Title: Harmonizing Nuclear Transport Governance in ASEAN: Legal and Maritime Imperatives

The Association of Southeast Asian Nations (ASEAN) presents a maritime-intensive operational and legal environment that complicates governance of nuclear fuel transport. Nine of the ten ASEAN Member States (AMS) are coastal or archipelagic, and several have overlapping or disputed maritime claims [1], raising questions of jurisdiction, liability, and transboundary risk. As several Member States are planning civil nuclear energy programmes with target timelines in the 2030s, the maritime import of nuclear fuel and related materials will likely remain an essential step until any domestic fuel-cycle facilities are developed, whether front-end or back-end [2].

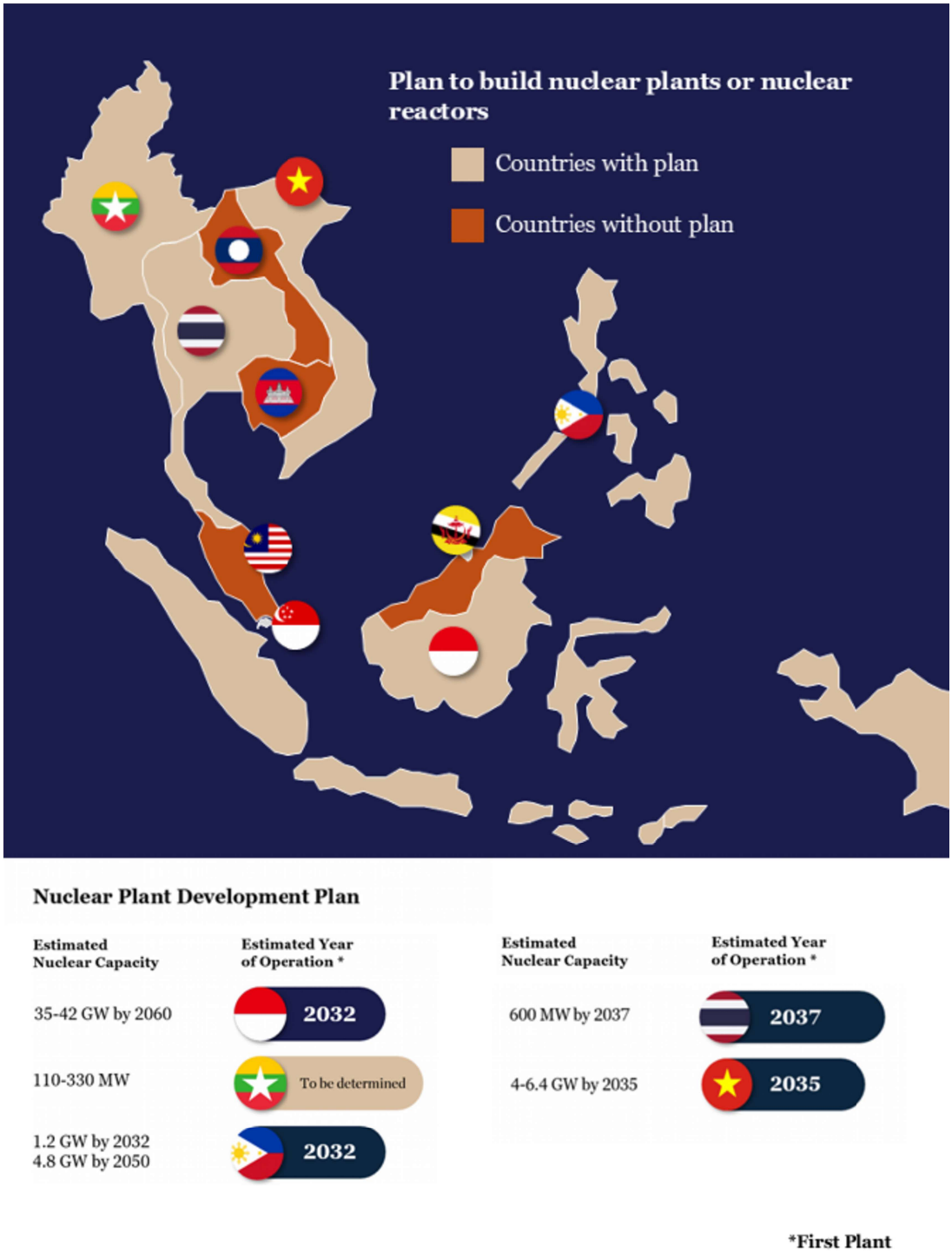

Figure 1: Current planned nuclear capability in the region, taken from [13]

Maritime chokepoints and transport exposure

The Straits of Malacca and Singapore (SOMS) recorded ~94,000 vessel transits in 2024, with the number expected to grow every year [3]. These straits are geographically narrow at points, heightening the risks of congestion, collision, and piracy [12]. Alternative passages such as the Lombok Strait fall within Indonesian jurisdiction but involve longer routes [4]. Any serious incident within these chokepoints would produce transboundary effects, disrupting energy supply chains and raising public safety and environmental concerns across multiple states.

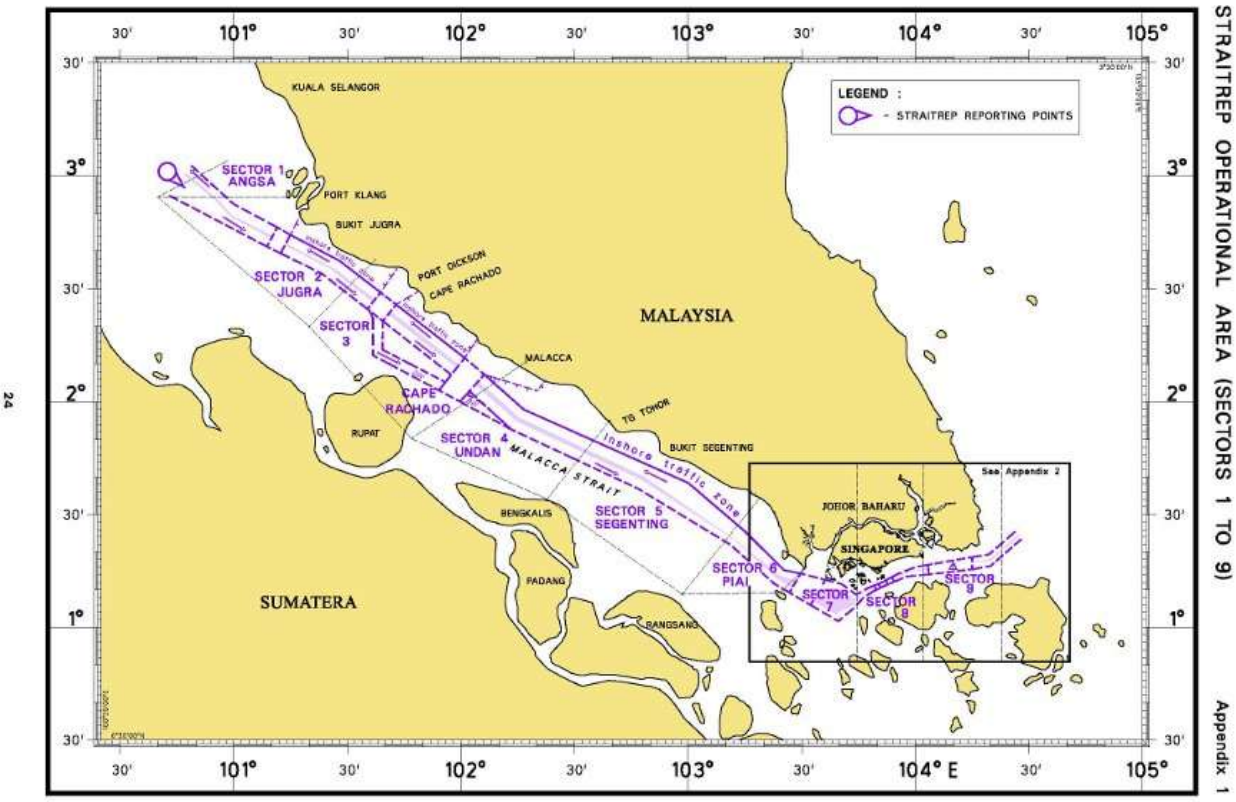

Figure 2: SOMS STRAITREP operational areas, taken from [14]

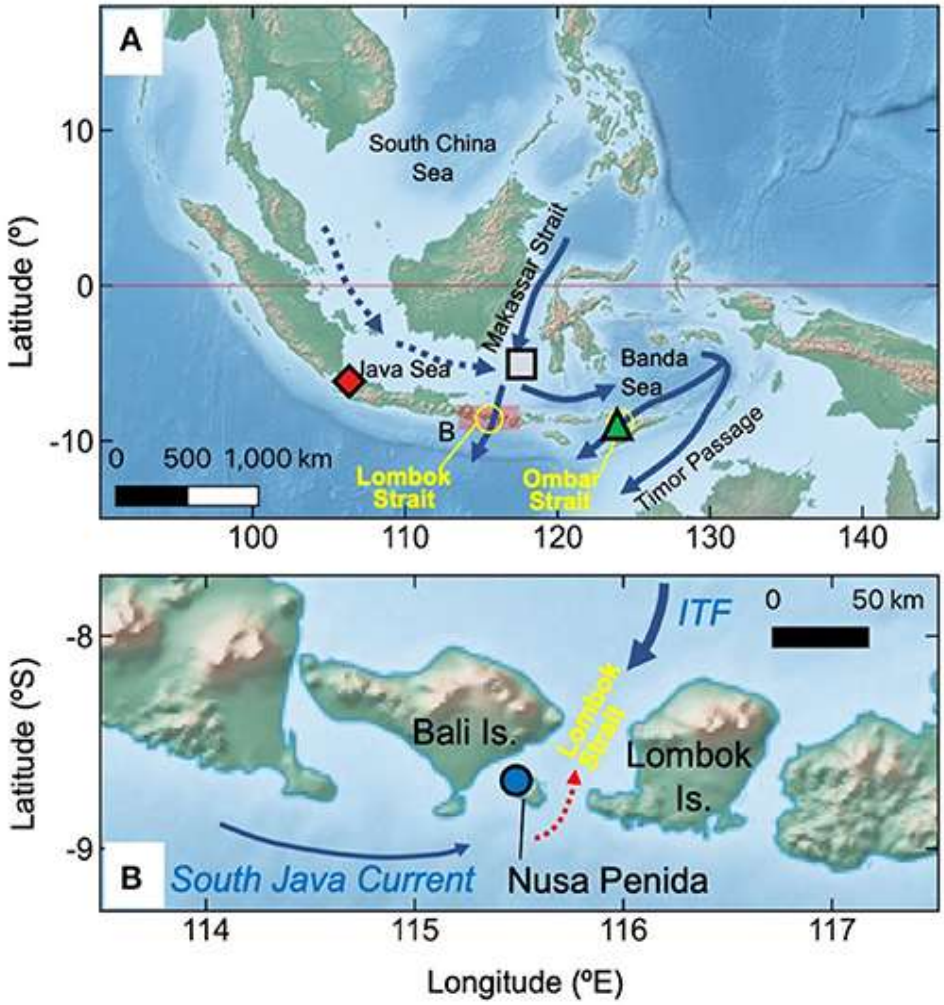

Figure 3: Relative position of Lombok Strait in the region, taken from [15]

Dependence on international supply and transport scale

ASEAN currently has no commercial fuel fabrication or nuclear waste repository infrastructure, and also lacks a clear, regionally accepted waste strategy [13]. Nuclear newcomers will likely rely on imported nuclear fuel from established suppliers in other continents, through maritime transport routes. Without standardized approaches, disparities in national practice could complicate both routine shipments and emergency response, thus underscoring the importance of a harmonized approach.

While limited airborne shipment of small radioactive sources is permitted, international best practice remains to move bulk nuclear fuel and radioactive materials by sea, consistent with IAEA guidance [5][6]. Maritime transport thus remains the globally accepted standard for routine nuclear consignments.

Fragmented legal and liability framework

Legal commitments across ASEAN remain patchy for now. To date, the Philippines is the only ASEAN member to ratify a global nuclear liability convention [7], while Indonesia has taken a preliminary step by signing the Convention on Supplementary Compensation [8]. As a result, most ASEAN states rely on general maritime law under UNCLOS and International Maritime Organization (IMO) instruments such as the International Maritime Dangerous Goods (IMDG) Code for hazardous consignments [6]. This fragmented approach generates gaps in liability coverage, transboundary compensation, and coordinated emergency response. Recent initiatives demonstrate growing awareness of these deficiencies, but regional harmonization remains nascent [9][10].

Recommended harmonization agenda

This paper argues that ASEAN should move beyond, and establish a regional framework that:

1. Creates explicit protocols for nuclear fuel transport aligned with IAEA safety standards and the IMO IMDG Code.
2. Builds a coordinated EPR mechanism under the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) [11].
3. Develops mutual recognition of port inspections, certifications, and liability provisions across ASEAN Member States.

Conclusion

ASEAN's geographic realities - archipelagic structures, congested maritime chokepoints, and the absence of domestic fuel-cycle facilities - mean that nuclear transport will remain unavoidable and transboundary. A harmonized ASEAN approach would directionally reduce vulnerabilities, improve public confidence in a region still developing its nuclear governance capabilities, and align the region with global best practices. Importantly, it would also allow ASEAN to present itself as a responsible and proactive actor in the global nuclear order, demonstrating that civil nuclear development can proceed in step with robust safety, security, safeguards, and liability frameworks. Moving decisively on this issue is not just beneficial; it is essential to ensuring that the region's nuclear ambitions evolve safely and sustainably.

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