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Alternative Fuels

NTU Singapore-led study urges robust fuel certification as shipping scales up green marine fuels

Research, led by MESD at NTU Singapore and commissioned by Pacific Environment, calls for improved traceability, fuel “fingerprinting” and centralised digital database to log all fuel transactions.



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Environmental non-profit Pacific Environment and Nanyang Technological University, Singapore (NTU Singapore) on Tuesday (8 September) have issued a new study highlighting that strict and reliable fuel certification is essential to keep the global shipping industry’s transition to clean fuels “honest and fraud-free”.

The study titled “The role of sustainable fuels certification schemes in maritime decarbonisation,” was led by the Maritime Energy & Sustainable Development Centre of Excellence (MESD) at NTU Singapore.

It evaluates established certification systems — including those by the International Sustainability & Carbon Certification (ISCC) and Roundtable on Sustainable Biomaterials (RSB), Brazil’s RenovaBio, the California Air Resources Board’s Low Carbon Fuel Standard (CARB LCFS), and the U.S. Environmental Protection Agency’s Renewable Fuel Standard (U.S. EPA RFS) — to guide the International Maritime Organisation (IMO) as it establishes global standards for Sustainable Fuel Certification Schemes (SFCS).

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These existing frameworks provide critical blueprints for measuring full-lifecycle carbon emissions, tracking fuel ownership, and ensuring broader environmental sustainability.

Singapore climate specialist, Lim Jie Ying, Pacific Environment, said, “Certification systems will play an essential role in ensuring that zero- and near-zero-emission fuels deliver genuine environmental benefits. As shipping scales up the use of these fuels, we need certification systems that are robust enough to guard against fraud and unsustainable production, while also being practical and workable across complex international supply chains.”

The study outlines major gaps in global fuel supply chains that leave them vulnerable to cheating. For example, documented cases of fraud involving recycled waste, such as used cooking oil and palm oil mill effluent, demonstrate the limitations of verification systems relying purely on paper documentation without physical origin checks.

To tackle these risks, the study recommends chemical testing or fuel “fingerprinting” to verify fuel authenticity independently, alongside stronger cross-checks. It also calls for a centralised digital database to log all fuel transactions, preventing suppliers from falsely claiming the same batch of green fuel more than once.

Lead researcher of the study, Dr Yeoh Keat Ping, Research Lead at MESD, NTU

Singapore, said: “Strengthening the traceability of sustainable fuels through continued research and innovation will be critical in supporting the maritime energy transition. This requires a combined effort across policy formulation, laboratory validation, digital tools and shared industry knowledge. As traded volumes of sustainable fuels grow, these solutions must be robust enough to keep pace with an evolving landscape.”

Additionally, the study addresses the risk of Indirect Land-Use Change (ILUC), where clearing land for fuel crops causes deforestation and displaces food production elsewhere. It urges the IMO to adopt a balanced risk-based approach to cap- or phase-out high-risk crop feedstocks, protecting both ecosystems and global food security.

For Singapore, Pacific Environment notes that the study highlights a key opportunity to strengthen the country’s role as a trusted green maritime hub. By expanding training for local sustainability auditors and adopting fuel fingerprinting techniques, Singapore could ensure high supply chain integrity for alternative fuels moving through Southeast Asia.

Note: The study titled ‘The role of sustainable fuels certification schemes in maritime decarbonisation’ can be found [here](#).

Photo credit: NTU Singapore

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