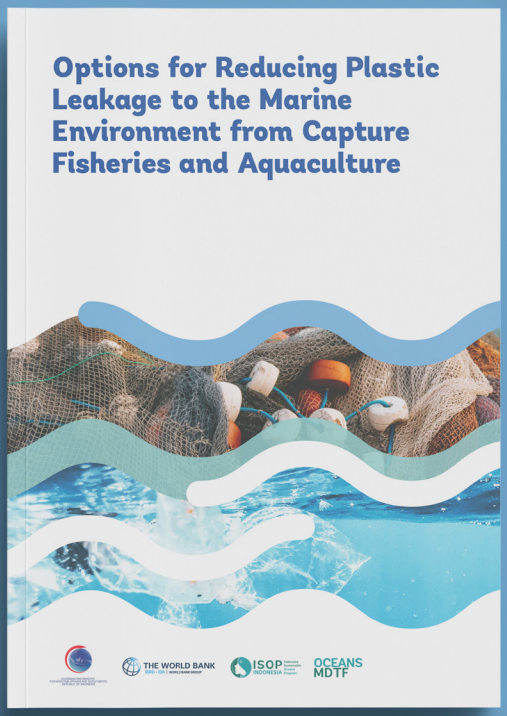
Key messages from the reports

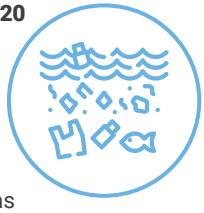


ABOUT THE REPORTS

The World Bank's "Management, Retrieval and Recycling of End-of-Life and Abandoned, Lost and Discarded Fishing Gear" report aim to enhance the evidence available to support efforts to improve management, retrieval, and recycling of ALDFG and EOLFG in Indonesia. It assesses **ALDFG** risk of each specific gear to establish baselines for the elements relevant to managing EOLFG and ALDFG and, in the longer term, to monitor and evaluate the impacts of prevention, mitigation and/or curative actions.

The "Options for Reducing Plastic Leakage to the Marine Environment from Capture Fisheries and Aquaculture" report presents options for reducing the Abandoned, Lost and Discarded Fishing Gear (ALDFG) and the Abandoned, Lost and Discarded Aquaculture Gear (ALDAG) in Indonesia and improving the management and use of the End-of-life Fishing Gear (EOLFG). The report provides time-bound prioritized actions under six broad categories.

Field surveys were conducted in 10 Oceanic Fishing Ports (or *Pelabuhan Perikanan Samudera* in Indonesian) and Archipelagic Fishing Port (or *Pelabuhan Perikanan Nusantara* in Indonesian) to determine the lifecycle of fishing gears in Indonesia. A methodology for monitoring and evaluating ALDFG risk was developed, field tested and validated. This methodology was based on global best practices, and adapted for the unique context and dynamics of Indonesia's fisheries. The risk assessment considers three risk factors: (i) quantity of end-of-life plastic material generated; (ii) vulnerability to loss and damage (i.e., likelihood of a specific gear being abandoned, lost or discarded); and (iii) magnitude of ecological impacts.



Sea-based leakage contributes at least 20 percent of all plastic waste that leaks into Indonesia's marine environment[1]. Sea-based leakage includes pollution from maritime activities such as aquaculture, shipping, fisheries, and tourism, as well as debris transported by ocean flows.

Abandoned, Lost and Discarded Fishing Gear (ALDFG) and End-of-life Fishing Gear (EOLFG) are major components of sea-based sources of marine debris. What is Abandoned, Lost and Discarded Fishing Gear (ALDFG) and End-of-life Fishing Gear (EOLFG)?

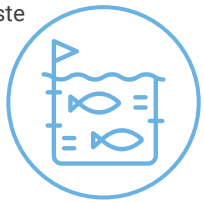
- Abandoned fishing gear could be retrieved by operator but is deliberately left at sea due to force majeure or other unforeseen reasons.
- Lost fishing gear cannot be located and/or retrieved by the operator. And hence is fishing gear over which the operator has accidentally lost control.
- Discarded fishing gear is released at sea without any attempt for further control or recovery by the owner/operator.
- End-of-life fishing gear includes fishing gears and fishing gear components that, through wear and tear, need to be replaced.

ALDFG comprises as much as 50 percent of all sea-based sources of marine debris[2]. Global ALDFG leakage is estimated at 1.14 Mt per year[3], though data limitations may mean that actual quantities are even greater[4].

In Indonesia, the most commonly used fishing gears include but not limited to surrounding gear, seine nets, trawls, lift nets, gillnets, entangling nets, hooks and lines and traps. Approximately 30 percent of all fishing gears in Indonesia become ALDFG or EOLFG every year.

- Gilnets and entangling nets pose the greatest ALDFG risk in Indonesia due to the large quantities of plastic material deployed and replaced annually, relatively high vulnerability to loss and damage, and high likelihood of ecological impacts arising from ghost fishing, entanglement, rafting of invasive species or smothering of habitats.
- Purse seines and encircling nets were assessed as having high relative risk. The small number of vessels operating these gears in Indonesia make these fisheries a good candidate for piloting ALDFG prevention and mitigation approaches.
- Traps and pots pose the third most significant ALDFG risk.

Abandoned, Lost and Discarded Aquaculture Gear (ALDAG) is another important sea-based source of plastic leakage. The cultivation of marine and aquatic species uses plastic components such as buoys, ropes, harvest bins and feed sacks. In total, Indonesia's marine aquaculture generates an estimated 865,544 tonnes of plastic waste every year. A significant proportion enters landfill (189,347 tonnes) or is otherwise disposed of on land. As much as 82,067 tonnes is estimated to leak to marine environments annually.



The primary pathways for plastic leakage from aquaculture include mismanagement, deliberate discharge, extreme weather, and catastrophic events such as tsunamis[5].

- Seaweed farms pose the greatest risk of plastic leakage mainly because seaweed farms tend to be located in shallow coastal areas where they are exposed to wave action.
- Floating cages and pens are also high risk. Cages tend to be located in relatively exposed deeper waters where they depend on water currents to maintain stock health. In these locations they are vulnerable to damage and abrasion from tides and storms, resulting in both periodic losses as well as chronic leakage.
- The risk of plastic leakage from coastal pond aquaculture is low. While extensive coastal ponds generate the greatest proportion of Indonesia's plastic aquaculture waste, direct leakage to marine environments is very low because ponds are typically located above sea level, and hence the main cause of leakage is infrequent catastrophic events such as storm surge or flooding.

[1] World Bank (2018). Indonesia Marine Debris Hotspot Rapid Assessment: Synthesis Report. World Bank Group and Coordinating Ministry of Marine Affairs, Government of Indonesia. https://documents1.worldbank.org/curated/en/983771527663689822/pdf/Indonesia-Marine-debris-hotspot-rapid-assessment-synthesis-report.pdf

[2] Consoli, P., Sinopoli, M., Deidun, A., Canese, S., Berti, C., Andaloro, F. & Romeo, T. (2020). The impact of marine litter from fish aggregation devices on vulnerable marine benthic habitats of the central Mediterranean Sea. Mar Pollut Bull, 152, 110928. doi:10.1016/j.marpolbul.2020.110928

[3] Eunomia (2016). Plastics in the Marine Environment. Eunomia Research and Consulting, Bristol, UK
Gilman, E., Musyl, M., Suuronen, P., Chaloupka, M., Gorgin, S., Wilson, J. & Kuczenski, B. (2021). Highest risk abandoned, lost and discarded fishing gear. Nature Scientific Reports 11: 7195 . doi: 10.1038/s41598-021-86123-3

[4] Richardson, K., Wilcox, C., Vince, J., & Hardesty, B. D. (2021). Challenges and misperceptions around global fishing gear loss estimates. Marine Policy 129: 104522. doi: 10.1016/j.marpol.2021.104522

[5] Huntington, T (2019). Marine Litter and Aquaculture Gear –White Paper. Report produced by Poseidon Aquatic Resources Management Ltd for the Aquaculture Stewardship Council. 20 pp. https://www.asc-aqua.org/what-we-do/programmeimprovements/gear-management/#marine-litter-and-aquaculture-gear-asc-white-paper

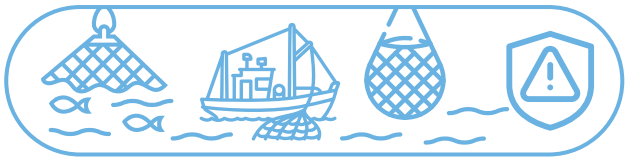
[6] Gilman, E. (2015). Status of international monitoring and management of abandoned, lost and discarded fishing gear and ghost fishing. Mar Policy 60: 225-239. doi:10.1016/j.marpol.2015.06.016

The impacts of fishery and aquaculture plastic pollution on the environment, economy, livelihoods, and food security are significant. Fishery and aquaculture plastic litter can cause significant damage to marine ecosystems and habitats[6], present hazards to navigation and safety at sea[7], reduce the socioeconomic value of coastal areas (English et al., 2019) and transfer toxins and microplastics into marine food webs with associated risks to human health from seafood contamination[8]. Over time, fishing gear such as anchored gillnets, trammel nets, and plastic pots could also lead to "ghost fishing," where old/discarded fishing gear entraps marine animals.

Managing and mitigating plastic pollution from fisheries and aquaculture has the potential to contribute to Indonesia's marine plastic debris targets while also providing economic opportunities. Existing waste management initiatives in Indonesia could be built upon to address issues associated with ALDFG. The Government of Indonesia has set the ambitious objective of reducing marine plastic debris by 70 percent by 2025. One of the five pillars of this plan is dedicated to "reducing sea-based leakage", reported to contribute at least 20 percent of all marine plastic debris in Indonesia.

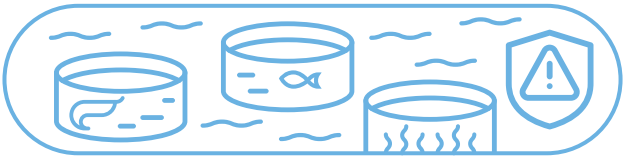
Recommended actions to manage the ALDFG, EOLFG and ALDAG. The complete time-bound prioritized actions can be accessed in the "Options for Reducing Plastic Leakage to the Marine Environment from Capture Fisheries and Aquaculture" report. The summary is presented below.

Preventing and mitigating ALDFG



- Implement effective marine spatial plan (MSP) and enforce fishing zoning arrangements to reduce loss of fishing gear at sea due to overcrowding of fishing vessels.
- Establish ghost gear fund, a funding mechanism to provide dedicated financial support to address the management of fishing and aquaculture waste and, where necessary, its retrieval from the marine environment.
- Improve gear design and materials to reduce the loss of soft plastic gear materials at sea.
- Enhance gear marking to assist with identifying ownership, detecting illegal, unregulated and unreported (IUU) fishing, enhancing the visibility of passive gears, and aiding monitoring and enforcement of ALDFG regulations.
- Coordinate regular ALDFG retrieval efforts, including the establishment of requirements or incentive for fishers to remove ALDFG.
- Monitor and report lost gears and disused end of life gears.
- Maintain good operations within gear repair facilities to keep gears in service longer, minimize damage and reduce rates of waste and ALDFG generation.

Preventing ALDAG



- Improve aquaculture equipment design to make aquaculture systems more robust and less vulnerable to equipment failure and plastic loss.
- Identify the economic drivers of aquaculture gear abandonment and discard.
- Enhance marine spatial planning and zoning to segregate marine activities and minimize spatial conflict with other marine users (e.g. accidental collision with fish cages or seaweed farms).
- Improve fallowing and decommissioning of aquaculture sites as haphazard and incomplete decommissioning could result in equipment and plastic materials being abandoned, unmanaged and at high risk of leakage to the marine environment.
- Develop technical guidelines for plastic waste management within the aquaculture industry.

Macfadyen, G., Huntington, T., and Cappell, R. (2009). Abandoned, lost or otherwise discarded fishing gear. UNEP Regional Seas Reports and Studies, No. 185; FAO Fisheries and Aquaculture Technical Paper, No. 523. ISBN 978-92-5-106196-1. United Nations Environment Programme and Food and Agriculture Organization of the United Nations, Nairobi and Rome

NOAA (2015). Report on the Impacts of "Ghost Fishing" Via Derelict Fishing Gear. NOAA Marine Debris Program, Silver Spring, MD

[7] Hong, S., Lee, J. & Lim, S. (2017). Navigational threats by derelict fishing gear to navy ships in the Korean seas. Mar Pollut Bull 119(2): 100-105. doi:10.1016/j.marpolbul.2017.04.006

[8] Barnes, D.K., Galgani, F., Thompson, R.C. & Barlaz, M. (2009). Accumulation and fragmentation of plastic debris in global environments. Philos Trans R Soc Lond B Biol Sci 364(1526): 1985-1998. doi:10.1098/rstb.2008.0205

Foley, C.J., Feiner, Z.S., Malinich, T.D. & Höök, T.O. (2018). A meta-analysis of the effects of exposure to microplastics on fish and aquatic invertebrates. Sci Total Environ 631-632: 550-559. doi:10.1016/j.scitotenv.2018.03.046

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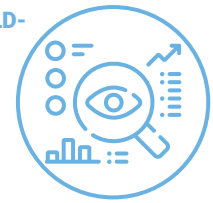
Rochman, C.M. (2015). The Complex Mixture, Fate and Toxicity of Chemicals Associated with Plastic Debris in the Marine Environment. In M. Bergmann, L. Gutow,\& M. Klages (Eds.), Marine Anthropogenic Litter (pp. 117-140). Springer International Publishing, Cham. doi:10.1007/978-3-319-16510-3_5

Promoting a circular economy for EOLFG

- Establish EOLFG value chains to ensure that at the end-of-life, materials should have clearly defined directions to follow before they become waste, including repair, reuse, refurbishment, recycling for secondary materials, or up-cycling/down-cycling to alternative use.
- Improve fishing gear circular design that use a less diverse range of material types to increase the likelihood and feasibility of materials being re-used or recycled.

Improving monitoring and reporting of ALDFG, EOLFG and ALDAG



- Government Regulation 81/2012 on Domestic Waste Management implements the International Convention for the Prevention of Pollution from Ships (MARPOL). The requirements under MARPOL Annex V Regulation 10.3 to implement a garbage management plan apply to 858 fishing vessels in Indonesia that are larger than 100 GT, but the requirement to carry and fill out a garbage record book does not apply to any of the smaller Indonesia's 171,744 inboard or 181,178 outboard motor vessels. To address plastic leakage from capture fishery and aquaculture sectors, Indonesia could establish national regulations that go beyond the minimum standards outlined in MARPOL Annex V to establish waste reporting requirements for all vessels operating within its maritime jurisdiction, as well as for aquaculture installations.
- Developing e-reporting and e-monitoring prototype systems.

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