Major Fishing Area was an overall number without being focused on the ATS region. The abundant fish in the ATS region encouraged vessel operators to increase the fleets with duplicated licenses and numbers.[101] As of 2019, the highest licensed vessels in Indonesia are located in the WPP 718 with 1,488 licenses.[102]

As a result, the Arafura Sea economic losses estimation mentioned in the previous report between 2001-2005 was around 1,274,553 tonnes.[103] Due to the limited data, this study will focus on Indonesia as the case study of this research since the most completed data derived from the Indonesian agencies are available. Additionally, the absence of datasets from other littoral nations remains complicated. However, this study strives to take an in-depth look at the ATS littoral nations economic and volume loss and the national-scale of RPOA-IUU countries.

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[98] DM (editor) Alongi et al., 'Biophysical Profile of the Arafura and Timor Seas', *Report prepared for the Arafura Timor Seas Ecosystem Action (ATSEA) Program.*, no. January (2011): 32.
[99] Wirasantosa et al., *ATSEA Thematic Reports on the Arafura and Timor Seas Region*.
[100] Agnew et al., 'Estimating the Worldwide Extent of Illegal Fishing'.
[101] A. Zulham, H. Hikmah, and N. Shafitri, 'Fisheries in Merauke: Linking Fishermen to Markets', *IOP Conference Series: Earth and Environmental Science* 348, no. 1 (2019).
[102] MMAF, *Marine and Fisheries Affairs in Figures 2018*.
[103] Wagey et al., *A Study of Illegal, Unreported and Unregulated (IUU) Fishing in the Arafura Sea, Indonesia*.

CHAPTER 3. METHODOLOGY

The methodology of this series of reports consisted of all four scopes of work (SoW), each with a different scope and analysis approach. Generally, the studies resulted in a report consisting of recommendations and strategies for improving IUU fishing eradication in the ATS region and RPOA-IUU-participating countries areas from different perspectives. The research stages of these studies can be seen in the following diagram:

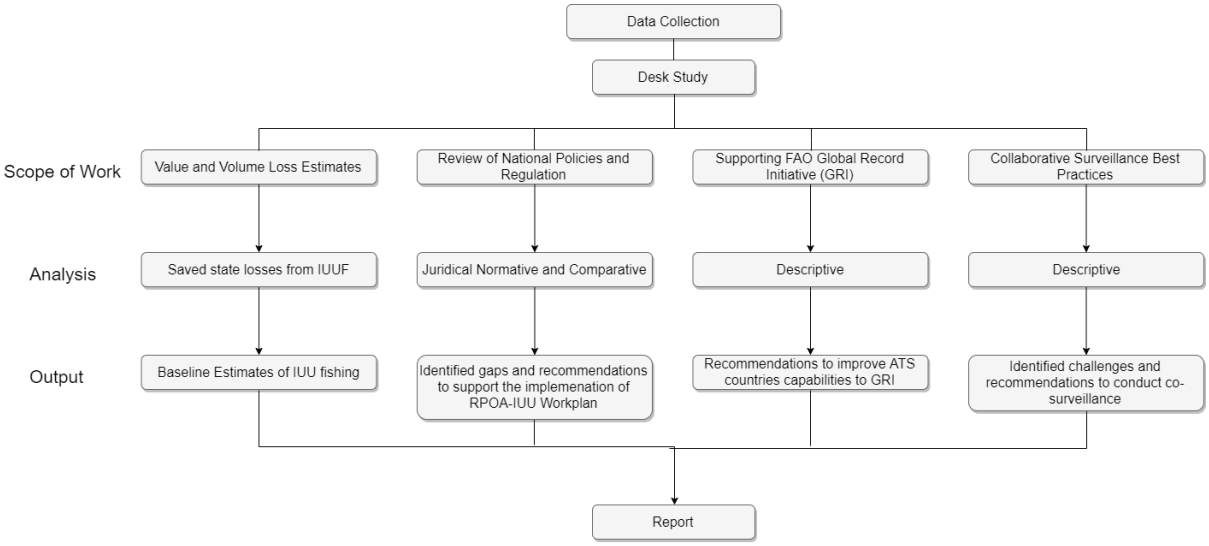

Figure 7. *Research Stages*

3.1 SCOPE OF WORK 1 – VALUE AND VOLUME LOSS ESTIMATES

This report represents the first report out of four, regarding IUU fishing loss estimates recouped by countries through the apprehension of these vessels. This study aims to determine and refine the existing baseline estimates of the economic and volume losses experienced by RPOA-IUU-participating countries and has three main objectives, namely:

- To compile and document existing baseline estimates of IUU fishing;
- To conduct studies that fill in the gaps in existing baseline data and to refine estimates of IUU fishing (quantitatively – in volume and value), especially in the ATS region and with country-level estimates; and
- To identify or compile identified hotspots for IUU fishing within the ATS region and recommend reducing these violations.

These findings are expected to support the implementation of RPOA-IUU, especially for the RPOA-IUU Sub Regional ATS 2020 workplans (e.g., MCS sub-regional ATS meeting, Coordination Committee Meeting) and posited as reference materials to inform policy decisions tailored to each respective country, especially for ATS littoral states.

This research will use a quantitative approach corresponding to the aforementioned objectives, as the report will compile a wide range of government documents, reports and published information relevant to the formula to calculate estimates set forth. The data collection is primarily carried out through desk study covering various literature, including published figures from government authorities and country reports from the RPOA-IUU Coordination Committee Meeting (CCM). Additionally, any data that cannot be obtained through literature-based research will be acquired with the assistance of each respective country authority and the RPOA-IUU secretariat, based within the Ministry of Marine Affairs and Fisheries of the Republic of Indonesia (MMAF). Data identified as essential to the successful completion of this study is as follows:

- Annual lists of fishing vessels conducting IUU activities, which the government authorities have apprehended between 2015-2019;
- Average annual Gross Tonnage (GT) or Vessel Length (VL) of the apprehended vessels between 2015-2019; and
- Annual average number of trips corresponding to the average GT of the apprehended vessels.

The first two points will be based on data acquired from officials and issued by the respective institution or agency, to ensure consistency in subsequent calculations. The period datasets presented in this report may vary due to irregularities and will therefore be based on the best available data for the period 2015-2019 in each of the respective RPOA-IUU-participating countries.

Although the team has put its best efforts into collecting all the required data, some were still unidentifiable. Apprehended vessels are defined in this study as vessels either caught in the act or believed to have conducted such crimes and were detained by law enforcement officials in each of the respective countries, whether subsequently processed for further investigation or not. Therefore, these findings are limited only to the illegal element of IUU fishing.

The third point (number of trips based on average GT) is based on professional judgement, compared with previous studies of a similar nature and compiled as follows:

Table 5. Trips Equivalent used in this Estimates Study

Size	Trips/Month	Trips/Year	Average Trip
<5 GT	25	12	300
5 – 20 GT	3	12	36
20 – 30 GT	1	12	12
>30 GT	-	3	3

In the case of Indonesia, the compiled list from cross-sectoral bodies that apprehended the IUU fishing vessels was previously unavailable. Thus, further identification of such number has been conducted through two focus group discussions (FGD) among stakeholders from the Indonesian authorities and the non-governmental parties. A list of stakeholders (in chronological order of presentation delivery) is listed below:

Table 6. List of Resource Persons Presented their Expertise on the Focus Group Discussion

No	Name	Position
1	Laksamana Muda T.S.N.B. Hutabarat	Deputy for Operations and Training of the Indonesian Coast Guard (Badan Keamanan Laut/BAKAMLA)
2	Tb. Haeru Rahayu	Director-General, Directorate General of Marine and Fisheries Resources Surveillance (PSDKP), MMAF
3	Muhammad Salman	Director of Cooperation and Public Relations, Deputy for Eradication, Indonesian Financial Transaction Reports and Analysis Center (PPATK)
4	Kolonel Laut (P) Mochammad Riza	Assistant Operations Officer II Naval Operations Staff, Indonesian Navy
5	I Nyoman Radiarta	Head of the Marine Research and Observation, Center for Marine and Fisheries Research and Human Resources, MMAF
6	Diah Yuliastuti	Head of Sub- Directorate for Pre-Prosecution at the Directorate of Crimes against State Security Attorney General's Office of the Republic of Indonesia
7	Kombes Pol Ir. Sjamsul Badhar	Head of Sub- Directorate Marine Police Security Maintenance Agency, Indonesian National Police (INP)
8	Tonny Wagey	Regional Project Manager ATSEA
9	Bayu Vita Indah Yanti	Center for Marine and Fisheries Socio-Economic Research, MMAF
10	Moh. Abdi Suhufan	Destructive Fishing Watch (DFW)
11	Bilahmar	Asosiasi Tuna Indonesia/Indonesian Tuna Association (ASTUIN)
12	Hendra Wiguna	Kesatuan Nelayan Tradisional Indonesia/Indonesian Traditional Fishermen Union (KNTI)
13	I Nyoman Suyasa	Himpunan Nelayan Seluruh Indonesia/ Indonesian Fishermen Association (HNSI)
14	Teja Arief Wibawa	Head of the Marine Research and Observation, Center for Marine and Fisheries Research and Human Resources, MMAF
15	Laksamana Muda Irvansyah	Deputy Assistant Operations Chief of Navy Staff
16	Kombes Pol Arif Budi Winova	Head of Sub-Directorate of Law Enforcement of Marine Police
17	Aulia Riza Farhan	Head of Sub Directorate of Operations Control Center of Directorate General of Marine and Fisheries Resources Surveillance, MMAF
18	Capt. Dwi Hartanto	Foreign Vessels Inspector of Indonesian Sea and Coast Guard

Data collected has been processed utilising certain formulae to calculate the estimated losses resulting from illegal fishing practices, both in terms of volume and economic value. This involved the study of several variables, namely:

- Size of vessels, using either tonnage or vessel length
- The equivalent weight of fish for one vessel, based on the results of the study, is 0.2 of the vessel's weight;[104]
- Trips taken by fishing vessels in one year
- Fish prices that apply internationally, in this case US$2/kg = US$2,000/tonne
- Number of vessels identified or captured by coastal state officials.

As the formula uses Gross Tonnage (GT), and some countries may only have the vessel length variable available, according to Mahabror and Hidayat, conversion of the two units will be calculated as follows:[105]

GT = a * L ^ b, where L = length of ship (m), a = 0.0117 and b = 2.8080

Meanwhile, the formula for calculating the estimated equivalent weight of fish according to Rahardjo is as follows:[106]

Fish weight equivalent/trip = 0.2 X GT

Therefore, this study will refer to the formula below to provide estimates of economic losses per year:[107]

Fish Weight Equivalent (0.2 x total tonnes of the estimated vessels conducted illegal fishing from overlay satellite imagery and VMS) x vessel trips x fish price/tonnes

Due to the absence of overlay imagery data and the length of the vessels acquired, the formula has been adjusted to conform to this study by substituting estimated vessels in the ATS region with apprehended vessels within the aforementioned area. However, such data remained unavailable until the end of the research period. Thus, the findings within this report cover illegal activities at the national level, rather than focusing collectively on the ATS waters.

The formula to calculate the volume of losses is as follows:

Fish weight equivalent (0.2 x average GT) x number of apprehended fishing vessels x vessel trips

Meanwhile, the economic value of such losses is calculated as follows:

Fish weight equivalent (0.2 x average GT) x number of apprehended fishing vessels x vessel trips x fish price/tonnes

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[104] P. Rahardjo, "Analisis Nilai Kerugian Akibat Illegal Fishing Di Laut Arafura Tahun 2001-2013 Workshop on Parameters and Indicators of Habitats to Be Expressed in Map of Trawl Fishing Gear Management in Arafura Sea" (Bogor, 2013).
[105] D Mahabror and JJ Hidayat, "Analisis Kerugian Ekonomi Akibat Illegal Fishing Di Zona Ekonomi Eksklusif Perairan Natuna. Prosiding Seminar Nasional Kelautan Dan Perikanan IV 2018" (Surabaya, 2018).
[106] Rahardjo, "Analisis Nilai Kerugian Akibat Illegal Fishing Di Laut Arafura Tahun 2001-2013 Workshop on Parameters and Indicators of Habitats to Be Expressed in Map of Trawl Fishing Gear Management in Arafura Sea."
[107] Mahabror and Hidayat, "Analisis Kerugian Ekonomi Akibat Illegal Fishing Di Zona Ekonomi Eksklusif Perairan Natuna. Prosiding Seminar Nasional Kelautan Dan Perikanan IV 2018."

3.2 SCOPE OF WORK 2 – REVIEW OF EXISTING REGULATIONS

Data collection for the second report is carried out primarily through desk study in relation to various literature and publications, including national law and policies in each RPOA-IUU-participating country. Additionally, data that cannot be obtained through literature-based research will be acquired with the assistance of each respective country's authority and the RPOA-IUU secretariat based within the MMAF.

Each respective RPOA-IUU-participating country's national legislation will be differentiated into two periods before and after 2011 (baseline year) and 2020. The baseline year was set for two reasons: first, there had previously been similar studies conducted by the Australian National Centre for Ocean Resources and Security and the University of Wollongong, entitled "Framework Study for Model Fisheries Legislation in South East Asia"[108], which featured the 11 countries of the RPOA-IUU-focused report. The report drafted legislative models for reference and attempted to review the existing legislation against the listed benchmarks, which consisted of 11 categorised measures, namely:

- Ecosystem Approach to Fisheries Management (EAFM)
- Data collection, monitoring and research
- Management plans
- Fishing vessel registration
- Flag state authorisations to fish and effective control over nationals
- Authorisations to fish by the coastal state
- Monitoring, control and surveillance
- Port state controls
- Catch certification
- Tracking the proceeds of illegal fishing
- Reporting

Secondly, the initial phase of the ATSEA Programme was conducted in 2011. Therefore, this report sets out to update and complement the previous report compiled over the last 10 (ten) years.

This study uses a normative juridical approach, complemented by a comparative approach. The juridical-normative approach means that this research emphasises the science of law and collects secondary data consisting of primary, secondary and tertiary legal materials. It will elaborate on the 11 RPOA-IUU-participating countries' legal response in implementing the IPOA-IUU and RPOA-IUU, namely Australia, Brunei Darussalam, Cambodia, Indonesia, Malaysia, Papua New Guinea, Philippines, Singapore, Thailand, Timor-Leste and Vietnam. The latest regulations and policies were compiled from various sources, including country reports presented to the RPOA-IUU Secretariat, ranging from the third to 12th RPOA Coordination Committee Meetings (CCM).

These domestic legislative frameworks are assessed against the benchmark measures that the authors set. These measures are derived from the Model Fisheries Legislation Study's weaknesses from each country[109], combined with the RPOA-IUU prioritised work plan items

[108] William Edeson et al., *Framework Study For Model Fisheries Legislation in South East Asia* (Wollongong, 2010).
[109] Ibid.

categorised by the 11 components of the RPOA-IUU action plan. These items were derived from the compilation of RPOA-IUU work plan items ranging from 2015 – 2019 and divided into 11 measures, then the core commonality between each item was extrapolated into a single item of data in the prioritised work plan. Below are the 21 items used as a point of comparison, while a detailed elaboration of how these work plans were chosen is also available in Annex 1.

Table 7. Prioritized Workplan Items Derived from the RPOA-IUU Workplan from 2015-2019

RPOA-IUU Work Plan Action Components	No	Prioritized Work Plan Item(S)
Current Resource Management Situation in the Region	1.1	Collaboration with advisory bodies and other bodies to assess the fisheries resources using the best available scientific information and the findings should be shared with other RPOA-IUU participating countries
	1.2	Review and report its capacity on actions taken against fishing vessel and nationals involved in IUU Fishing including on the high seas
Implementation of international and regional instruments	2.1	Countries to continue to report on their progress with ratification or implementation, as appropriate, of international and regional instruments concerning responsible fishing practices and combating IUU fishing
	2.2	Countries to undertake activities relevant to the FAO Global Record on fishing vessels and to update on progress in its implementation
Role of regional and multilateral organizations	3.1	Continue to work with regional organizations to strengthen fisheries management and conservation in the South East Asian region
	3.2	Increase their participation in regional and multilateral organizations, including RFMOs and report any activities to all participating countries in RPOA CCM
	3.3	Consider cooperating with CCAMLR through the voluntary implementation of the CCAMLR Catch Documentation Scheme
Coastal State responsibilities	4	Countries to collaborate, either bilaterally or multilaterally to establish the mechanism on data sharing and monitoring of fishing vessel movement and activities, including suspected IUU fishing in their waters
Flag State responsibilities	5.1	Consider the implications and strive towards implementation of the FAO guidelines on Flag State Performance
	5.2	Publish the vessel list on the RFMO, and continue to review their vessel register to ensure that no IUU listed vessel of the following RFMO is registered: WCPFC, IOTC, CCSBT, CCAMLR, SPRFMO, SIOFA, IATTC, ICCAT
	5.3	Evaluate the implementation of international and regional standards concerning working conditions on their fishing

RPOA-IUU Work Plan Action Components	No	Prioritized Work Plan Item(S)
		vessels to address these gaps in the future. E.g., ILO Convention C188 concerning Work in the Fishing Sector
	5.4	Evaluate the gaps in its ability to control vessels operating in areas beyond national jurisdiction to address these gaps in the future
Port State Measures	6.1	Implementation of the FAO PSM Agreement
	6.2	Designate and publicize on their national websites, ports to which foreign fishing vessels may request entry, consistent with the FAO Agreement on Port State Measures
	6.3	Evaluate its ability to take effective action against IUU vessels entering their ports (such as through the imposition of sanctions and the seizure of catch)
Regional market measures	7	Developing the ASEAN Catch Documentation Scheme
Regional capacity building	8	
Strengthening MCS system	9.1	Provide data and information on IUU fishing vessels and report on their MCS activities, including actions taken and lessons learnt
	9.2	Review and report on improvements of catch reporting
Transhipment at sea	10.1	Regulate measures on transhipment at sea by fishing vessels flying their flags
Implementation	11.1	Report regulations/policies change in MCS activities and fisheries managements

In addition, the measures include Special Requirements of Developing Countries – a benchmark extracted from the NPOA-IUU element. Therefore, the number of indicators provided varies according to the deficiencies in regulations or policies before 2011.

For comparison, the acquired national regulations and policies in response to IUU fishing are listed in two periods: before and after 2011. This study attempts to update and analyse whether existing regulations and policies have overcome the weaknesses identified by the study conducted by RPOA-IUU, and ease or eradicate the challenges faced by each country in the escalating issues of IUU fishing. This is addressed by comparing regulations against the benchmark measures, which are components of the RPOA Action Plan 2007. Each sub-chapter will be supplemented with a list of regulations and policies in two-year categories (time-sequence). Subsequent recommendations will be made based on the analysis of benchmark measures, in order to enhance the RPOA-IUU work plan 2020. This does not entail any consideration of the country's capacity, circumstances or interest. A detailed table review is available in Annex 2.

3.3 SCOPE OF WORK 3 – SUPPORT OF THE FAO GLOBAL RECORD INITIATIVE

The third report attempts to identify efforts that should be taken by the ATS littoral states (Australia, Indonesia, PNG and Timor-Leste) in ensuring their effective participation in the Food and Agriculture Organization (FAO) Global Record Initiative (GRI). Besides identifying challenges and mapping regulatory frameworks, this report provides recommendations on how these states can adjust their regulations to maximise their contribution to the GRI.

This study uses a normative method that is qualitative in nature. That is, the research emphasises international laws regulating the GRI and is therefore required to collect secondary data consisting of primary, secondary and tertiary legal materials. The method is carried out with a conceptual and systematic approach, to dissect relevant national and international provisions.

Data collection is mainly carried out through desk study into various literature and publications, including national law and each country's report submitted to the FAO GRI. The primary legal materials are gathered by collecting and analysing international laws and regulations, along with agreements made bilaterally and multilaterally by relevant states. Secondary legal materials can also be obtained through studies of various national and international books, journals, papers and mass media written by experts. Additionally, in-depth interviews with several key persons in the littoral states of ATS were conducted to confirm the findings from the literature study. The team has interviewed Pedro Rodrigues (The Ministry of Agriculture and Fisheries, Timor-Leste) and Simon Funge-Smith (Senior Fisheries Officer, FAO Asia-Pacific) to extend the knowledge of the study.

3.4 SCOPE OF WORK 4 – COLLABORATIVE SURVEILLANCE

This study report also utilises a qualitative normative method, which means that this research emphasises the existing national law and is required to collect secondary data consisting of primary, secondary and tertiary legal materials. Data collection is mainly carried out through desk study covering the establishment and implementation of collaborative surveillance (co-surveillance) best practices, in relation to primary and secondary legal materials. Additionally, in-depth interviews with several key persons in the littoral states of ATS were conducted to confirm the findings from the literature study.

The research is limited to ATS littoral states: Australia, Indonesia, PNG and Timor-Leste. As no co-surveillance practices are found in Australia and PNG, this study will identify best practices and review the existing available surveillance in Indonesia (POKMASWAS) and Timor-Leste (Tara Bandu and SPOT Tracker). Additionally, field research was conducted in Merauke from 31 November - 4 December 2020 to understand the implementation of POKMASWAS in the area. The team interviewed various stakeholders, as listed below:

Table 8. List of interviewed stakeholders during Field Visit on Merauke, Indonesia on 30th November to 4th December 2020

No	Name	Position
1	Florentius Suhono Suryo	Head of Fisheries Office Merauke
2	Medi Aditya	Analyst Intelligence of the Marine Security and Safety Monitoring Station, Indonesian Coast Guard (Badan Keamanan Laut/BAKAMLA)
3	Agus Supriadi	Supervisor of Marine Security and Safety Monitoring Station, BAKAMLA
4	Tommy	Captain (Tekong/Nahkoda) - Partners of BAKAMLA
5	Nay	Captain (Tekong/Nahkoda) - Partners of BAKAMLA
6	Mahyuddin	Head of POKMASWAS Representatives
7	Handoyo	Former Head of Fisheries Agency
8	I Wayan Suena	Head of Operations Unit Marine Police
9	Jamalludin	Staff – Operations Unit Marine Police
10	Meisal Rachdiana	Coordinator Supervision Unit of Directorate General of Marine and Fisheries Resources Surveillance (Satuan Pengawasan PSDKP) Merauke
11	Danny Mikael M	Staff of Supervision Unit of Directorate General of Marine and Fisheries Resources Surveillance (Satuan Pengawasan PSDKP), Merauke
12	Arif Rachmat	Staff of Satuan Pengawasan PSDKP, Merauke
13	Budiono	Staff of Satuan Pengawasan PSDKP, Merauke
14	Susanto Masita	Harbor Master of Pelabuhan Archipelago Fishing Port or Perikanan Nusantara (PPN) Merauke
15	Kiman	Manager of Storage Facility in the Private Port (Pelabuhan Tangkahan)
16	Daud	Representative of Indonesia Fisherman Association (Himpunan Nelayan Seluruh Indonesia) Merauke

Furthermore, we also enhanced our insights related to POKMASWAS development and observation results over the years in Merauke, by conducting discussions with various third parties, including the following stakeholders:

Table 9. List of Interviewed Stakeholders for Further Study on POKMASWAS Implementation

No	Name	Position
1	Dwi Ariyoga G	National Coordination Unit (NCU) of Indonesia
2	Abdi Suhufan	Destructive Fishing Watch

Meanwhile, with regards to co-surveillance practices in Timor-Leste, our team has interviewed the following stakeholders:

Table 10. List of Interviewed Stakeholders for Further Study on Timor-Leste Practices

No	Name	Position
1	Pedro Rodrigues	The Ministry of Agriculture and Fisheries (MAF) of Timor-Leste
2	Alexander Tilley	WorldFish

Both sets of interviews have enriched the information that we have collected through desk review.

Overall, this study is the first attempt to analyse and improve performance in the fight against IUU fishing. This series of reports encompasses four independent scopes of work, which should be considered collectively. As this issue continues to evolve and develop, we gladly welcome further study to refine, correct or complement our work to date on this series.

Considering the impact on these studies caused by global travel restrictions resulting from the Covid-19 pandemic, there is a pressing need to obtain further data from the field, in order to calculate unreported and unregulated activities. For this reason, the study shall be considered as a case study rather than a comprehensive regional assessment, since the data collected is primarily from Indonesia. In addition, we also acknowledge that the extensive scope of work, combined with time and travel limitations, resulted in some incomplete outputs; the other 10 RPOA-IUU-participating countries have not yet clarified certain findings. However, we have made every available effort to consolidate all discoveries and compile them into an easily understandable report, thereby supporting the ongoing efforts of littoral countries to combat IUU fishing in the ATS region.

CHAPTER 4. BASELINE ESTIMATES

This chapter will elaborate on the IUU fishing value and volume loss estimate on the respective states in which the datasets are acquired from each national record. However, not all countries have similar level of information obtained. Before understanding each country's estimates datasets, every sub-chapter will be supplemented with the maritime boundaries, marine capture production, and the current state efforts in combating IUU fishing activities as guidance to understand each country's circumstances.

Additionally, the IUU fishing index score will be added to measure the current MCS mechanism's effectiveness. IUU Fishing Index is an assessment measuring 152 coastal states' indicators of vulnerability, prevalence, and response to IUU fishing, which are benchmarked against other countries resulting in a global index.[110] The index is pioneered by the Global Initiatives Against Transnational Organized Crime, a Geneva-based NGO network of experts in various fields, in collaboration with a Poseidon Aquatic Resource Management Ltd with financial support from the Norwegian Ministry of Foreign Affairs. Considering the outdated global estimates on the IUU fishing in 2009,[111] this index attempts to overcome the deficiency such as the lack of country-specific estimates and the lack of updated factors that need to be considered. Consequently, there is no updated consistent and comparable data that can be used as a reliable point of reference for better policymaking or identifying which intervention is most needed by the country.

The scores provide countries that identified which issues need to be improved to have more effective regulations and policies. The scale ranged between 1 being the best, and 5 the worst. There are 40 standardized indicators divided into two groups: responsibilities (Coastal, Flag, Port, and General States) and types (Vulnerability, Prevalence, and Response) referred on the table below.[112]

Table 11. IUU fishing index indicators

Responsibilities	Indicator Group	Indicator Name
Coastal State	Vulnerability	• Size of EEZ • Agreement over all maritime boundaries • Authorized foreign vessels to operate in EEZ • Dependency on fish for protein
	Prevalence	• Has MSC-certified fisheries • Views of MCS practitioners on coastal compliance
	Response	• Coastal state is contracting party or cooperating non-contracting party to all relevant RFMOs • Operate a national VMS or FMC
Flag State	Vulnerability	• Distant-water vessels on RFMO RAVs • Distant-water vessels under several RFMOs

[110] G Macfadyen et al., 'The Illegal, Unreported and Unregulated Fishing Index', *Poseidon Aquatic Resource Management Limited and the Global Initiative Against Transnational Organized Crime*, no. January (2019).
[111] Agnew et al., 'Estimating the Worldwide Extent of Illegal Fishing'.
[112] Macfadyen et al., 'The Illegal, Unreported and Unregulated Fishing Index'.

Responsibilities	Indicator Group	Indicator Name
	Prevalence	• Vessels on IUU lists • View of fisheries observers on flag state compliance incidents • Views of MCS practitioners on flag state compliance incidents
	Response	• Accepted FAO Compliance Agreement • Authorized vessel data provided to FAO HSVAR • Provision of vessel data for inclusion in Global Record • Compliance with RFMO flag state obligations • Flag state is contracting party or cooperating non-contracting party to all relevant RFMOs
Port State	Vulnerability	• Number of fishing ports • Port visits by foreign fishing or carrier vessels
	Prevalence	• Views of MCS practitioners on port compliance incidents • View of fisheries observers on port compliance incidents
	Response	• Party to the Port State Measures Agreement • Designated ports specified for entry by foreign vessels • Compliance with RFMO port state obligations
General	Vulnerability	• Perception of levels of corruption • Gross national income per capita • Volume of catches • Trade balance for fisheries products • Share of global imports
	Prevalence	• 'Carded' under the EU IUU Regulation • Identified by the National Oceanic and Atmospheric Administration for IUU fishing • Mentions of IUU fishing in media reports
	Response	• Mandatory vessel tracking for commercial seagoing fleet • Ratification/accession of UNCLOS Convention • Ratification of UN Fish Stocks Agreement • Mentions in media reports of combating IUU fishing • Have a national plan of action to prevent, deter and eliminate IUU (NPOA-IUU) fishing • Demand for MSC products • Market state is contracting party or cooperating non-contracting party to relevant RFMOs

Lastly, each chapter will also narrate the estimation calculation output in which every country data element may vary due to the complexity and scarcity of such data.

4.1 AUSTRALIA

As the third-largest marine jurisdiction globally, one of six Australia's investment priorities for its development policy is fisheries.[113] The coastline area stretches over 25,760 km and vast EEZ covering 8.2 million km^{2,} which produces 173,430 tonnes accounting for 64% of total fisheries and aquaculture production volume in 2017.[114] An apparent trend consumption over seafood within the country also increased to 341,272 tonnes despite still ranks behind poultry, beef, and pig which provides around 11.000 people employment in fishing, hunting, and trapping.[115]

The continuous increase of fish stocks within the biologically sustainable levels of stocks rose from 27% in 2004 to 69% in 2015, indicating considerable progress.[116] To date, the biggest threat to fish stocks in Australia is IUU fishing in which the Government takes very seriously. Australian Fisheries Management Authority (AFMA), on behalf of the central (Commonwealth) government and Australian (State) jurisdictions, oversaw this matter.

Australia's EEZ bordering the semi-enclosed ATS region and the Northern Territory and some Queensland water areas in the Gulf Carpentaria and the high traffic of fishing vessels makes it vulnerable for IUU fishing practices. Contrary to the low production and consumption over the wild-catch, particularly in the Northern Territory and Dogleg area known to be hotspots, the effort put into eradicating IUU fishing is high shown by the IUU Fishing Index. Australia has the highest overall IUU score among the RPOA-IUU participating countries and beyond the world average of 1.91.[117] As a leading country, Australia has put its best effort starting from a major review of its fisheries regulations in 2018 to increase its engagement with Southeast Asia to eradicate IUU fishing through coordinated patrols, sharing information, and assisting other countries.[118] Notable examples are Australia shared the information on the Sri Lankan fishing vessels fishing illegally in the Indonesian and Timor-Leste waters through its routine aerial surveillance, and planning to provide Timor-Leste with a patrol vessel. In regional engagement, Australia attempts to initiate a new program named "Combating IUU fishing and Promoting Sustainable Fisheries in Southeast Asia" which is still in the design and consultation phases.

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[113] Bill McCormick, 'Oceans', *Parliament of Australia*, last modified 2012, accessed September 9, 2020, https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/BriefingBook44p/Oceans.
[114] AH Steven, David Mobsby, and Robert Curtotti, *Australian Fisheries and Aquaculture Statistics 2018*, 2020, https://doi.org/10.25814/5e4377eb3eea2.
[115] Ibid.
[116] FAO, *The State of World Fisheries and Aquaculture 2018 - Meeting the Sustainable Development Goal*.
[117] IUU Fishing Index, 'Australia: Country Scores for Responsibilities', accessed September 9, 2020, http://iuufishingindex.net/profile/australia.
[118] Department of Agriculture and Water Resources of Australia, *RPOA IUU CC Meeting Country Report Australia 2019* (Siem Reap Province, November 2019).

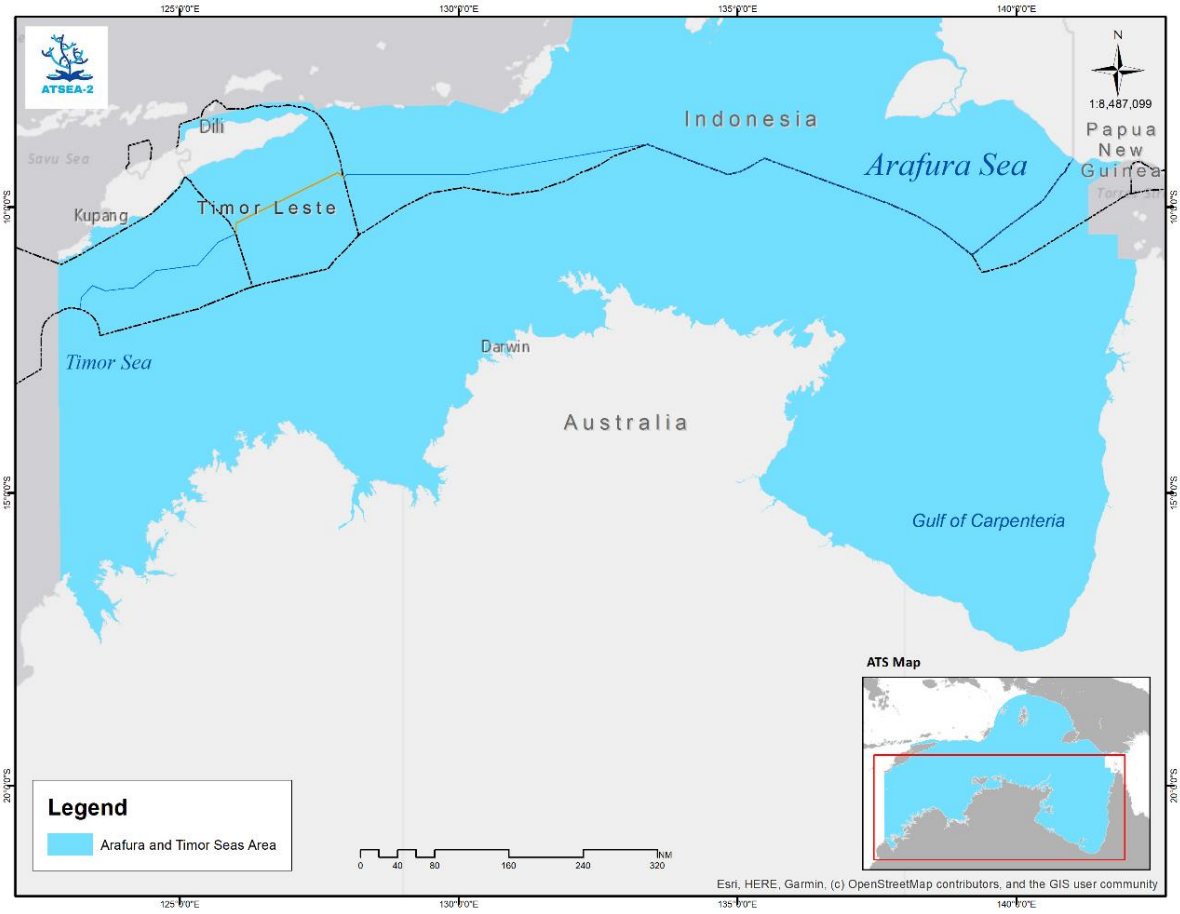

Figure 8. *Maps of Arafura and Timor Seas on Australia*

The Commonwealth Fisheries Harvest Strategy Policy[119] and Commonwealth Fisheries Bycatch Policy[120] becomes noticeable progress in 2019, ensuring long-term sustainability and managing the impacts accordingly. In 2020, the Fisheries Management Act 1991 and the Fisheries Management Regulations is still under ongoing review. Besides legislative measures, Australia's effort was concentrated into two: 1) prevention of IUU fishing takes form participating in various regional and international management plans; and 2) prosecution through enhancing patrol in the Australian fishing zone.[121] Notable apprehended IUU vessels were the Volga, the Russian registered long liner, which captured around 120 tonnes of Patagonian toothfish.[122] The case has been brought to the International Tribunal for the Law of the Sea (ITLOS).[123]

[119] DAWR, 'Commonwealth Fisheries Harvest Strategy Policy Framework for Applying an Evidence-Based Approach to Setting Harvest Levels in Commonwealth Fisheries' (Canberra, 2018).
[120] Department of Agriculture and Water Resources, 'Commonwealth Fisheries Bycatch Policy: Framework for Managing the Risk of Fishing-Related Impacts on Bycatch Species' (2018).
[121] Teachers Notes and Student Activities, *Australia ' s Maritime Jurisdiction*, 2007.
[122] Adrienne Oppenheim, 'The Plight of the Patagonian Toothfish: Lessons from the Volga Case', *Brooklyn Journal of International Law* 30, no. 1 (2004): 7.
[123] International Tribunal for the Law of the Sea (ITLOS), *The "Volga" Case (Russian Federation v. Australia) Prompt Release Judgment*, 2002.

To date, the Australian government has not yet published to the public the number of apprehended/prosecuted IUU fishing vessels. Even the list of licensed vessels to operate within the country were only available from the WCPFC. There were 54 licensed out of a total of 57 Australian-flagged fishing vessels recorded, of which dominated by long liner.[124] According to the compiled annual RPOA Country reports from 2016-2019 there are 18 vessels apprehended without details of the dimension. Consequently, the average GT used will be 53. Regardless of the limited data, it is estimated that Australia has rescued 572 tonnes of equal to US$1,144,800 loss over IUU fishing activities. These numbers decreased significantly compared to 2005-2006 with 11.671 tonnes or equivalent to US$23.341.200, indicating the efforts to combat IUU fishing has yielded satisfactory results.[125]

Table 12. Value and Volume Loss Estimates of IUU Fishing in Australia (2015-2019)

Country	Year	Fish Weight Equivalent		Trip	Price /Tonne	Apprehended Vessels/Year	Value Loss (Tonnes)	Volume Loss (Tonnes)
Australia	2015	53	0,2	3	2000	-	US$0	0
	2016-2017	53	0,2	3	2000	13	US$826,800	413
	2018-2019	53	0,2	3	2000	5	US$318,000	159
	Total						**US$1,144,800**	**572**

4.2 BRUNEI DARUSSALAM

Brunei Darussalam lies on the northwest coast of the shared island with Indonesian Borneo and Sabah and Sarawak states of Malaysia, facing the South China Sea.[126] The EEZ area has been proclaimed,[127] Brunei's water area relatively small, around 500km^2 with a 161 km coastline. Capture fisheries account for 67% of the fisheries industry's total production, which equals B$73.81 million.[128] Compared to the other RPOA-IUU participating countries, Brunei's fisheries industries only contribute 0.3% of the GDP as it employed 3,235 labour in 2018 mainly from small-scale fisheries.[129]

Legal review regarding fisheries was stated during the country report's submission to the 12th Coordination Committee with the assistance and guidance from the Attorney General Chambers of the Prime Ministers' Office, cooperating with SEAFDEC to develop national stock assessment, capacity building programs, and ASEAN Catch Documentation Schemes.[130] The fisheries measures in Brunei are embodied in Fisheries Order 2009, which amended in 2010 and 2014.[131] The country

[124] WCPFC, 'WCPFC Record of Fishing Vessels', accessed September 13, 2020, https://www.wcpfc.int/record-fishing-vessel-database.
[125] Department of Agriculture and Water Resources of Australia, *RPOA IUU CC Meeting Country Report Australia 2019*.
[126] FAO, *AQUASTAT Country Profile - Brunei Darussalam* (Rome, 2011).
[127] Brunei Darussalam, *Exclusive Economic Zone Proclamation S4/1994 SUP.IIA Revised in 2018*, n.d.
[128] Department of Fisheries, *Brunei Darussalam Fisheries Statistics in Brief 2018*.
[129] Ibid.
[130] Department of Fisheries, *RPOA IUU CC Meeting Country Report Brunei Darussalam 2019* (Siem Reap, 2019).
[131] Brunei Darussalam, *Fisheries Order 2009 No. S 25, Entry to Force 2nd June 2009, Amended in 2010 and 2014*, 2009.

also adopted NPOA-IUU as confirmed by the RPOA-IUU secretariat, although the document is nowhere to be found on the website. In terms of the MCS mechanism, Brunei has established a Maritime Security Committee at the national level, involving several relevant enforcement agencies conducting regular sea patrol operations.[132]

According to 2018 statistics, only 37 commercial vessels from 23 companies operate and license in Brunei while small-scale fishers' stats only recorded the fishers engaged with the activity, 1,925 people consisted of companies, full-time, and part-time fishermen.[133] Significant changes were recorded in 2013 onwards, where the data provided only in-board powerboat, although the vessels class tonnage has varied with two new GT class recorded 20-49.9 GT and 100-199.9 GT meaning the industrial fishers has developed. [134]

Only a few cases were of IUU fishing were detected in Brunei waters over the year. In 2018, three foreign vessels had been apprehended with enough offence evidence, brought to court for trial and sentenced according to the Fisheries Order, 2009 of Brunei Darussalam.[135] Even the first case of illegal vessels in 2020 was caught in June.[136] The significance of IUU fishing to Brunei's EEZ remained unknown, however the country is willing to cooperate by sharing any information of IUU Vessel Watch List with the RPOA Secretariat where possible appropriate.[137] There is no record of Brunei-flagged vessels conducting any illegal fishing, thus bringing Brunei first among Asian countries and second in RPOA-IUU participating countries in terms of IUU score given by the IUU Fishing Index with 2.22.[138]

Table 13. Value and Volume Loss Estimates of IUU Fishing in Brunei Darussalam (2015-2019)

Country	Year	Fish Weight Equivalent		Trip	Price /Tonne	Apprehended Vessels/Year	Value Loss (Tonnes)	Volume Loss (Tonnes)
Brunei Darussalam	2014	53	0,2	3	2000	2	US$127,200	64
	2015	53	0,2	3	2000	1	US$63,600	32
	2016	53	0,2	3	2000		US$0	0
	2018	53	0,2	3	2000	3	US$190,800	95
	2019	53	0,2	3	2000	2	US$127,200	64
	Total						**US$508,800**	**254**

Based on the country's report during the last 5 (five) years there are 9 vessels captured with estimated value loss if not apprehended at US$508,800 or equivalent to 254 tonnes. Only in 2016, there is no record of apprehension by Bruneian law enforcement.

[132] Department of Fisheries, *RPOA IUU CC Meeting Country Report Brunei Darussalam 2019*.
[133] Department of Fisheries, *Brunei Darussalam Fisheries Statistics in Brief 2018*.
[134] Ibid.
[135] Department of Fisheries, *RPOA IUU CC Meeting Country Report Brunei Darussalam 2019*.
[136] James Kon, 'Vietnam Boat Detained for Illegal Fishing', *Borneo Bulletin*, June 2020, https://borneobulletin.com.bn/2020/06/vietnam-boat-detained-for-illegal-fishing-2/.
[137] Department of Fisheries, *RPOA IUU CC Meeting Country Report Brunei Darussalam 2019*.
[138] Macfadyen et al., 'The Illegal, Unreported and Unregulated Fishing Index'.

4.3 CAMBODIA

Cambodia has a 435km coastline and an Exclusive Economic Zone (EEZ) extending 200 nautical miles.[139] The marine fishery area contains pivotal habitats for fish spawning and refuge with 32,492 hectares of seagrass, 2,806ha of coral reef and 58,852ha of mangrove forest, 79% of which are located in Koh Kong province.[140] As the fish is a traditional staple in the Cambodian diet and vital to nutrition and food security which account for annual per capita fish consumption of 41 kilograms representing 70% of Cambodia's intake of animal protein.[141] However, to sustain the Cambodian diet, it is dominated by freshwater production, 535,005 tonnes, rather than the wild-catch fisheries production, 212,100 tonnes. [142]

Since 1998, the contribution of the fishery sector to GDP has steadily increased from 1,470.6 billion riel in 1998 (US$393 million) to 4,609.5 billion riel (US$1.136 billion) in 2016.[143] However, the sector's share of GDP has declined over the same period from 12.5% in 1998 to 5.70% in 2016.[144] Therefore, strengthening governance, addressing specific management, and eliminating IUU fishing in marine areas shall be prioritized considering how important seas are for Cambodians.

Initial efforts towards preventing, deterring, and eliminating IUU fishing within Cambodia's sea jurisdiction has been minimum, the performance was shown from the issuance of the yellow card by the European Commission (EC) in November 2012, which turn to EC's blacklist in March 2014.[145] Thus, it affects heavily as the EU banned all fisheries products caught by Cambodian flagged vessels. Since then Cambodia's fisheries measures has developed over time through the effort on ratifying both regional and international instrument including the Port State Measures and United Nations in Fish Stock Agreement, establishing the National Plan of Action (NPOA) IUU for 2020-2024 and strategic plan for fisheries conservation and management 2019-2028, improving law enforcement through enhanced cooperation with the FAO, SEAFDEC, and EU.[146] Despite the efforts put according to IUU Fishing Index, Cambodia's performance score is among the states that critically need further development as it placed last among RPOA-IUU with 3.23.[147]

To respond to these challenges, the EU has funded Cambodia Programme for sustainable and inclusive growth in the fisheries sector, capture component (CAPFISH-Capture) to be implemented.[148] Additionally, the Cambodian government has conducted several measures namely, nominating the focal point for implementing PSMA's technical issues, preparing a roadmap for MCS implementation

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[139] PEMSEA, 'Country Partners: Cambodia', accessed September 8, 2020, http://pemsea.org/about-pemsea/our-partners/country-partners/cambodia.
[140] Fisheries Administration (FiA), *Marine Fishing Vessels Census*, 2018.
[141] FAO, *Complementary Support to the Cambodia Programme for Sustainable and Inclusive Growth in the Fisheries Sector: Capture Component*.
[142] Fisheries Administration (FiA), *Marine Fishing Vessels Census*.
[143] World Bank, 'GDP Cambodia', last modified 2016, accessed September 8, 2020, https://data.worldbank.org. Using an exchange rate of 3,744 riel to the US$in 1998 and 4,058 riel to the US$in 2016.
[144] National Institute of Statistics Cambodia, *GDP per Capita Cambodia*, 2016, http://www.nis.gov.kh/nis/NA/NA2016_Tab.htm.
[145] Stephen Chin, 'A Hard Tackle against Illegal Fishing', *The Asean Post*, August 2018, https://theaseanpost.com/article/hard-tackle-against-illegal-fishing.
[146] Fisheries Administration (FiA), *RPOA IUU CC Meeting Country Report Cambodia 2019* (Siem Reap, 2019).
[147] Macfadyen et al., 'The Illegal, Unreported and Unregulated Fishing Index'.
[148] FiA, *RPOA IUU CC Meeting Country Report Cambodia 2020*, 2020.

and establishing the VSM with GSM (Global System for Mobile Communication).[149] It also plans to designate fishing port for the implementation of the PSMA soon.

Cambodia's Fisheries Administrator (FiA) with the latest data recorded in 2018 published a vessels census highlighting the finding of only 3% are licensed and equipped with additional information on the number of fishing vessels by size (large, medium and small) and by engine power (horsepower).[150] It asserted that the licensing mechanism still encounters problems in terms of coverage. FiA statistics also lists the illegal fishing activities which reached 3,204 cases and the datasets were also furnished with the number of the offenders jailed, 42 people.[151] However, the large numbers covered both freshwater and marine waters whereas only 228 pertained to marine fisheries. The rest referred to the case in freshwater areas such as the usage of illegal equipment which still within the scope of IUU activities.

		NO OF ILLEGAL CASES				
NO	PROVINCE/ REGIONAL FISHERIES INSPECTORATE	PUNISHMENT	SENT TO COURT	DESTRUCTION OF ILLEGAL EVIDENCE	TOTAL	NO OF OFFENDERS JAILED
1	Phnom Penh	3		9	**12**	
2	Kandal	7	15	123	**145**	
3	Prey Veng	14	22	246	**282**	
4	Takeo	1		141	**142**	
5	Svay Rieng			101	**101**	
6	Kampong Cham	6	1	132	**139**	2
7	Tbong Khmum	23	6	67	**96**	
8	Kratie	2	18	223	**243**	1
9	Stung Treng		4	97	**101**	4
10	Ratanak Kiri			28	**28**	
11	Mondul Kiri			19	**19**	
12	Kampong Chhnang	2	14	256	**272**	2
13	Pursat	3	7	228	**238**	3
14	Battambang	3		208	**211**	
15	Pailin			12	**12**	
16	Kampong Speu			3	**3**	
17	Kampong Thom	10	18	257	**285**	13
18	Siem Reap	18	10	232	**260**	7
19	Banteay Meanchey			30	**30**	
20	Odoar Meanchey			0	**0**	
21	Preah Vihear			35	**35**	
22	Kep			38	**38**	
23	Kampot		8	60	**68**	
24	Kamong Som	6		30	**36**	
25	Koh Kong	14	1	30	**45**	10
26	Fisheries Inspection Chaktomuk			45	**45**	
27	Fisheries Inspection Mekong			59	**59**	
28	Fisheries Inspection South Tonle Sap			74	**74**	
29	Fisheries Inspection North Tonle Sap	1		90	**91**	
30	Coastal Fisheries Inspection	16		31	**47**	
31	Fisheries Administration (Central)	1		46	**47**	
	Total	**130**	**124**	**2,950**	**3,204**	**42**

Source: FiA, 2019

Figure 9. *Number of Illegal Cases Identified by Cambodian Authority, 2019*

[149] Ibid.
[150] Fisheries Administration (FiA), *Marine Fishing Vessels Census*.
[151] Bann and Sopha, *FishCounts – Increasing the Visibility of Small-Scale Fisheries in Cambodia ' s National Planning*.

Cambodia's data collection per 2019 was impressive as the licensed vessel list and the illegal cases were publicly shared. Although it may not be obtained directly from the Government's website or report, hence the report from FishCounts attached the data obtained from FiA. As the list of apprehended vessels were available, therefore average GT of the boat can be matched with 53. The estimated economic value loss for Cambodia if not apprehended is at US$14,500,800 or equivalent 17,25003.032 tonnes. The high number shown within the calculation strictly obtained from the 2018 record. Thus, a higher number is expected if other year data is available.

Table 14. Value and Volume Loss Estimates of IUU Fishing in Cambodia (2015-2019)

Country	Year	Fish Weight Equivalent		Trip	Price /Tonne	Apprehended Vessels/Year	Value Loss (Tonnes)	Volume Loss (Tonnes)
Cambodia	2018	53	0,2	3	2000	228	US$14,500,800	7,250
	Total						**US$14,500,800**	**7,250**

4.4 INDONESIA

As the largest archipelagic country in the world with coastlines that extend around 99,093 km and more than 17.000 islands, Indonesia encompasses the largest water areas among other RPOA-IUU participating countries.[152] The area of 3,257,483 km^2 is included the inland and other bodies of water including the EEZ.[153] The combination of extensive water areas and most of the population was in the coastal areas resulted in marine capture volume production at 6,603,630 tonnes, equal to Rp 185 billion in 2017 and predicted to increase up to 7,248,297 tonnes in 2018.[154] Unlike other states that most of the seafood consumption comes from the aquaculture sectors, Indonesia's fish consumption was mainly yielded by capture fisheries households.[155]

The share of GDP of the fisheries sector at current prices in 2018 is estimated to contribute 2,60% and provides livelihoods to 2.6 million peoples employed in fishing sectors excluded the fisheries-related business, which may exceed 3 million if its included.[156] The Ministry of Marine Affairs and Fisheries (MMAF) approximates the fish consumption is around 35kg per capita per year in 2017.[157] Accordingly, fisheries sector plays a vital role for the food security and livelihoods of the coastal communities hence keeping the plentiful natural resources in the ocean is important to sustain this populous country.

[152] Coral Triangle Initiative, *Summary Report CTI-CFF MEWG Meeting: Review of Regional State of Coral Triangle Report and Monitoring and Evaluation Indicators* (Jakarta, 2012).
[153] Ifan Ariansyach, 'Fisheries Country Profile: Indonesia', *SEAFDEC*, last modified 2017, accessed September 13, 2020, http://www.seafdec.org/fisheries-country-profile-indonesia/.
[154] MMAF, *Marine and Fisheries Affairs in Figures 2018*.
[155] Ariansyach, 'Fisheries Country Profile: Indonesia'.
[156] OECD, 'Fisheries and Aquaculture Statistics: Employment', *OECD Stat*, last modified 2020, accessed September 9, 2020, https://stats.oecd.org/Index.aspx?DataSetCode=FISH_FLEET#.
[157] MMAF, *Marine and Fisheries Affairs in Figures 2018*.

IUU fishing is a major concern for Indonesian, consequently for having scattered land areas and wide sea. Several constraints such as the low income and standard of living for fishers and lack of capacity to patrol over all the area make it prone to the illegal fishers to fish within Indonesia's jurisdiction.[158]

Indonesia previously has published the NPOA-IUU for the period of 2012 to 2016,[159] However, there is no sign of the second NPOA-IUU will be updated soon. Instead, Indonesia government established NPOA for monitoring and countermeasures for destructive fishing activities 2019-2023.[160] To name a few, MMAF Regulation No. 35/2015 on Human Rights Certification System for Fisheries, MMAF Regulation No. 2/2017 on Requirements and Mechanisms for Human Rights Certification for Fisheries, and Presidential Regulation No.16/2017 on Indonesia's Marine Policy are regulated to eradicate IUU fishing and its related activities. The country also established new institutions namely Indonesian Coast Guard, so-called BAKAMLA (*Badan Keamanan* Laut) and Task Force on Illegal Fishing, so-called SATGAS 115 (*Satuan Tugas 115*). Despite the abovementioned efforts, the IUU Fishing Index score of Indonesia was categorized below average with 2.70 which placed 5th place among ASEAN member states.[161]

Per data obtained in 2020, Indonesia recorded 1,088 vessels have conducted illegal activities within the Indonesia's water areas. With the existing data, Indonesia ranks first as the highest country with economic loss if not apprehended among other RPOA-IUU participating countries with US$70.258.776 or equivalent to 35,130 tonnes. This compilation obtained from MMAF, Indonesian Marine Police, BAKAMLA, and Indonesian Navy with detailed GT of the apprehended vessels.

Table 15. Value and Volume Loss Estimates of IUU Fishing in Indonesia (2015-2019)

Country	Year	Fish Weight Equivalent		Trip	Price /Tonne	Apprehended Vessels/Year	Value Loss (Tonnes)	Volume Loss (Tonnes)
Indonesia	2015	53.275	0,2	3	2000	172	US$10,799,280	5,400
	2016	50.835	0,2	3	2000	316	US$20,527,704	10,264
	2017	51.9825	0,2	3	2000	271	US$17,925.312	8,963
	2018	58.25	0,2	3	2000	170	US$11,134,800	5,567
	2019	57.8	0,2	3	2000	159	US$9,871,680	4,936
	Total						**US$70,258,776**	**35,130**

[158] FAO, "Fishery and Aquaculture Country Profiles: Indonesia," last modified 2014, accessed September 13, 2020, http://www.fao.org/fishery/facp/IDN/en.
[159] Ministry of Marine Affairs and Fisheries (MMAF), *Ministerial Decree No. 50 of 2012 on National Plan of Action to Prevent and to Combat Illegal, Unreported, and Unregulated Fishing 2012-2016, 50/MEN/2012* (Indonesia, 2012).
[160] Ministry of Marine Affairs and Fisheries Republic of Indonesia, *Ministerial Decree No. 114 of 2019 on National Action Plan of Control and Countermeasure of Destructive Fish Capture Activities 2019-2023, 114/KEPMEN-KP/SJ/2019* (Indonesia, 2019).
[161] Macfadyen et al., 'The Illegal, Unreported and Unregulated Fishing Index'.

4.5 MALAYSIA

Malaysia has 4,810 km coastline with EEZ of approximately 418,000km^2.[162] The country's two regions, West Malaysia and East Malaysia are divided by the South China Sea in which the country shares maritime borders with six countries namely, Singapore, Indonesia, Thailand, Philippines, Brunei Darussalam and Vietnam. The extensive marine area amounted to 1.5 million tonnes, equivalent to RM 11,312.83 million from marine captures alone.[163] However, Malaysia's fishing industry only contributed a small percentage about 0.9% to the GDP in 2018.[164] Despite per capita consumption of fish is quite elevated at about 59 kg in 2016, which is one of the highest in the world.[165]

IUU fishing poses a threat to the 'open' water areas, Malaysian Government previously estimates that the country loses about 6 billion ringgit ($1.43 billion) annually caused by illegal fishing.[166] The country has enacted Fisheries Act 1985 with amendments made in 2012 and 2019and the adoption of RPOA-IUU through its NPOA-IUU.[167] The country is currently working on improving the Act and gap analysis for possible accession to the PSMA and UNFSA.[168] The establishment of Malaysia's Task Force on Illegal Fishing also became a prominent body as the task force embarked on its first operations and seized 25 fishing vessels.[169] Although the effort has been made progressive, the IUU score awarded by IUU Fishing Index to Malaysia is still below the overall world IUU, 2.52 however it has taken 4th position among ASEAN countries.[170] At the regional level, Malaysia is devoted to developing the e-ACDS with the SEAFDEC assistance.[171]

According to the existing country report for RPOA-IUU participating countries from the 2015, Malaysia's law enforcement has apprehended 2 vessels which equivalent to US$127,200 or equivalent to 64 tonnes.[172] Further data from the official government should be obtained to complement the estimation even though there is an available estimation from the apprehension conducted by the Task Force no reliable sources affirmed the data therefore, it was not included in this study to be calculated.

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[162] Coral Triangle Initiative, *Summary Report CTI-CFF MEWG Meeting: Review of Regional State of Coral Triangle Report and Monitoring and Evaluation Indicators*.
[163] FAO, 'Fishery and Aquaculture Country Profiles: Malaysia', accessed September 9, 2020, http://www.fao.org/fishery/facp/mys/en.
[164] Department of Fisheries Malaysia, 'Annual Fisheries Statistics 2018', *Department of Fisheries Malaysia* 1 (2018).
[165] FAO, 'Fishery and Aquaculture Country Profiles: Malaysia'.
[166] 'ASEAN Losing Billions To Illegal Fishing', *The Asean Post*, June 2020, https://theaseanpost.com/article/asean-losing-billions-illegal-fishing.
[167] DOF, *Malaysia's National Plan of Action to Prevent, Deter and Eliminate IUU Fishing*, *Department of Fisheries Malaysia*, 2013.
[168] Department of Fisheries, *RPOA IUU CC Meeting Country Report Malaysia 2020*, 2020.
[169] Prashanth Parameswaran, 'Malaysia's New Illegal Fishing Task Force in the Spotlight', *The Diplomat*, 2019, https://thediplomat.com/2019/05/malaysias-new-illegal-fishing-task-force-in-the-spotlight/.
[170] Macfadyen et al., 'The Illegal, Unreported and Unregulated Fishing Index'.
[171] Department of Fisheries, *RPOA IUU CC Meeting Country Report Malaysia 2020*.
[172] Department of Fisheries, *RPOA IUU CC Meeting Country Report Malaysia 2015*, n.d.

Table 16. Value and Volume Loss Estimates of IUU Fishing in Malaysia (2015-2019)

Country	Year	Fish Weight Equivalent		Trip	Price /Tonne	Apprehended Vessels/Year	Value Loss (Tonnes)	Volume Loss (Tonnes)
Malaysia	2015	53	0,2	3	2000	2	US$127,200	64
	Total						**US$127,200**	**64**

4.6 PAPUA NEW GUINEA

Papua New Guinea (PNG) is an archipelagic nation made up of the eastern half of the island of New Guinea, with around 600 smaller islands spanning more than 1,300 km with a coastline of around 17,000 km and the EEZ expand 2.5 million km2.[173] PNG has produced 236,823 tonnes from the wild catch in which the number decreased from the previous year with 310,979 tonnes.

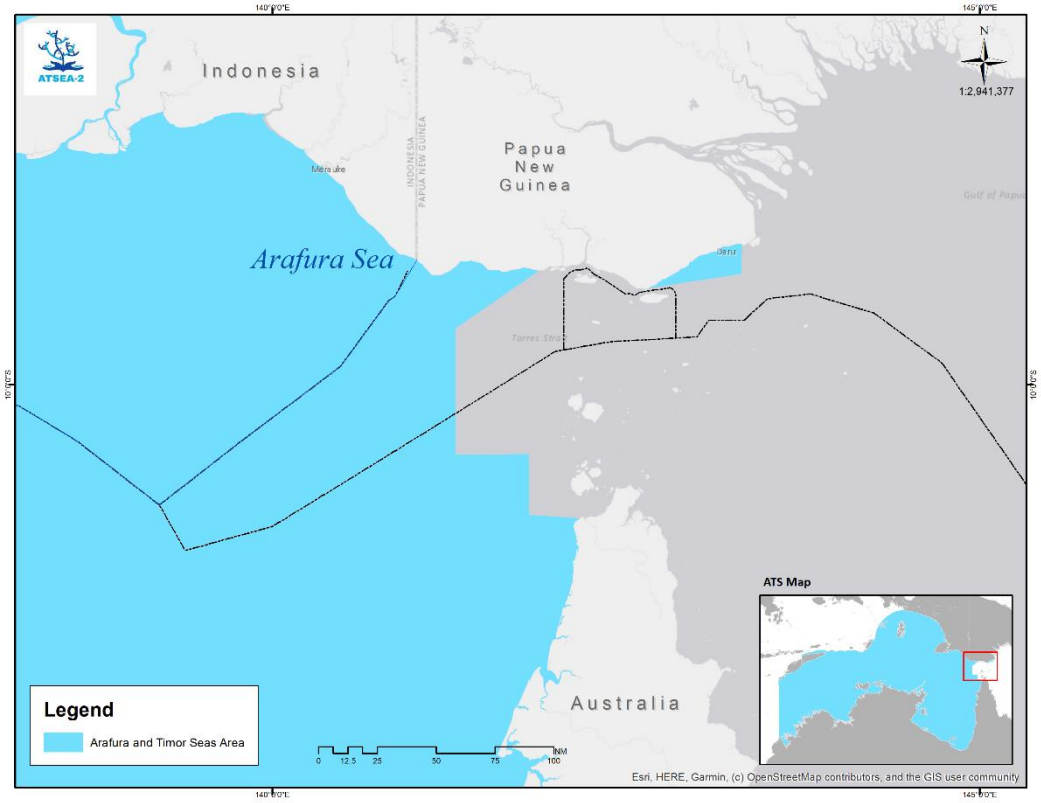

Figure 10. *Maps of Arafura and Timor Sea on Timor-Leste*

[173] Coral Triangle Initiative, *Summary Report CTI-CFF MEWG Meeting: Review of Regional State of Coral Triangle Report and Monitoring and Evaluation Indicators.*

Several measures have been implemented at the national level to combat IUU fishing, endangering marine areas' fish stocks and ecosystems. Legal reform started with the Fisheries and its Management Act[174], currently the country is in the progress of adopting the NPOA-IUU. The country has also recognized the high potency of tuna in their EEZ, as Tuna represents 94% of the marine capture fisheries, thus establishing the National Tuna Fishery Management and Development Plan Part 1. [175]Additionally, PNG has also published a national ocean policy 2020-2030 which served as policy guidance for ocean governance.[176] Development in the MCS mechanism also put in place in terms of data collection and capacity building.[177]

PNG has achieved above the overall IUU world score with 2.23 and ranked third among the RPOA-IUU participating countries after Australia and Brunei Darussalam.[178] The datasets of the vessels operating within the country are yet to be acquired; hence, calculating baseline estimates of PNG may not be possible. Based on the country report to the RPOA-IUU annual meeting, the National Fisheries Authority (NFA) published the number of apprehended IUU vessels. NFA found 6 vessels operating illegally in PNG's EEZ through one surveillance operation consisting of 5 Unlicensed Type-3 boats and 1 licensed longliner. Out of 6 vessels, 5 were resolved through prosecutions the other one settled through administrative proceedings by paying fine of US$5,000.00. Between November 2018 to 2019, the total registered investigation and prosecution done in PNG reached 133 cases.[179]

Despite the IUU cases having been recorded, the details of the GT of the vessels remain unavailable. Therefore, as the average GT may not be processed, it is calculated using the average GT assumption by 53. The estimated total loss if not apprehended is US$8,840,400 or equivalent to 4,420 tonnes. The dogleg area remains a concern for the RPOA sub-region ATS.[180]

Table 17. Value and Volume Loss Estimates of IUU Fishing in Papua New Guinea (2015-2019)

Country	Year	Fish Weight Equivalent		Trip	Price /Tonne	Apprehended Vessels/Year	Value Loss (Tonnes)	Volume Loss (Tonnes)
Papua New Guinea	2015	53	0,2	3	2000		US$0	0
	2016	53	0,2	3	2000	6	US$381,600	191
	2017	53	0,2	3	2000		US$0	0
	2018 - 2019	53	0,2	3	2000	133	US$8,458,800	4,229
	Total						**US$8,840,400**	**4,420**

[174] Papua New Guinea, 'Fisheries Management Act 1998', *(Act No 48 of 1998)* 41, no. 48 (1998).
[175] FAO, 'Fishery and Aquaculture Country Profiles: Papua New Guinea', accessed September 14, 2020, http://www.fao.org/fishery/facp/PNG/en.
[176] Department of Justice and Attorney General of Papua New Guinea, *National Oceans Policy of Papua New Guinea 2020-2030* (Port Moresby, 2020).
[177] National Fisheries Authority, *RPOA IUU CC Meeting Country Report Papua New Guinea 2020*, 2020.
[178] Macfadyen et al., 'The Illegal, Unreported and Unregulated Fishing Index'.
[179] National Fisheries Authority, *RPOA IUU CC Meeting Country Report Papua New Guinea 2019*, 2019.
[180] National Fisheries Authority, *RPOA IUU CC Meeting Country Report Papua New Guinea 2020*.

4.7 PHILIPPINES

The Philippines' geographical landscape has more than 7,641 islands with a length of coastline of approximately 36,289 km with a territorial water area of 2,200,00 km^2.[181] As one of the major archipelagic countries, coastal communities are heavily dependent on a resourceful and healthy ocean to fulfil their daily needs and livelihoods. Capture fishing activity engaged the highest number of people around 927,612 who harvest fish production only from municipal catch at 1,106,071 tonnes within the country in 2018.[182] Most fish production were Skipjack, Indian Sardines, and roundscad comprising a 57% share of 946,438 tonnes.[183] The country ranked 9th among the top fish producing countries in the previous year, constituting 2.01% of the total world production.[184] However, the production volume in 2019 decreases both the commercial and marine municipal fisheries at 939,999 and 966,425 tonnes respectively.[185]

IUU fishing management was severe back as the European Commission issued a yellow card to the Philippines in June 2014, which were then lifted in 2015 due to the series of reforms to upgrade the fisheries governance after inadequately addressing IUU fishing.[186] Currently, the IUU score of the Philippines is still below the world overall with 2.71.[187] However, the development of fisheries policy and governance has been made, such as the issuance of NPOA-IUU[188] in 2013 and Comprehensive National Fisheries Industry Development Plan 2016-2020.[189]

Small-scale fisheries numbers within the Philippines reached 258,956 units in 2018 while in the same year the number of commercial fishing operators and fishing vessels is around 8,198 units meaning that municipal fisheries are dominating the sector.[190]

Between 2016-2019, the Philippines has apprehended 1,103 fishing vessels through seaborne operations, landing denial, mobile checkpoints, and market denials for violations of law, including prohibited gears, illegally caught fish, and trading of endangered aquatic species.[191] Since no tonnage class was identified therefore the assumption of the tonnage is at 53 GT, the estimated total loss in the Philippines is approximately US$70,150,800.

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[181] Coral Triangle Initiative, *Summary Report CTI-CFF MEWG Meeting: Review of Regional State of Coral Triangle Report and Monitoring and Evaluation Indicators*.
[182] Department of Agriculture-Bureau of Fisheries and Aquatic Resources, 'Fish Contribution to the Economy: The Philippines', accessed September 9, 2020, https://www.bfar.da.gov.ph/profile?id=18#post.
[183] Department of Agriculture-Bureau of Fisheries and Aquatic Resources, *Philippine Fisheries Profile 2018* (Quezon City, 2018), https://www.bfar.da.gov.ph/publication.
[184] FAO, *FAO Yearbook: Fishery and Aquaculture Statistics 2017*.
[185] Philippine Statistics Authority, *Special Release: Fisheries Situation Report - January to December 2019* (Quezon City, 2020), https://psa.gov.ph/sites/default/files/Chicken_Q12019.pdf.
[186] European Commission, 'Press Release: EU Acts on Illegal Fishing: Yellow Card Issued to Thailand While South Korea & Philippines Are Cleared', accessed September 9, 2020, https://ec.europa.eu/commission/presscorner/detail/en/IP_15_4806.
[187] Macfadyen et al., 'The Illegal, Unreported and Unregulated Fishing Index'.
[188] Philippines, *Executive Order No. 154 on National Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported, and Unregulated Fishing and for Other Purposes* (Philippines, 2016).
[189] Department of Agriculture-Bureau of Fisheries and Aquatic Resources, *Comprehensive National Fisheries Industry Development Plan 2016-2020* (Manila: Department of Agriculture-Bureau of Fisheries and Aquatic Resources, 2016).
[190] Department of Agriculture-Bureau of Fisheries and Aquatic Resources, *Philippine Fisheries Profile 2018*.
[191] Department of Agriculture-Bureau of Fisheries and Aquatic Resources, *RPOA IUU CC Meeting Country Report Philippines 2019* (Siam Reap Province, 2019).

Table 18. Value and Volume Loss Estimates of IUU Fishing in The Philippines (2015-2019)

Country	Year	Fish Weight Equivalent		Trip	Price /Tonne	Apprehended Vessels/Year	Value Loss (Tonnes)	Volume Loss (Tonnes)
Philippines	2015	53	0,2	3	2000		US$0	0
	2016 - 2019	53	0,2	3	2000	1,103	US$70,150,800	35,075
	Total						**US$70,150,800**	**35,075**

4.8 SINGAPORE

Singapore is a small city-state located at the southern tip of the Malaysia Peninsula shared marine jurisdiction with Malaysia and Indonesia. The country has around 60 small islets with limited water areas, marine capture fisheries is not a major sector as the country seafood consumption were 90% imported from the neighbouring countries.[192] The import production of fish and other seafood is around 129,439 tonnes, while local production is 6,498 tonnes.[193] Hence, Singapore still does not have any specific production plan for the next 5 years regarding the capture fisheries.[194] The strategic location took advantage of having the largest and busiest port for shipping purposes in Southeast Asia.[195]

Local fish production is mainly produced through aquaculture and only small quantities were from local capture fisheries, accounting for 6,528 tonnes in 2018.[196] Jurong Fishery Port (JFP) and Senoko Fishery Port (SFP), the only fishing ports available within the country, handled 44,455 and 5,164 tonnes respectively.[197] In 2017, both ports served 3,606 vessels to land their fish-yield. The Singapore Food Agency has been recently appointed, substituting Agri-Food & Veterinary Authority of Singapore (AVA), to take care of the fisheries matters including listing licensed commercial fishing vessels and uploading them to both the SEAFDEC RFVR and the FAO Global Record Initiative (GRI). Meanwhile, IUU fishing matters were taken care of by the inter-agency working group at the national level.

Despite no adoption of the NPOA, Singapore placed 3rd for tackling IUU fishing with an overall score of 2.46, with the highest score from flag score by prevalence.[198] Singapore may not be a major fishing nation, but Singapore has succeeded in leading the ASEAN Member States through the ASEAN Guidelines for Preventing the Entry of Fish and Fish Products from IUU Fishing Activities into the Supply Chain adopted by AMAF in 2015, and the ASEAN Catch Documentation

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[192] SEAFDEC, 'Countries Profile of Singapore Addressing the IUU Fishing in the Southeast Asian Region', last modified 2015, accessed September 13, 2020, https://www.futuredirections.org.au/wp-content/uploads/2015/06/Singapore.pdf.
[193] Agri-Food & Veterinary Authority, *Agri-Food & Veterinary Authority of Singapore Annual Report 2017/18* (Singapore, 2019).
[194] Singapore Food Agency, *Statistical Capacity Assessment for the FAO-Relevant SDG Indicators 2018/19: Singapore* (Singapore, 2019).
[195] Annajane Kennard, 'Singapore', *Britannica*, accessed September 13, 2020, https://www.britannica.com/place/Singapore.
[196] Department of Statistics of Singapore, *Yearbook of Statistics Singapore 2019* (Singapore, 2019).
[197] Agri-Food & Veterinary Authority, *Agri-Food & Veterinary Authority of Singapore Annual Report 2017/18* .
[198] Macfadyen et al., 'The Illegal, Unreported and Unregulated Fishing Index'.

Scheme.[199] As the country has been using logbooks and log sheets to collect data, the EC IUU regulation takes no effect on the country, especially if there is no record the fish catch is being exported to the EU. [200] Instead, the impacts promote Singapore to work on reducing IUU fishing in small-scale fisheries.

According to the AVA, the licensing of fishing vessels is only for <15GRT or at least 12.2 meters according to the Agri-Food & Veterinary Authority of Singapore (AVA). To date, there has been no general vessels and apprehended IUU vessels lists found from the national record. The datasets found on the number of vessels within the country only available publicly from SEAFDEC with the highest boat recorded are in 2014 consisted mainly of the out-board powered boat and no numbers for the non-powered boat.

Currently, the datasets on the IUU fishing vessels and its details caught in Singapore still have yet to be obtained. Accordingly, no estimation can be made of the existing data and no available prior estimation.

4.9 THAILAND

Thailand is located between the Andaman Sea and the Gulf of Thailand with a total length of the continental coastline of 2,624 km and a total area of water of 319,750 km^2 including the 200nm EEZ that has been claimed.[201] Fish has become the most significant sources of protein for the Thai people with average annual consumption per capita was at 33.73 kg in 2016 higher than the other commodities.[202] Annual productivity from the wild capture is significantly higher than the production from Aquaculture contributing 1.69 million tonnes with an estimated total of 187.947 workers engaged in the harvesting process both Thai and migrants.[203]

Thailand has proven its fisheries governance to be effective since the withdrawal of the yellow card issued by EC in early January 2019 which gave Thailand government pressure to reform.[204] The fisheries laws have been continuously reviewed such as the Fisheries Act 1947, the royal ordinance on fisheries, Thailand's Fisheries Management Plan (FMP) 2015-2019 and the National Plan of Action on IUU (NPOA-IUU) 2015-2019. Besides legislative measures, Thailand also conducts active MCS through sea and port inspections, especially designated fishing ports for foreign fishing vessels, and shares information to the Global Record and RFVR, showing the willingness to cooperate as a flag state.[205]

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[199] Singapore, *Singapore's Contributions to Combating Illegal, Unreported and Unregulated (IUU) Fishing Report for the Ocean Conference* (Singapore, 2018).
[200] Abdul Razak Latun et al., 'Boosting National Mechanisms to Combat IUU Fishing : Dynamism of the Southeast Asian Fisheries Sector', *FIsh for The People* 14, no. 1 (2016): 36–43.
[201] Coral Triangle Initiative, *Summary Report CTI-CFF MEWG Meeting: Review of Regional State of Coral Triangle Report and Monitoring and Evaluation Indicators*.
[202] Thana Yenpoeng, 'Fisheries Country Profile: Thailand', *SEAFDEC*, accessed September 11, 2020, http://www.seafdec.org/fisheries-country-profile-thailand/.
[203] Department of Fisheries of Thailand, 'Thailand Fisheries Overview: Thailand Fisheries Supply Chain 2019'.
[204] Department of Fisheries of Thailand, 'How the EU Stamped down on Decades of Illegal Fishing in Thailand', accessed September 11, 2020, https://www4.fisheries.go.th/dof_en/view_news/299.
[205] Department of Fisheries of Thailand, *RPOA IUU CC Meeting Country Report Thailand 2019* (Siam Reap Province, 2019).

For Thailand, the new vessel registration system is complied with the NPOA-IUU and IPOA-IUU that vessel's history must be checked and investigated before registration, so that the IUU vessel cannot be registered as Thai flagged vessel. The overall performance score given by the IUU Fishing Index is 2.33 out with the highest score obtained from the flag score, in which Thailand effort has exceeded the world overall IUU score, 2.29.[206]

Based on the real-time data, the total of commercial fishing vessels is 10,398 and Thai-flagged vessels registered to fish outside Thai waters is only 4.[207] Department of Fisheries (DoF) recorded as of 2019 that the active fishing vessels in Thailand is mostly consisted of medium-sized vessels (<30GT - >60GT) at 2,633 units followed by large-sized, small-sized, and the lowest number is the extra large-sized vessels with 88 units. [208] To date, Thailand's authorities have not shared the apprehended/seized IUU vessels publicly.

Since 2014, Thailand has taken several measures one of which is follow-up with the logbooks contained extensive information of fishing vessel registration, licence number, type of fishing gear, fishing ground area, fishing duration, port of departure/arrival, species and quantities of catch and the certification by master fishermen. Publicity of such data is easily accessible for the public, on the contrary, the seized and detained IUU vessels list was not available on the website. Therefore, no estimation can be made from the existing available data. According to the FAO 2021 Report, the Sub-Region of the Gulf of Thailand remains a hotspot.[209]

4.10 TIMOR-LESTE

Timor-Leste is located in the Banda Sea in the north and Timor Sea in the south, bordering the Arafura Sea, maritime boundaries for the countries is relatively small due to the geographical location surrounded by two big countries, Australia and Indonesia. It has a coastline of 706 km shared with one of the islands in Indonesia, Nusa Tenggara Timur, and delimit an EEZ of 72,000 km^2.[210] The water areas of Timor-Leste are filled with rich marine biodiversity and located within the Coral-Triangle, several endangered marine species are found such as leatherback turtle, sperm whale, whale shark and many others.

Agriculture is the main source of livelihood followed by fishing which is dominated by the small-scale. Due to the high price and low availability of fish in the market, makes annual per capita fish consumption of Timorese were low estimated at 6.1kg compared to the meat consumption at 13.3kg.[211] Despite potential annual catches projected to be 116,000 tonnes, the total production of

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[206] Macfadyen et al., 'The Illegal, Unreported and Unregulated Fishing Index'.
[207] Department of Fisheries, 'List of Fishing Vessels Licensed for Commercial Fishing in Thailand', last modified 2020, accessed September 11, 2020, http://fel.fisheries.go.th/pages/.
[208] Thailand Statistics, '2019 Active Fishing Vessel Group by Size', accessed September 11, 2020, https://www4.fisheries.go.th/dof_en/view_message/233.
[209] Wilcox et al., *A Review of Illegal, Unreported and Unregulated Fishing Issues and Progress in the Asia Pacific Fisheries Commision Region*.
[210] Lara Wever, *Assessing Management Challenges and Options in the Coastal Zone of Timor-Leste* (Gold Coast, 2008).
[211] Juliana López Angarita et al., 'Fisheries and Aquaculture of Timor-Leste in 2019: Current Knowledge and Opportunities', *WorldFish* (2019): Program Report: 2019-15, www.worldfishcenter.org.

the capture fisheries sector for 2018 was only 3,200 tonnes.[212] As the country facing caloric malnutrition,[213] fish has become a new priority to be added to the Timorese diet as it is an important source of protein yet it is underused and the fisheries sectors were underdeveloped.[214]

As the world's new emerging nations, it was predicted that the marine ecosystem in Timor-Leste jurisdiction to be 'promising' due to the limited commercial exploitation and relatively small fish demand.[215] However, several studies showed that over-fishing near shore, dynamite blasting, and targeting juvenile species have put the coral reef systems at high risk.[216] Unsustainable fishing practices remain a major threat faced by Timor-Leste since 2011, with an estimation of 20% of the total catch landed in local ports harvested by IUU vessels operated in the Timor-Leste's EEZ.[217] In 2003, annual losses from IUU fishing were estimated at some US$20 million. [218] Overall IUU score of Timor-Leste is 2.61 in which still shows the need to improve, thus still ranked 5th in Southeast Asia.[219]

According to the Regional Fisheries Livelihood Programme for South and Southeast Asia (RFLP), fishers generally fish every day, alone or in groups of two to three, for 6–12 hours. [220] Most artisanal fishers use small, paddle canoes made of wood with a range in length from 2 to 6 m, and larger motorized boats from 4 to 7 m, with a few larger boats reported in some places (e.g. Atauro Island). [221] Based on the unpublished data acquired from the Directorate of Fisheries (DGP), listed 2,237 boats were consisting of 1,590 wooden canoes and 647 motorboats registered in the country as of 2018.

There are several ongoing developments on the regulatory framework, such as implementing its National Fisheries Strategic Plan and revising fisheries legislation. Timor-Leste has been working closely with the WorldFish on the pilot project of PDS devices and IUU fishing monitoring through Global Fishing Watch and Visible Infrared Imaging Radiometer Suite (VIIRS).[222] In terms of realizing the RPOA-IUU Workplan, Timorese government conducted Focus Group Discussion for the ATS region.

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[212] FAO, 'Fishery and Aquaculture Country Profiles: Timor-Leste', accessed September 12, 2020, http://www.fao.org/fishery/facp/TLS/en.
[213] Global Hunger Index, '2019 Global Hunger Index by Severity', *Https://Www.Globalhungerindex.Org/Results.Html*.
[214] López Angarita et al., 'Fisheries and Aquaculture of Timor-Leste in 2019: Current Knowledge and Opportunities'.
[215] Alongi et al., 'Biophysical Profile of the Arafura and Timor Seas'.
[216] Lauretta Burke et al., *Reefs at Risk Revisited*, *Defenders*, vol. 74, 2011, http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3150666&tool=pmcentrez&rendertype=abstract; Wirasantosa et al., *ATSEA Thematic Reports on the Arafura and Timor Seas Region*.
[217] Wirasantosa et al., *ATSEA Thematic Reports on the Arafura and Timor Seas Region*.
[218] Burke et al., *Reefs at Risk Revisited*, vol. 74, p. .
[219] Macfadyen et al., 'The Illegal, Unreported and Unregulated Fishing Index'.
[220] López Angarita et al., 'Fisheries and Aquaculture of Timor-Leste in 2019: Current Knowledge and Opportunities'.
[221] Ibid.
[222] Ministry of Agriculture and Fisheries, *RPOA IUU CC Meeting Country Report Timor-Leste 2020*, 2020.

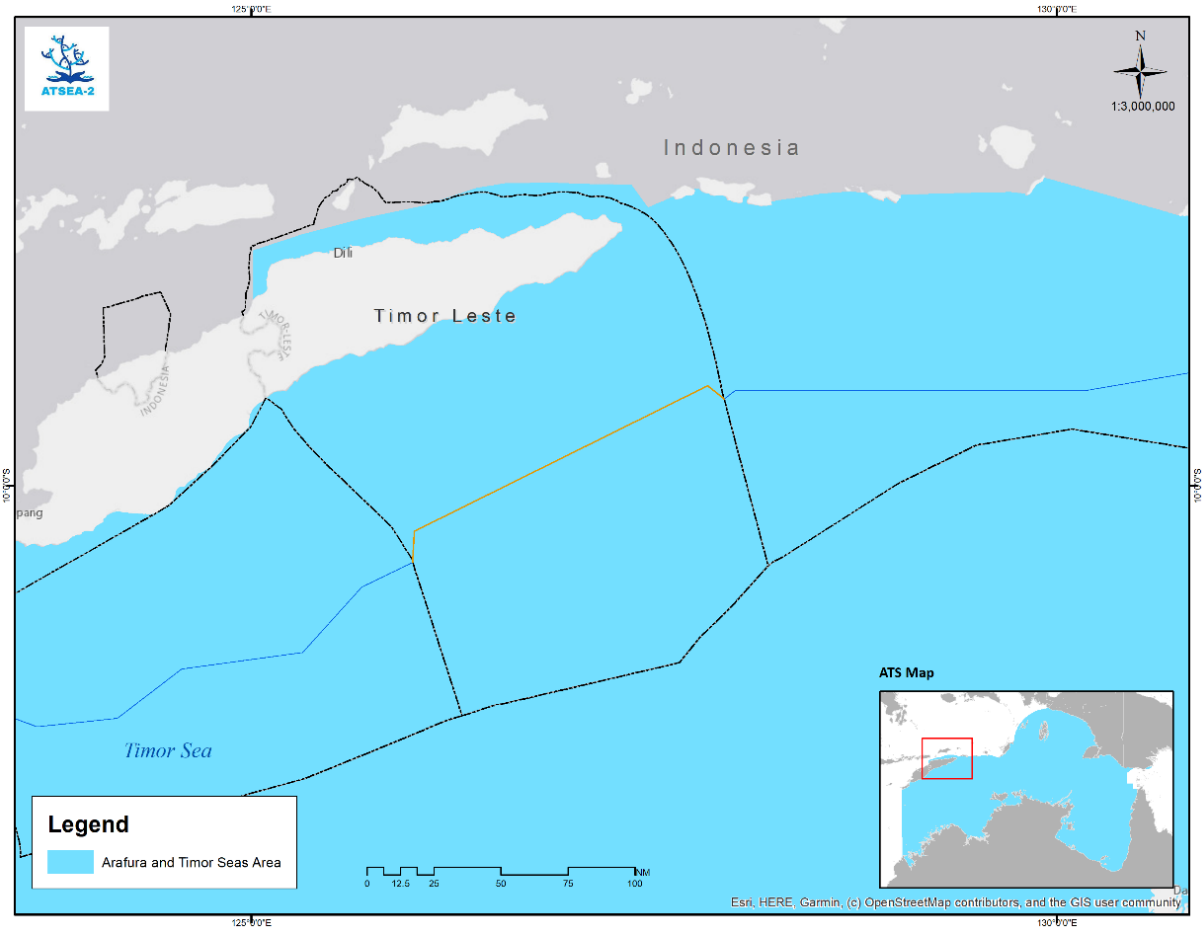

Figure 11. *Maps of Arafura and Timor Sea on Timor-Leste*

Further, data collection over Timor-Leste fishing vessels and its IUU cases are importantly needed to be able to establish the baseline estimates as no essential data needed were made available. However, there is one vessel apprehended previously with no dimension details given by the government officials with an estimated potential loss of US$63,600. The absence of patrol vessels contributed to the lack of follow-up from the notice, especially the eastern area adjacent to the ATS region.

Table 19. Value and Volume Loss Estimates of IUU Fishing in Timor-Leste (2015-2019)

Country	Year	Fish Weight Equivalent		Trip	Price /Tonne	Apprehended Vessels/Year	Value Loss (Tonnes)	Volume Loss (Tonnes)
Timor-Leste	2017	53	0,2	3	2000	1	US$63,600	32
	Total						**US$63,600**	**32**

4.11 VIETNAM

Vietnam is on the west bank of the South China Sea consisted of more than 4,000 islands scattered offshore. The long coastline of 3,260 km is home to more than 11,000 marine species including the country's EEZ that extend to more than 1 million km^2 hence the geographical conditions is ideal to thrive in fishery sectors.[223] The total capture fisheries production in 2019 is more than 3,7 million MT made up of 47% of the total production that engaged more than 4 million workforces if it is combined with the aquaculture sector.[224]

The Master Plan on Fisheries Development overlooks the vision towards modernized fisheries sector by 2030 to become a large commodity production sector while protecting the fishery resources.[225] In October 2017, the EC has imposed the country with Yellow Card with the ambitious target of 7 million tonnes fisheries output by 2020 and the recurrent Viet Nam-flagged vessels detained in many Southeast Asia countries, IUU fishing remain a challenge for the country ambitious plan.[226]

Vietnam ranked 5th from the lowest worldwide score based on an overall IUU score of 3.16.[227] The improvement shall be made in several severe scores namely in port score and general score. The new fisheries law and under-law regulations for guiding the Fisheries Law have been developed to comply with international regulations in addition to the establishment of the NPOA-IUU.[228] Henceforth, Vietnam reported will also regulate the need to install VMS device for the 15 m in-length over as well as revising port in and out procedure to effectively eliminate IUU fishing through the establishment of Fisheries Inspection and Control Office.[229]

The only record from the national statistics is the number of upper 90 CV offshore fishing vessels are 34,563 (the highest between 2010-2018) nationally in year 2018 with the capacity of 13,480.[230] Meanwhile, SEAFDEC's fishing boat data is only consisted of the grand total units annually from 2010 to 2016 with fluctuating trends throughout the period. The highest number is in 2014 of 31,235 vessels followed by a significant decline in the following year with an estimate of 28,719 vessels.[231]

The government of Viet Nam reported starting from early 2019 to 10 September 2019, there were 113 cases involving 187 vessels and 877 fishermen arrested and sanctioned by other countries' forces.[232] 118 out of 187 have been publicly announced for violations in other countries' waters while the rest is currently under verification stages. Most Viet Nam-flagged vessels were detained

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[223] Nguyen Tuan Uyen, 'Fisheries Country Profile: Viet Nam', accessed September 13, 2020, http://www.seafdec.org/fisheries-country-profile-viet-nam/.
[224] Vietnam Association of Seafood Exporters and Producers, 'Overview of Vietnam Fisheries Sector', accessed September 13, 2020, http://mseafood.vasep.com.vn/685/onecontent/fishery-profile.htm.
[225] Socialist Republic of Viet Nam, 'The Fisheries Development Master Plan for Viet Nam to 2020 with a Vision to 2030' 2013, no. September (2013): 31–43.
[226] Sampa Kundu, 'How Vietnam Plans to Prevent Illegal, Unreported and Unregulated Fishing', *The Diplomat*, https://thediplomat.com/2019/05/how-vietnam-plans-to-prevent-illegal-unreported-and-unregulated-fishing/.
[227] Macfadyen et al., 'The Illegal, Unreported and Unregulated Fishing Index'.
[228] Vietnam, *Decision No: 78/QD-TTg on National Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing up to 2025* (Vietnam, 2018).
[229] Directorate of Fisheries of Vietnam, *RPOA IUU CC Meeting Country Report Vietnam 2019* (Siem Reap, 2019).
[230] General Statistics Office, *Number of Upper 90 CV Offshore Fishing Vessels* (Hanoi, 2019).
[231] SEAFDEC, *Number of Fishing Boats by Type and Tonnage in Southeast Asia*.
[232] Directorate of Fisheries of Vietnam, *RPOA IUU CC Meeting Country Report Vietnam 2019*.

by Malaysia with 81 units; concurrently only one vessel was caught by the Chinese Taipei. On the other hand, vessels arrested or sanctioned by Indonesia, Thailand, Cambodia, and the Philippines are 48, 30, 27, and 2 vessels. [233]

Currently, the datasets on the IUU fishing vessels and its details caught in Vietnam still have yet to be obtained from the latest report submitted to the RPOA-IUU CCM. Accordingly, no estimation can be made of the existing data and no available prior estimation.

[233] Ibid.

CHAPTER 5. CASE STUDY: INDONESIA

Based on the latest estimates, Indonesia recorded annual losses of approximately US$1,2 million during the period 2014-2017.[234] Up until 2014, Indonesia lost around US$4 billion each year to IUU fishing.[235] During her tenure as Minister of MMAF between 2014-2019, Susi Pudjiastuti took the unprecedented step of destroying 556 seized vessels caught fishing illegally in Indonesian waters.[236] As a result of this stricter law enforcement, studies conducted by the MMAF and University of California Santa Barbara in 2016 indicated that foreign fishing in the country has since dropped by more than 90%, while total illegal fishing has also decreased by 25%.[237] Although the IUU-free marine areas reached 47.27% coverage in 2014, the government still has much work to do for the rest of the country's Fisheries Management Area (FMA).[238] Based on the country report to the RPOA-IUU Coordination Committee Meeting (CCM), an annual meeting for RPOA-IUU participating countries, the Indonesian government committed to developing technical measures for the Port State Measures Agreement (PSMA) and continues to work on the enhancement of fisheries product tracing.[239]

We readily acknowledge that the absence of specific national or regional estimations may lead to biases for policymakers in reviewing their respective countries' efforts. Therefore, this section endeavours to elaborate on Indonesia's calculations as the case study, in response to complete information acquired by the author from relevant stakeholders such as MMAF, the Indonesian Maritime Security Agency (Badan Keamanan Laut/BAKAMLA), the Navy and Marine Police. Specifically, this relates to vessels apprehended in the WPP-718 area, which comprises territories located within the ATS region. Nevertheless, this study may serve as a baseline reference for the upcoming five-year review of the MCS and law enforcement in the fight against IUU fishing.

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[234] Aulia Riza Farhan et al., 'Calculation Model of Economic Losses Due to Illegal Fishing Activities in Indonesian Territorial Calculation Model of Economic Losses Due to Illegal Fishing Activities in Indonesian', no. December (2018): 13.

[235] Mary Ann Palma, Martin Tsamenyi, and William Edeson, *Promoting Sustainable Fisheries: The International Legal and Policy Framework to Combat Illegal, Unreported and Unregulated Fishing* (Leiden: Brill | Nijhoff, 2010).

[236] Natalie Sambhi, 'Legacies, Lessons and Lobsters: Indonesia's Maritime Policy in a Post-Susi World', *Asia Maritime Transparency Initiative*, accessed September 13, 2020, https://amti.csis.org/legacies-lessons-and-lobsters-indonesias-maritime-policy-in-a-post-susi-world/.

[237] Ahmad Baihaki, 'Fighting Illegal Fishing: Making a Big Bang with Big Data', *The Jakarta Post*, 2019, https://www.thejakartapost.com/academia/2019/02/27/fighting-illegal-fishing-making-a-big-bang-with-big-data-1551250832.html.

[238] MMAF, *Marine and Fisheries Affairs in Figures 2018*.

[239] MMAF, *RPOA IUU CC Meeting Country Report Indonesia 2020*, 2020.

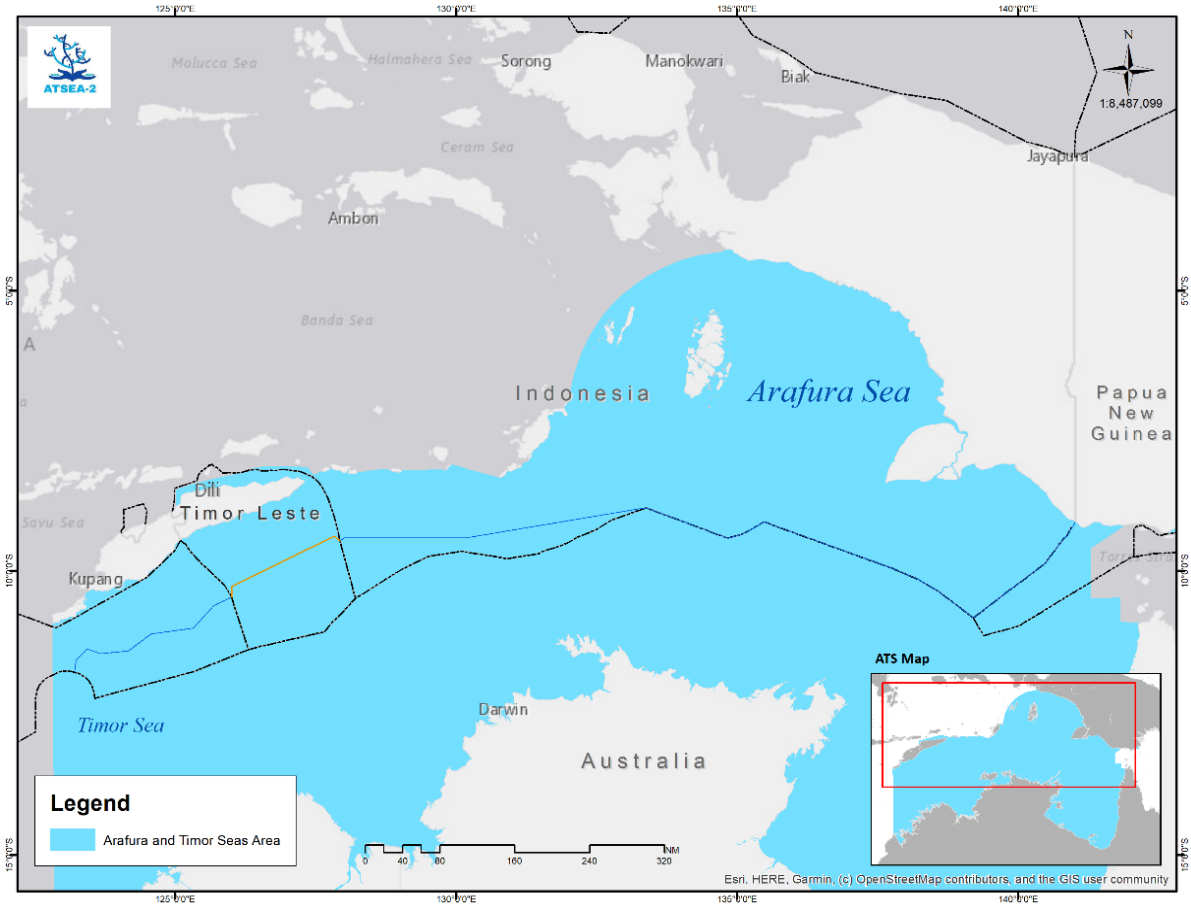

Figure 12. *Maps of Arafura and Timor Seas Area of Coverage*

The ATS region borders the Indonesian provinces of Maluku and Papua (see Picture 10); the two most productive provinces in Indonesia, where annual fish catches reach 2,637,564 tonnes.[240] However, between 2016-2017, the productivity of fisheries in Aru Bay, the Arafura Sea and the East Timor Sea almost halved (-44.04%).[241] In 2016, the marine fishing fleet comprised 543,845 units of mostly non-powered boats and <5GT vessels.[242] It means that small-scale fishers dominate WPP-718 fishing activities. According to Indonesian law, a Vessel Monitoring System (VMS) is only required on boats over 30 tonnes (gross), representing approximately 10% of the domestic fishing fleet.

Due to insufficient overlay satellite imagery in WPP-718, it is not possible to estimate overall losses within the area. Several institutions are working independently to resolve these matters; namely BAKAMLA and the Ministry of Transportation, with regards to automatic identification systems (AIS); and the Ministry of Maritime Affairs and Fisheries, which is currently working on VMS. Thus, the assigned institution working specifically on data collection – the Marine Research and Observation Centre (*Balai Riset dan Observasi Laut*/BROL) – cannot provide the data for the

[240] MMAF, *Marine and Fisheries Affairs in Figures 2018*.
[241] Ibid.
[242] Ibid.

entire period requested (2015-2019). Sporadic processing capability of the required variables also contributes to this issue.

Although national estimates were established in the previous chapter, we have also tried to calculate using the same method for the WPP-718 in focus. From the compilation of data relating to apprehended vessels received from all four stakeholders, we found only a small number (four) of vessels within the last five-year period, representing an estimated prevented economic loss of US$685,200, equivalent to 343 tonnes. If the same data were available for Australia, Papua New Guinea and Timor-Leste, it would be possible to combine the figures and calculate an ATS-specific estimation to be used as a point of reference for enhancing the MCS and law enforcement within the area.

Figure 13. Value and Volume Loss Estimates of IUU Fishing in WPP-718, Indonesia (2015-2019)

Country	Year	Fish Weight Equivalent		Trip	Price /Tonne	Apprehended Vessels/Year	Value Loss (Tonnes)	Volume Loss (Tonnes)
Indonesia	2017	130	0,2	3	2000	2	US$312.000	156
	2019	155,5	0,2	3	2000	2	US$373.200	187
	Total						**US$685.200**	**343**

CHAPTER 6. CONCLUSION

There is no one-size-fits-all solution to eradicating IUU fishing. Each country has its own financial capacity, human resources and political will. Quantifying both the volume and economic value of losses resulting from IUU fishing can serve as an instructive metric for tailoring the necessary policy response. This study is by no means the first or most comprehensive attempt to calculate losses caused by IUU activities, as many previous attempts have offered different calculation patterns. However, these studies have mostly focused on the Illegal element and analysed potential loss. This is because illegal fishing activities are tangible, whereas unreported and unregulated fishing, by definition, lack the data required to form a solid basis for understanding. The absence of standardised global or country-level estimates for IUU fishing makes this process of understanding even more complicated.

In response, this study offers a unique approach to quantifying countries' law enforcement ability, by calculating losses avoided by apprehending vessels in the waters of RPOA-IUU-participating countries during a five-year period (2015-2019). This data was acquired primarily from the RPOA-IUU CCM Country Report; in Cambodia, it came from FiA data published in a working paper by the International Institute for Environment and Development (IIED); and in Indonesia, data was supplied directly by all four stakeholders, namely MMAF, BAKAMLA, the Indonesian Navy and the Marine Police.

The recent FAO study, entitled "A Review of Illegal, Unreported and Unregulated Fishing Issues and Progress in the Asia-Pacific Fisheries Commission Region" estimated losses of US$3-US$5,2 billion within the ATS sub-region, equivalent to 2,572,000 tonnes.[243] A different method and approach were used to generate these data. This study is limited to the RPOA-IUU-participating countries, based on data derived from lists of apprehended vessels. The fact that this data is far from complete has resulted in significant information gaps when compared to similar studies.

Results show that the two countries with the highest number of detained vessels were Indonesia (US$70,258,776, equivalent to 35,130 tonnes) and the Philippines (US$70,150,800, equivalent to 35,075 tonnes). The lowest catch came from Timor-Leste, worth an estimated US$63,600, equivalent to 32 tonnes; meanwhile, there was no data available for Singapore, Thailand or Vietnam. The total for all countries is estimated to be US$165,595,176, equivalent to 82,798 tonnes.

[243] Wilcox et al., *FAO Report on a Review of Illegal, Unreported and Unregulated Fishing Issues and Progress in the Asia Pacific Fisheries Commission Region*.

Below is a table of all datasets acquired, collated, and calculated.

Figure 14. Compilation of the Value and Volume Loss Estimates for each RPOA-IUU Participating Countries (2015-2019)

Country	Year	Fish Weight Equivalent		Trip	Price /Tonne	Apprehended VesselsYear	Value Loss (Tonnes)	Volume Loss (Tonnes)
Australia	2015	53	0.2	3	2000	-	US$0	0
	2016-2017	53	0.2	3	2000	13	US$826,800	413
	2018-2019	53	0.2	3	2000	5	US$318,000	159
	Total						**US$1,144,800**	**572**
Brunei Darussalam	2014	53	0.2	3	2000	2	US$127,200	64
	2015	53	0.2	3	2000	1	US$63,600	32
	2016	53	0.2	3	2000		US$0	0
	2018	53	0.2	3	2000	3	US$190,800	95
	2019	53	0.2	3	2000	2	US$127,200	64
	Total						**US$508,800**	**254**
Cambodia	2018	53	0.2	3	2000	228	US$14,500,800	7,250
	Total						**US$14,500,800**	**7,250**
Indonesia	2015	53.2	0.2	3	2000	172	US$10,799,280	5,400
	2016	50.8	0.2	3	2000	316	US$20,527,704	10,264
	2017	51.9	0.2	3	2000	271	US$17,925,312	8,963
	2018	58.2	0.2	3	2000	170	US$11,134,800	5,567
	2019	57.8	0.2	3	2000	159	US$9,871,680	4,936
	Total						**US$70,258,776**	**35,130**
Malaysia	2015	53	0.2	3	2000	2	US$127,200	64
	Total						**US$127,200**	**64**
Papua New Guinea	2015	53	0.2	3	2000		US$0	0
	2016	53	0.2	3	2000	6	US$381,600	191
	2017	53	0.2	3	2000		US$0	0
	2018 - 2019	53	0.2	3	2000	133	US$8,458,800	4,229
	Total						**US$8,840,400**	**4,420**
Philippines	2015	53	0.2	3	2000	-	US$0	0

Country	Year	Fish Weight Equivalent		Trip	Price /Tonne	Apprehended VesselsYear	Value Loss (Tonnes)	Volume Loss (Tonnes)
	2016 - 2019	53	0.2	3	2000	1,103	US$70,150,800	35,075
	Total						**US$70,150,800**	**35,075**
Singapore	2015-2019	53	0,2	3	2000	-	US$0	0
	Total						**US$0**	**0**
Thailand	2015-2019	53	0,2	3	2000	-	US$0	0
	Total						**US$0**	**0**
Timor-Leste	2017	53	0,2	3	2000	1	US$63,600	32
	Total						**US$63,600**	**32**
Vietnam	2015-2019	53	0,2	3	2000	-	US$0	0
	Total						**US$0**	**0**
Total Compiled							**USD 165,595,176**	**82,798**

Data relating to Indonesia in this study was by far the most substantial, as this is where the author is based. Due to Covid-19 travel restrictions, the availability of data for other countries was limited. In terms of regional calculations, we noted that only four vessels were apprehended in WPP-718, which forms part of the ATS region, within the last five-year period, accounting for an estimated prevented economic loss of US$685,200, equivalent to 343 tonnes.

Subsequent investigations should incorporate and utilise AIS, VMS and aerial spotting data. Although some ATS littoral nations do not currently have the capability to provide such sophisticated data, both PNG and Timor-Leste have already developed their respective catch traceability systems, referred to as FIMS and PeskAAS, respectively. In conclusion, more thorough and field-based data collection is required to complement the findings of this study in relation to potential losses. This study can thereby pave the way to a better understanding of IUU through estimates of potential loss, supported by a range of reliable and instructive data.

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