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FURTHER CONSIDERATION OF THE DEVELOPMENT OF THE IMO LIFE CYCLE GHG ASSESSMENT (LCA) FRAMEWORK

Design considerations for a robust, comprehensive, and global ILUC risk assessment framework

Submitted by Pacific Environment, CSC and EDF

SUMMARY

Executive summary:	Responding to the invitation to submit proposals on how to implement an indirect land use change (ILUC) risk-based management framework by GESAMP-LCA WG, this document suggests robust, transparent assessment criteria to distinguish between sustainability themes/aspects 4 (carbon stock - direct land use change (DLUC)) and 5 (carbon stock – indirect land use change (ILUC)). Such distinction, along with clear, comprehensive, and evidence-based ILUC risk-tiers, is a critical foundation for an effective management system, the elements of which are further laid out in document MEPC 85/7/32 (Pacific Environment et al.).
Strategic direction, if applicable:	3
Output:	3.2
Action to be taken:	Paragraph 22
Related documents:	MEPC 84/7/16, MEPC 84/7/46, MEPC 84/7/42; MEPC 85/7/4 and MEPC 85/7/32; resolution MEPC.391(81)

Background

1 The report of the fourth meeting of the GESAMP-LCA WG in document MEPC 85/7/4 (Secretariat) sets out the current status on the progress of developing a methodology to define and assess the risk of land use change (LUC). It further invites proposals on how to operationalize the indirect land use change (ILUC) risk-based management framework.

2 Responding to this invitation, and referencing previous submissions, the co-sponsors offer key design considerations for a robust, global, evidence-based ILUC risk assessment framework for consideration by GESAMP-LCA WG, this Working Group and the Committee.

A distinct and accurate definition of ILUC risk categories

3 In document MEPC 85/7/4, GESAMP-LCA WG proposes substantive revisions to the current ILUC-risk definitions in the *2024 Guidelines on life cycle GHG intensity of marine fuels* (2024 LCA Guidelines) (resolution MEPC.391(81)). Under the proposed amendments, the qualitative risk-based approach to ILUC would consist of three categories: high-, medium-, and low-ILUC risk:

.1 high-ILUC risk: all feedstocks would be presumed high-ILUC risk unless classified otherwise;

.2 medium-ILUC risk: feedstock would be defined by land eligibility restrictions that exclude biofuel feedstock cultivation on land with high carbon stock, such as forests, wetlands, or peatlands (sustainability theme/aspect 4 (carbon stock – direct land use change (DLUC))). Medium-ILUC risk feedstock would also be required to demonstrate traceability from feedstock production to the delivery point and to not qualify as low-ILUC risk; and

.3 low-ILUC risk: feedstock would be required to meet the medium-ILUC risk criteria and to comply with at least one of the following additional criteria: being classified as waste or residue, as proposed by GESAMP-LCA WG; not requiring additional land for production, including through a yield increase approach or unused land approach; or fulfilling additional requirements for low-ILUC risk feedstock classification to be recognized by the Committee.

4 For the reasons contained in document MEPC 85/7/32, the co-sponsors do not support these revisions to the current ILUC-risk definitions and suggest further developing these definitions before considering amending the 2024 LCA Guidelines.

5 Of particular concern, the safeguards suggested under the terminology of an "ILUC risk-management approach" are necessary to address DLUC but do not adequately consider ILUC risk, i.e., market-mediated, physically remote, but causally linked to the assessed biofuels project. These safeguards would therefore fail to address the indirect effects that sustainability theme/aspect 5 (carbon stock – indirect land use change (ILUC)), is intended to capture.

6 The 2024 LCA Guidelines define ILUC as "inducing negative changes in the use or management of land which occurs outside the product system being assessed" and further bases this definition on ISO 14067:2018, which describes it "as a change in the use or management of land, which is a consequence of direct land use change, but which occurs outside the product system being assessed." Both references clearly mark the spatial disconnect between biofuel volumes produced and changes in land management.

7 As laid out above, annex 5 of the report of the fourth meeting of GESAMP-LCA WG (MEPC 85/7/4) proposes to qualify medium-ILUC risk feedstocks through traceability to concrete production points that do not have high DLUC. Traceability can demonstrate conditions within the production system, but it cannot capture market-mediated LUC outside that system. The proposed criterion, therefore, cannot address the indirect effects expressly referenced in sustainability theme/aspect 5 (carbon stock – indirect land use change (ILUC)) of the 2024 LCA Guidelines or in the corresponding definition in ISO 14067:2018.

8 While the three-tiered categorization of feedstocks may offer a plausible level of nuance, any measures based on such a narrow definition cannot, on their own, sufficiently reduce ILUC risk since their main effect is local, i.e. inside the individual cultivation system. The lone prioritization of such project-level impacts and measures will not be sufficient to address high-ILUC risks. Rather, an evidence-based, global risk-assessment framework is required to substantiate the tiered approach proposed by GESAMP-LCA WG.

ILUC risk requires global, system-level assessment standards

9 By definition, ILUC takes place beyond the boundaries of any single project and is therefore difficult to detect through site-based audits. Agricultural commodities are traded in interconnected global markets, so additional demand for one crop can affect the prices and production of that crop and its substitutes globally. Illustrating this relation, Chen et al. (2025)[1] found that global biodiesel demand for major vegetable oils (soy, palm, canola, sunflower) increased 8.5% from 2002 to 2018, driving palm oil prices up by 20.8%. As buyers sought substitutes for volumes that were redirected to fuel production, the resulting price effect spread across the vegetable oil market and encouraged new palm oil plantations and deforestation, in Indonesia and Malaysia.[2] This illustrates the ILUC problem: a batch of feedstock may originate from an established cropland and satisfy project-level DLUC requirements while still contributing to deforestation in a completely different country.

10 To complement and contextualize the project-level criteria and definitions set out by GESAMP-LCA WG, system-level land use assessment criteria must be considered to avoid dangerous path-dependencies and a resulting incomplete framework that privileges local certification over proven global interdependencies and trends. Such global assessment criteria can be developed from existing frameworks[3], adjusted for the structure already provided by the 2024 LCA Guidelines, and complement previous work of GESAMP-LCA WG. Without it, the distinctions between ILUC and DLUC, as well as between the high- and medium-ILUC risk categories, are eroded.

11 Consequently, in addition to the local criteria already discussed, an assessment of ILUC risk could build on existing frameworks to incorporate global evidence, while considering alternative or complementary evidence and sources. In particular, qualitative treatment of risk in IMO's regulatory scheme does not preclude the use of quantitative assessments to sort fuels into such risk-based bins/categories:

.1 for example, to identify high-ILUC risk feedstocks, the EU Renewable Energy Directive (RED) framework applies a quantitative threshold based on total global expansion of biofuel feedstocks, in terms of associated land-use/farmland expansion, and the share of that land-use/farmland expansion coinciding with high-carbon stock land. The assessment is based on multiple sources of evidence: the Global Biosphere Management Model (GLOBIOM) economic equilibrium model, geospatial and remote sensing data, publicly available trade and production statistics, and relevant scientific literature;

1 Chen, Tzu-Hui J., Richard J. Sexton, and Aaron Smith (2025). Using Vegetable Oils for Biofuel Accelerates Tropical Deforestation and Increases Carbon Emissions. https://agdatanews.substack.com/p/using-vegetable-oils-for-biofuel

2 Chen et al. (2025). Using Vegetable Oils for Biofuel Accelerates Tropical Deforestation and Increases Carbon Emissions. Pages 6-9 outline the methodology and robustness of this conclusion.

3 Seber,Gonca et al. (2026) Considerations for a qualitative risk-based indirect land use change framework for the International Maritime Organization, International Council on Clean Transportation. http://theicct.org/publication/considerations-for-a-qualitative-risk-based-indirect-land-use-change-framework-for-the-imo-oct26

.2 ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) uses a pair of equilibrium economic models to estimate ILUC emissions, Global Trade Analysis Project – Biofuel (GTAP-BIO) and GLOBIOM. This approach is most reliable where results from various models converge closely.[4] Under CORSIA's reconciliation rule, the assigned ILUC value is defined as the arithmetic average of the two model outputs when the difference between them is within 10% of the baseline fossil value of 89 gCO_2eq/MJ.[5] Otherwise, the assigned ILUC value is defined as the lower of the two modelled emissions intensities plus 4.5 gCO_2eq/MJ. Further, if modelled DLUC emissions exceed the default ILUC emissions, the DLUC value replaces the default ILUC value[6]; and

.3 the state of California's 2015 Low Carbon Fuel Standard (LCFS) includes a similar LUC assessment, based on GTAP-estimated land conversions and supplemented by estimated GHG emissions from the Agro-Ecological Zone Emission Factor (AEZ-EF) model. The resulting total carbon emissions are normalized by the total fuel production and averaged over 30 years. Results are further substituted by a sensitivity analysis for critical parameters through a bespoke simulation model based on expert consultation and a literature review.[7]

12 Building on these precedents, a multimodal approach could be adopted by IMO, whereby combined results are used as parameters to classify ILUC risk.[8] Although the 2024 LCA Guidelines set out a qualitative risk-based approach, economic equilibrium models are still a well-known tool for assessing ILUC risk. A candidate fuel's modelled ILUC emissions intensity can be used for comparison against binning/sorting thresholds rather than a determinate metric itself subject to the emissions tax.

Evolving agricultural realities and changing biofuel demand require regular and comparable reassessment

13 Should the demand for marine biofuels increase, global feedstock markets are bound to evolve. To assess the changes in supply patterns, agricultural production systems, and their interaction with high-carbon stock land, a regular review of feedstock-specific ILUC risk would be necessary. Such a review could be based on regular reiterations, or expand on comparable methodologies to identify land use trends over time and across regions.

4 For instance, under CORSIA, results for most starch and sugar crops converge more closely than those for vegetable oils, which diverge significantly. For details, see: Megan Roux et al. (2024). Which Rules to Follow? How Differences in Renewable Fuel Standards Obscure the Potential Climate Impact of Transportation Fuels. Frontiers in Energy Research 12. https://www.frontiersin.org/journals/energy-research/articles/10.3389/fenrg.2024.1490137/full

5 T&E (2020) Understanding the indirect land use change analysis for Corsia. https://www.transportenvironment.org/articles/understanding-indirect-land-use-change-analysis-corsia

6 International Civil Aviation Organization. *CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels.* https://www.icao.int/sites/default/files/environmental-protection/CORSIA/Documents/CORSIA%20Eligible%20Fuels/ICAO-document-06-Default-Life-Cycle-Emissions-November-2025.pdf

7 California Air Resource Board. LCFS Land Use Change Assessment. https://ww2.arb.ca.gov/resources/documents/lcfs-land-use-change-assessment

8 Seber, Gonca et al. (2026) Considerations for a qualitative risk-based indirect land use change framework for the International Maritime Organization, International Council on Clean Transportation. http://theicct.org/publication/considerations-for-a-qualitative-risk-based-indirect-land-use-change-framework-for-the-imo-oct26

14 The reliance on bioenergy in domestic transport and non-transport sectors rarely takes into consideration parallel global demand: Brazil's 2024 Nationally Determined Contribution (NDC),[9] the United States renewable fuel standards[10] for road transport, Indonesia's Second NDC's[11], or the European Union's[12] planned biomethane production, categorized by some as beyond sustainable levels,[13] all point to an increasing reliance on various biofuels, thereby increasing competition and limit their availability for maritime use. To mitigate compounding risks across regions and sectors, sole reliance on domestic sustainability schemes is insufficient, as they may not address global demand growth and may be suspended under unforeseen demand pressure, as occurred most recently in the suspension of the Amazon memorandum.[14]

15 At the same time, biofuel production is already straining global agricultural systems: the recently published second iteration of the EU's high-ILUC risk assessment showed an increased expansion of multiple feedstock crops into high carbon-stock land (e.g., forests and peatlands). The threshold evaluation identified soy and palm oil as high-ILUC risk. Sugar cane and maize also showed material expansion but did not exceed the threshold to be defined as high-ILUC risk.[15]

16 Adding demand from further sectors, like maritime, will incentivize more biofuel production, and therefore must be accompanied by precautionary monitoring and regular reconsideration of unintended effects, here the risk of ILUC, to satisfy maritime demand.

ILUC risk considerations of feedstocks: establishing distinct, but comprehensive risk categories

17 While the co-sponsors believe a binary ILUC categorization would suffice, GESAMP-LCA WG's three risk categories could be considered appropriate to the range of feedstocks and production pathways available to produce marine biofuels. However, each of these categorizations must be robust, mutually exclusive, and include appropriate measures to manage ILUC risk. Crucially, it must avoid "uncategorized/unassessed" feedstocks, as those would effectively fall outside of the framework and require resource- and time-intensive drafting and assessment exercises, while shipowners and fuel producers are left to estimate and hedge their commercial and environmental risks.

9 Brazilian Government (2024). Brazil's NDC - National determination to contribute and transform.
10 EPA. Renewable Fuel Standard Programme
11 Republic of Indonesia (2025). Second Nationally Determined Contribution
12 COM/2022/230. RePowerEU Plan
13 Feedback EU (2023). Setting a target that is fit for food and the climate – An analysis of biomethane feedstocks to help fast forward sustainable energy and food system transformation.
14 The Guardian (2026). Brazil authorities suspend key Amazon rainforest protection measure. https://www.theguardian.com/environment/2025/aug/21/brazil-authorities-suspend-key-amazon-rainforest-protection-measure
15 A feedstock is classified as high-ILUC risk if an expanding land-use for its production of a triggers two thresholds: >1% of total land-expansion, and >10% of that expansion taking place in high-carbon stock land. Although 16% sugar cane's growth expanded into high-carbon stock land, it missed the thresholds for total global expansion and therefore was not denoted high-ILUC risk. For details, see: Commission Delegated Regulation (EU) 2019/807 (2019), https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R0807. European Commission, 2026, COM/2026/36. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2026:36:FIN.

18 To ensure robustness and inclusivity, the risk categories should be assessed based on general assessment criteria:

.1 high-ILUC risk may be assessed exclusively based on associated direct and indirect LUC. Feedstocks must be considered high-ILUC risk except where robust additionality rules apply, and certification thereof is available;

.2 low-ILUC risk may be assessed/achieved through parallel tracks.[16] Feedstocks fulfilling one of these criteria may be categorized as such:

.1 wastes, residues and by-products, positive list of feedstocks or a decision tree to identify them; and

.2 robust additionality rules and certification thereof: some yield increases, use of degraded and abandoned lands[17], or other land management practices must explicitly avoid market-mediated impacts and land expansion, which can be satisfied by using feedstocks that do not participate in feed and food markets; and

.3 should it be deemed necessary, the medium-ILUC risk category could occupy a middle ground where available evidence does not indicate ILUC emissions severe enough to justify exclusion as high-ILUC risk but does indicate some risk of leakage, land use pressure, or model uncertainty that warrants limits on their use. Such a third category should include safeguards against proliferation, such as contribution caps or conservative emission penalty factors. Its utility depends on the exact definition and criteria for the high-ILUC risk category.

Design considerations for operationalizing an ILUC risk-assessment framework

19 Based on these considerations, a reliable, robust, and transparent risk-assessment and risk-management framework should include, at a minimum, the following elements:

.1 a clear definitional and methodological distinction of direct and indirect land use change (LUC);

.2 comprehensive, mutually exclusive, reliable, and applicable risk categories for feedstocks used in biofuel production;

.3 reproducible, evidence-based, transparent, feedstock-specific assessment methodology based on publicly available evidence;

.4 regular re-assessment of ILUC risk, based on equivalent or expanded methodologies to monitor long-term trends;

.5 a defined reference baseline to assess LUC, set prior to meaningful uptake of biofuel in the maritime sector;

[16] Project-level certification should work as a narrowly defined exception to high-ILUC risk restrictions.

[17] Any claimed production increase should have to be backed by a robust, verified demonstration that it comes from practices adopted specifically because of the policy incentive. Examples of such measures are set out in document MEPC 85/7/32

.6 a clear distinction between the primary, global, evidence-based criteria to assess feedstock ILUC risk, and the separate set of compliance metrics for low-ILUC risk feedstocks; and

.7 a robust link between ILUC risk categories and appropriate measures to manage such risk.

Conclusion and recommendations

20 The co-sponsors of this document invite the Working Group to consider the ILUC risk-assessment design elements as set out in paragraphs 17 to 19.

21 The co-sponsors of this document recommend that the Committee forward this document to GESAMP-LCA WG to consider these design elements and criteria when assessing proposals and further developing the ILUC risk-management framework.

Action requested of the Working Group

22 The Working Group is invited to consider the information provided in this document, in particular the recommendations in paragraphs 20 and 21 and, as appropriate, forward them to GESAMP-LCA WG for further consideration, and take action as appropriate.