

Strengthening Malaysia's Energy Sector Greenhouse Gas Inventory through Factor Decomposition Analysis and Standard Operating Procedure Improvement

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Abstract

Malaysia's energy sector is the largest contributor to national greenhouse gas (GHG) emissions, primarily due to electricity generation, transportation, manufacturing activities and continued reliance on fossil fuels. A transparent, consistent and analytically robust GHG inventory is therefore essential for understanding emission trends, meeting international reporting obligations and supporting the formulation of effective climate and energy policies.

The Ministry of Natural Resources and Environmental Sustainability (NRES), in collaboration with relevant national agencies and technical institutions, has initiated activities to strengthen Malaysia's energy sector GHG inventory. Supported by funding from the Japan International Cooperation Agency (JICA), the initiative focuses on two complementary areas: factor decomposition analysis of energy sector emissions and the documentation and enhancement of the Standard Operating Procedure (SOP) for energy sector inventory preparation.

Factor decomposition analysis is undertaken to provide a more comprehensive understanding of the factors driving changes in energy-related GHG emissions over time. The analysis distinguishes the effects of key drivers, including economic and sectoral activity, energy intensity, structural changes, fuel mix and emission factors. This approach enables the inventory team to move beyond reporting changes in total emissions by explaining the underlying reasons for emission increases or reductions across individual energy subsectors. The findings are expected to support the identification of priority mitigation areas, enhance the interpretation and communication of inventory results, and strengthen the linkage between national GHG inventory findings, energy transition planning and climate mitigation policies.

The second component focuses on documenting and strengthening the SOP for Malaysia's energy sector GHG inventory. A key objective of the SOP is to support institutional continuity and facilitate the recruitment, appointment, onboarding and capacity development of new energy sector inventory compilers. It provides structured guidance on inventory boundaries, source categories, activity data requirements, calculation methodologies, emission factors,

documentation procedures and reporting responsibilities. By establishing a clearly documented and reproducible inventory process, the SOP supports knowledge transfer, reduces dependence on individual compilers and helps ensure continuity during changes in personnel or institutional arrangements. It also contributes to maintaining the transparency, consistency, comparability, completeness and accuracy of Malaysia's reporting to the United Nations Framework Convention on Climate Change.

Together, the factor decomposition analysis and SOP enhancement contribute to a more systematic, transparent and policy-relevant energy sector GHG inventory. The initiative demonstrates the value of combining methodological analysis with institutional capacity strengthening to improve inventory quality, support knowledge dissemination and enhance the long-term sustainability of Malaysia's national GHG inventory system.

References/ Publications

Intergovernmental Panel on Climate Change. (2006). *2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

Intergovernmental Panel on Climate Change. (2019). *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories*.

Ministry of Natural Resources and Environmental Sustainability, Malaysia. *Malaysia's Biennial Transparency Report and National Greenhouse Gas Inventory Reports*.

Access to relevant information

Information may be obtained from the Ministry of Natural Resources and Environmental Sustainability Malaysia.