

Supporting Clean Energy in the ASEAN: Policy Opportunities from Sustainable Aviation Fuels Initiatives in Indonesia and Malaysia

A Atmowidjojo^{1*}, E Rianawati¹, B L F Chin², S Yusup³, A T Quitain⁴, S Assabumrungrat⁵, C L Yiin⁶, W Kiatkittipong⁷, A Srifa⁸, and A Eiad-ua⁹

¹ Resilience Development Initiative, Bandung, 40135, Indonesia, ORCID ID: 0000-0002-0002-0955

² Department of Chemical and Energy Engineering, Faculty of Engineering and Science, Curtin University Malaysia, Miri Sarawak, 98009, Malaysia

³ Department of Chemical Engineering, HI CoE: Center for Biofuel and Biochemical, ISB, Universiti Teknologi PETRONAS, Perak, 32610, Malaysia.

⁴ Center for International Education, Kumamoto University, Kumamoto, 860-8555, Japan.

⁵ Bio-Circular-Green-economy Technology & Engineering Center, BCGeTEC, Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn University, Bangkok, 10330, Thailand

⁶ Department of Chemical Engineering and Energy Sustainability, Faculty of Engineering, Universiti Malaysia Sarawak (UNIMAS), Kota Samarahan 94300, Malaysia.

⁷ Department of Chemical Engineering, Faculty of Engineering and Industrial Technology, Silpakorn University, Nakhon Pathom, 73000, Thailand.

⁸ Department of Chemical Engineering, Faculty of Engineering, Mahidol University, Nakhon Pathom, 73170, Thailand.

⁹ College of Materials Innovation and Technology, King Mongkut's Institute of Technology Ladkrabang, Ladkrabang, Bangkok, 10520, Thailand.

^{1*}amelia.christina@rdi.or.id, ¹elisabeth.rianawati@rdi.or.id, ²bridgidchin@curtin.edu.my,

³drsuzana_yusuf@utp.edu.my, ⁴quitain@kumamoto-u.ac.jp, ⁵suttichai.a@chula.ac.th,

⁶clyiin@unimas.my, ⁷kiatkittipongw@su.ac.th, ⁸atthapon.sri@mahidol.edu, ⁹apiluck.ei@kmitl.ac.th



Abstract. Sustainable aviation fuels is a strategic long-term solution for zero-carbon aviation industry by 2050, thus underscoring the need to accelerate the deployment through reforms in the relevant key areas. Aligned to the agenda, this paper aims to study the policy opportunities for drop-in sustainable aviation fuel (SAF) deployment in the ASEAN by considering the initiatives undertaken by Indonesia and Malaysia. Four areas are used as coding framework to assess the current status, challenges, and policy opportunities, namely (1) policy, strategy, and reforms; (2) standards and certification system; (3) economic instruments; and (4) international integration. First, the current status and challenges within each country is assessed. Indonesia has shown a more command-and-control approach with an upfront SAF blending mandate. However, it needs to be supported by several compliance measures. Malaysia, on the other hand, has conducted country assessments but no SAF-specific policy has been issued yet. Both countries still lack the economic instruments, while international integration is still relatively under-explored with only limited inter-regional partnerships. As the biggest palm-oil producing countries, Indonesia and Malaysia possess enormous potentials to lead the region in deploying SAF, thus more initiatives are urged.

1. Introduction

Air transport has been relied on by millions of people in business and governments for many purposes worldwide. Aviation accounts for 2% of global greenhouse gas (GHG) emissions [1], while small in the absolute terms, it is an important transportation means with a 13% share of transport sector emissions [2]. To join transport sector decarbonization efforts, air transport is racing towards the 2050 global goals of sustaining carbon-neutral growth and reducing net CO² emissions by 50% of what they were in 2005, and eventually, reaching zero-carbon connectivity by 2060/65 [3].

As part of a decarbonization pathway, calls to action have been rolled out both from in-sector and out-of-sector approaches. Unlike cars, planes have no short-term alternatives to liquid fuels, especially for long-haul flights. In addition, air transportation infrastructures are designed to last for decades, therefore new fuels must be drop-in biofuel. Drop-in biojet fuels or termed sustainable aviation fuels (SAF) can be the single largest opportunity to meet and exceed the 2050's goal as it plays a significant role in the long-term scenarios [3]. However, the industry has been slow to expand due to strong economic barriers to SAF deployment with only 0.01% of global jet fuel use. The barriers include technological maturity, certification of more conversion pathways, scale-up and commercialization, price parity gap with fossil fuels, and competition with road transportation biofuels [4].

Long-term supporting policies are considered crucial to address these challenges until the SAF technology comes out of its infancy. On the other hand, another barrier is the international nature of aviation which has resulted in delayed national policy development [5]. However, enacted measures by the International Civil Aviation Organization (ICAO) only covers emissions from international flights, hence it has stated that it will be upon individual nations to bear the responsibility in deploying SAF, particularly for domestic flights [4]. Therefore, different policies may exist harmoniously at national and international levels. Government institutions will be the spearhead for fostering national SAF industry by defining the goals and targets, legislation, taxation, and support measures.

That being said, every region has strong justification to take their initiatives in supporting SAF deployment, including ASEAN region which is projected to experience CAGR of 5.8% in air travel demand from 2016-2036 [6]. Indonesia, for example, is at the top of the large emerging market economies with expected following air market growth of 3.6% each year and 310 million passengers predicted to travel via Indonesia alone by 2035 [3,6]. With its huge contribution to aviation, the region lacks the initiatives with only apparent progress made in limited ASEAN Member States (AMS) [7–10]. Despite the lagging progress, studies related to SAF development studies scarce, with more focus placed on the technical aspects although lacking of regulation has been spotted as one of the prominent challenges [11,12]. To address the gap, the assessment of policy opportunities in this study will cover the identified four key areas to offer a holistic perspective for a more robust policymaking.