Connecting the Dots: The Convergence of Trade-Based Money Laundering and Environmental Crimes in Southeast Asia

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How to Cite: Yousop, N. L. M., Razak, N. H. A., Noordin, B. A. A., & Zakaria, W. M. F.W. (2025). Connecting the dots: The convergence of trade-based money laundering and environmental crimes in Southeast Asia. *Journal of ASEAN Studies, 13*(2), 371-391. https://doi.org/10.21512/jas.v13i2.10304

Abstract

Criminals increasingly resort to trade-based money laundering (TBML) from environmental crimes to conceal illicit funds by exploiting complexities and loopholes in trade transactions. In this study, an extensive analysis was conducted across prominent databases such as Scopus, WoS, and Google Scholar, focusing on TBML and environmental crime research from 2007 to 2025. The study's primary objective is to comprehensively explore the extent of TBML and environmental crime in Southeast Asia while identifying current research trends and the interconnections between these two phenomena. Despite the widespread incidence of environmental crime in the region and substantial evidence of associated money laundering involving natural resources, the findings indicate that scholarly work on TBML remains limited and fragmented. The review further shows that corruption, weak law enforcement capacity, and technological change continue to facilitate TBML. Trade misinvoicing appears to be the dominant laundering technique, complicating detection and weakening enforcement responses. The findings highlight a significant gap between the scale of the problem and the development of the academic literature, underscoring the need for stronger regulatory frameworks, improved enforcement coordination, and greater policy attention to the misuse of international trade for illicit financial flows in Southeast Asia.

Keywords: money laundering, trade-based money laundering, environmental crime, international trade, Southeast Asia

Journal of ASEAN Studies, Vol. 13, No. 2 (2025), pp. 371–391
P-ISSN 2338-1361/ E-ISSN 2338-1353
Received: 25th July 2023/ Revised: 09th March 2026/ Accepted: 09th March 2026

Introduction

Money laundering represents a profound structural vulnerability to global economic stability, institutional integrity, and the trajectory of sustainable development. Current empirical estimates suggest that illicit financial flows constitute a subterranean economy accounting for 2 percent to 5 percent of global gross domestic product, translating to an annual volume of approximately USD 800 billion to USD 2 trillion (Camdessus, 1998; Ferwerda, 2023; Ferwerda & Unger, 2021). Substantively, money laundering is the clandestine process by which illicitly generated capital is obfuscated, transformed, and seamlessly reintegrated into the formal economy through ostensibly legitimate commercial architectures (Schroeder, 2001; Tanzi, 1996). Far beyond a simple mechanism of concealment, this process allows criminal proceeds to penetrate legal financial systems actively. In doing so, it recycles capital in ways that systematically erode the traceability of unlawful origins, thereby preserving the purchasing power of criminal syndicates. Consequently, these unchecked financial flows distort macroeconomic resource allocation, compromise institutional efforts to dismantle transnational organized crime, and severely obstruct the recovery of stolen assets (Afolabi, 2023; Afolabi & Babatunde, 2025; Masciandaro, 2017; Rikkilä et al., 2021).

Historically, global anti-money laundering (AML) enforcement has concentrated on fortifying the primary entry points of the formal banking and financial sector. This regulatory tightening has inadvertently triggered a displacement effect, prompting criminal actors to reroute illicit value through the highly porous channels of international commerce (Zdanowicz, 2004, 2017). This sophisticated displacement is operationalized through TBML, defined as the strategic exploitation of trade transactions, financing, and associated documentation to disguise the transfer of value and legitimize criminal proceeds (Financial Action Task Force, 2006; Financial Action Task Force & Egmont Group, 2020). By manipulating trade documents, TBML seamlessly embeds illicit value within the high-volume complexities of global supply chains. The enduring persistence of this modality is a direct function of the sheer scale, velocity, and inherent opacity of global maritime and terrestrial trade. This is further compounded by jurisdictional fragmentation, asynchronous customs data, and asymmetric regulatory enforcement across different borders. Consequently, legitimate international trade is systematically co-opted and transformed from a vital engine of economic growth into a covert vehicle for concealing criminal proceeds, evading regulatory scrutiny, and sustaining the operational capacity of broader corruption networks (Hataley, 2020; Marzouk, 2022; Tiwari et al., 2024).

Within this paradigm, environmental crime is uniquely situated to exploit vulnerabilities in the global trading system. Unlike purely digital or financial crimes, environmental crime is inherently physical because it relies heavily on the logistical infrastructure of cross-border trade and commercial documentation to move illicit commodities and their associated capital through formal global markets. Encompassing the illegal extraction, exploitation, and trade of natural resources and environmentally sensitive goods (Financial Action Task Force, 2021; Scott, 2024; Yamaguchi, 2023), this category of crime finds a highly strategic and lucrative foothold in Southeast Asia. The region's dense maritime

connectivity, unparalleled biodiversity, and high concentration of valuable natural resources create structural opportunities for criminal actors to physically and financially nest illicit activities within legal trade flows. Empirical evidence from the Global Organized Crime Index underscores a profound regional vulnerability to these offenses, particularly those involving high-value flora and fauna (Bueta, 2021; Dang et al., 2021; Koshy, 2020). Criminal syndicates frequently commingle illicit environmental goods with legitimate cargo, a dynamic that overwhelms the technical, evidentiary, and resource capacities of border authorities, thereby neutralising their ability to identify and disrupt criminal networks operating within formal trading systems.

Despite the intersecting gravity of ecological degradation and financial subversion, the specific nexus between environmental crime and TBML remains critically under-theorized and empirically neglected. While the prevailing literature has extensively documented environmental crime, broad patterns of illicit trade, and localized governance deficits in emerging economies, it has paid surprisingly limited attention to the precise economic, financial, and commercial mechanisms that link environmental exploitation and trade-based money laundering in Southeast Asia.

In this context, the present study synthesizes the relevant scholarly literature, policy reports, and empirical evidence published between 2007 and 2025 to examine TBML activities in relation to environmental crime issues, particularly in Southeast Asia. This longitudinal perspective enables a systematic assessment of the channels, institutional conditions, and operational mechanisms linking these activities. By clarifying this relationship, the study develops a more integrated understanding of an underexamined dimension of illicit trade. It offers policy-relevant insights for anti-money laundering enforcement, customs oversight, and regional regulatory cooperation.

Overview on the Research Trends

To address the research objective and respond to the existing knowledge gap, this study employs a systematic secondary data analysis. A focused search strategy was developed using the keywords presented in Figure 1, and relevant publications were retrieved from the Scopus database for the period 2007 to 2025. The starting point of 2007 was selected because it marks the earliest identifiable study on TBML. The sample includes journal articles, books, book series, and conference proceedings. These records are examined to identify both the historical development and emerging trajectories of the literature. The extracted information was then compiled into a purpose-built Excel dataset using comma-separated values (CSV) and Research Information Systems (RIS) download formats. This approach ensures consistency in data organization and enabled an assessment of publication patterns through descriptive indicators such as frequency counts and percentage distributions.

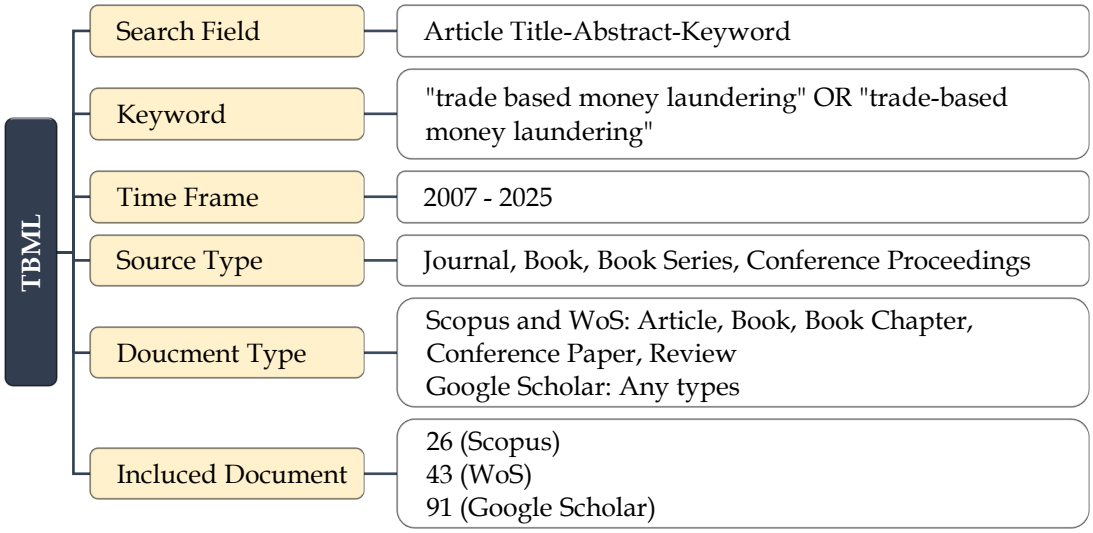


Figure 1. The TBML Search Strategy

The initial search results point to the limited scale of the TBML literature. By the end of 2025, only 26 relevant articles or books were identified in the Scopus database. To place this finding in a broader comparative context, the search was extended to the Web of Science and Google Scholar. Over the same period, WoS returned 43 records, while Google Scholar identified 91 results. To improve precision in Google Scholar, the search was further refined using the command "allintitle trade-based money laundering". A closer review of the retrieved records revealed some overlap across databases, with several publications appearing in both Scopus and the other platforms. Despite differences in database coverage, the evidence consistently indicates that the overall body of TBML research remains limited.

A review of the early literature also reveals several important reference points in the field's development. One of the most influential early contributions was the Financial Action Task Force report *Trade-Based Money Laundering*, published in 2006, which helped shape subsequent policy discussion and scholarly attention. Evidence from Google Scholar further suggests that Zeng-An and Li-Fang (2006) offered one of the earliest academic discussions of TBML in a conference proceeding, focusing on artificial transfer pricing and its estimated contribution to the global money laundering pool. In addition, the WoS database identifies Thanasegaran and Shanmugam (2007) as an early study examining TBML in Malaysia. This contribution is particularly important because it provides one of the earliest country-level analyses of TBML in Southeast Asia. Taken together, these early studies suggest that although TBML has been recognized for nearly two decades, the pace of academic development has remained relatively slow.

This limited development becomes even more apparent when attention shifts to the intersection between TBML and environmental crime. To examine this relationship more systematically, the search strategy was refined by combining the terms "trade-based money laundering" and "environmental crime" within the Article Title, Abstract, and Keyword fields, as shown in Figure 2. This search yielded only one record in Scopus in 2025. WoS produced an equally limited result, identifying one record in the same year by a different

author. Such sparse coverage indicates that the direct intersection between TBML and environmental crime remains only marginally represented in the indexed literature. More importantly, it suggests that TBML has not yet been examined in a sustained way as a financial dimension of environmental crime.

To situate this pattern within the broader research landscape, the search was expanded to include the terms "money laundering" and "environmental crimes". Under this broader search, Scopus returned 28 documents, with the earliest publication appearing in 2014 and annual output rising to six articles in 2025. By contrast, WoS identified only two documents, both published in 2025. Although this broader literature remains modest in size, it nonetheless points to a gradual increase in scholarly interest in the financial dimensions of environmental crime. This contrast is important. While the wider literature on money laundering and environmental crime has started to gain visibility, the specific role of TBML within that nexus remains largely overlooked.

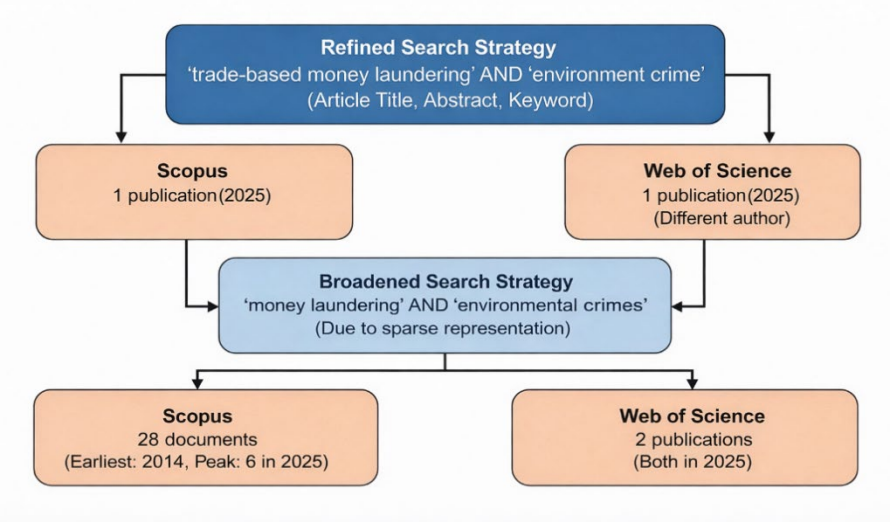


Figure 2. The TBML and Environmental Crime Search Strategy

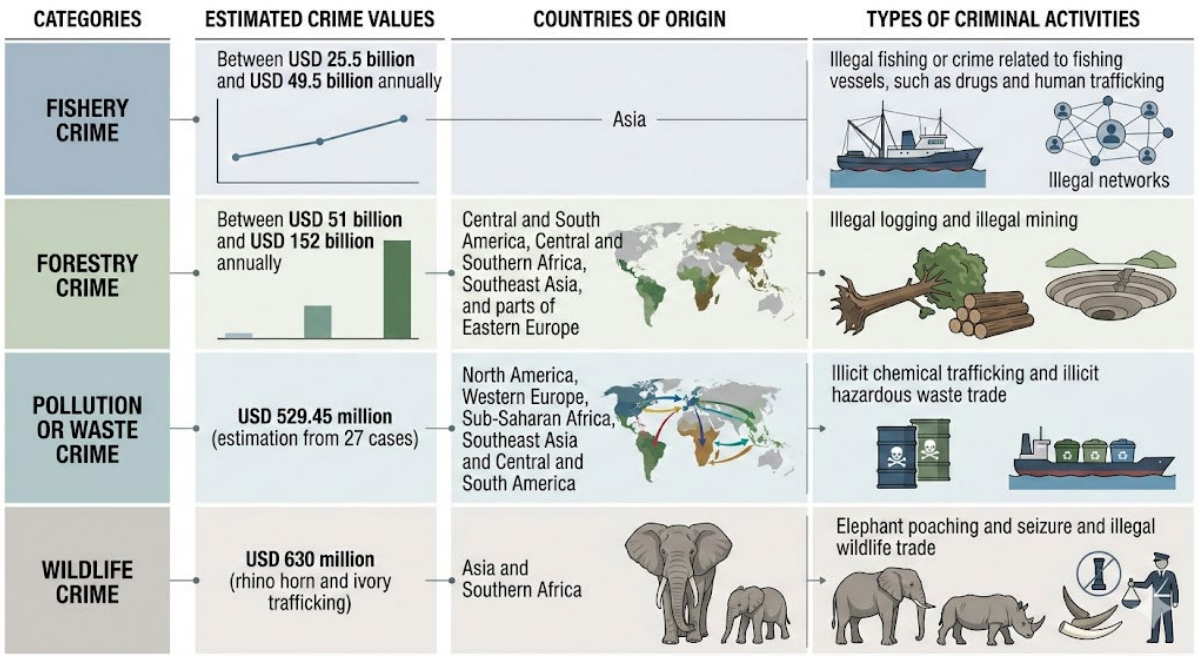
This gap is particularly significant given recent developments in the policy domain. Financial Action Task Force reports published in 2020 and 2021 contributed to the early recognition of financial concealment as a central feature of environmental crime. However, the limited number of records retrieved from Scopus and WoS suggests that this policy recognition has not yet been matched by equivalent progress in academic research. Much of the existing literature continues to focus on predicate offenses such as illegal logging, wildlife trafficking, illegal fishing, and hazardous waste dumping, often through the related perspectives of corruption, weak governance, and regulatory failure (Arminen & Menegaki, 2019; Cerutti et al., 2013; Cozma et al., 2021; Mohd Noor et al., 2022; Smith, 2023; Sulemana & Kpienbaareh, 2020). By contrast, considerably less attention has been given to the financial mechanisms through which the proceeds of such crimes are concealed and laundered, particularly through international trade channels.

This imbalance in the literature reinforces the need for further inquiry. As Ferwerda (2023) argues, money laundering research remains at a developmental stage and continues to

require more credible and reliable estimation approaches. In the context of environmental crime, this limitation is even more pronounced. Existing scholarship has yet to clearly explain how laundering mechanisms operate across environmental crime markets or how trade-based channels may facilitate the movement, disguise, and integration of illicit proceeds. The present study, therefore, contributes by addressing an underdeveloped area of research at the intersection of TBML and environmental crime, where both conceptual understanding and empirical evidence remain limited.

The Rise of Environmental Crimes in Southeast Asia

Environmental crimes comprise illegal activities that damage, exploit, or unlawfully appropriate the natural environment and its resources, including forest crime, illegal wildlife trade, illegal mining of gold and other minerals, illegal fishing, and the illicit trafficking of waste and fuel (Financial Action Task Force, 2021). Within the context of international trade, these offenses are characterised by their transnational nature, generating cascading ecological and socio-economic impacts across regional borders (Lupton, 2023; van Uhm & Wong, 2021; Yamaguchi, 2023). As shown in Figure 3, environmental crimes can be grouped into four main categories, namely wildlife crime, pollution and waste crime, forestry crime, and fishery crime, with Asia, and particularly Southeast Asia, among the most severely affected.



Note: Information was compiled from the International Criminal Police Organization (INTERPOL) and United Nations Environment Programme (UNEP) websites. The origin and direction of each crime type were adapted from Baker (2005) with additional information from the Financial Action Task Force (2021). The image was generated using AI Gemini.

Figure 3. Categories of crime, estimated crime values, countries of origin or direction, and types of criminal activities.

This severity is also reflected in Table 1, which reports persistently high scores for both flora and fauna crimes in Southeast Asia from 2021 to 2025. Flora crime increases from 5.86 in 2021 to 6.18 in 2023 before easing slightly to 6.09 in 2025, indicating sustained pressure from illegal logging, timber trafficking, and related plant-based offenses. Fauna crime is even more pronounced, with scores of 7.09 in 2021 and 7.23 in both 2023 and 2025, the highest in the sample across the observed period and exceeding other high-risk regions such as Central Africa, West Africa, and South America. This persistence indicates that wildlife trafficking and related fauna offenses remain entrenched rather than episodic, underscoring the seriousness of environmental crime in Southeast Asia and providing context for why illicit proceeds generated from these activities may require concealment through mechanisms such as TBML within legitimate trade and financial systems.

Table 1. Flora and Fauna Crimes by Region

Region	**Flora crimes**			**Fauna crimes**		
	2021	**2023**	**2025**	**2021**	**2023**	**2025**
Central Africa	5.73	5.82	5.86	5.64	5.59	5.68
East Africa	4.61	4.94	5.06	5.56	5.94	5.94
North Africa	1.92	1.75	1.58	4.08	4.67	4.83
Southern Africa	4.38	4.69	4.46	5.35	5.65	5.77
West Africa	5.58	5.46	5.57	5.69	5.85	5.77
Caribbean and Central	3.48	3.60	3.82	3.79	3.98	4.33
North America	2.25	2.25	2.25	4.25	4.25	4.50
South America	5.04	5.29	5.67	4.96	5.33	5.75
Central Asia and the Caucasus	2.81	2.88	2.69	3.75	3.69	3.81
Eastern Asia	4.60	4.90	4.70	5.40	5.30	5.40
Southeast Asia	**5.86**	**6.18**	**6.09**	**7.09**	**7.23**	**7.23**
Southern Asia	4.75	5.00	5.06	5.50	5.63	5.75
Western Asia	3.61	3.50	3.43	4.68	4.75	4.82
Central and Eastern Europe	4.12	4.41	4.24	3.88	4.18	3.94
Northern Europe	1.44	1.75	1.94	2.25	2.50	2.56
Southern Europe	2.13	2.25	2.25	3.06	3.19	3.31
Western Europe	2.05	2.36	2.41	3.09	3.18	3.18
Australia and New Zealand	2.50	2.50	2.75	3.50	4.00	3.18
Melanesia	4.60	4.90	6.00	5.80	5.80	6.50
Micronesia	1.00	1.13	1.10	5.63	6.25	6.30
Polynesia	1.17	1.17	1.17	3.50	3.83	4.17

Note: The data was obtained from the Global Initiative Against Transnational Organized Crime 2021, 2023 and 2025. The total score displayed was manually calculated by taking the average index score from the Flora and Fauna crimes index.

Southeast Asia occupies a particularly important position in the global geography of environmental crime because of the interaction among abundant natural resources, strong

domestic and international demand, and uneven regulatory capacity. The region's porous land borders and strategically located maritime routes have increased its attractiveness to organized criminal networks engaged in the cross-border movement of illicit environmental goods (Schaper, 2020). These vulnerabilities are compounded by uneven enforcement across ASEAN member states, which creates opportunities for illegal activities to shift across jurisdictions in response to differences in monitoring capacity and regulatory intensity. Illegal logging remains a notable example, as it continues to drive deforestation and intensify broader environmental and climate-related risks in the region (Mohd Noor et al., 2022). Simultaneously, the illicit trade in endangered species and the burgeoning "e-waste" processing industry in Thailand and Malaysia underscore a shift toward increasingly sophisticated, high-polluting illegal operations (Baldé et al., 2022; Bueta, 2021). Following China's 2018 "National Sword" policy, which restricted plastic waste imports, Southeast Asia became the primary destination for global waste flows, often bypassing local regulatory controls despite repatriation efforts (Dermatas & Georganti-Ntaliape, 2020; United Nations Office on Drugs and Crime, 2022). These trends suggest that current legal frameworks are failing to keep pace with the scale of the problem, necessitating a shift toward treating these activities as sophisticated financial enterprises.

In recent years, the transition of environmental crime from a regulatory nuisance to a transnational financial threat has been underscored by its deepening integration into global money laundering circuits (Financial Action Task Force, 2020, 2021). The economic incentive structure of these crimes is defined by a high-return, low-risk profile, in which offenders maximize utility by evading taxes, regulatory compliance, and waste-disposal costs. A critical, yet often overlooked, driver of this financial attractiveness is the valuation gap. Unlike fiat currencies or precious metals, environmental resources such as rare timber or minerals, lack standardized, transparent pricing mechanisms (Gan et al., 2016; van Uhm & Nijman, 2022; van Uhm & Zhang, 2022; Yamaguchi, 2023). This structural opacity creates a "valuation vacuum" that criminal syndicates exploit through price manipulation and misreporting to conceal illicit gains (Quah & Tan, 2019). By laundering these proceeds through legitimate financial channels, offenders effectively decouple the illicit origin from the capital, making it increasingly difficult for authorities to disrupt the flow.

TBML as an Operational Conduit

TBML is an illegal activity, causing a direct impact on government finances and public services and fuelling organized crime, thereby threatening economic stability and societal well-being (Financial Action Task Force, 2006; OECD, 2019; Saenz & Lewer, 2022). Financial Action Task Force (2006, p. 3) defined TBML as "the process of disguising the proceeds of crime and moving value through trade transactions (by making false invoices, misrepresenting goods to avoid controls, and breaking other customs and tax laws) to legitimize their illegal origin or finance their activities."

TBML exploits the infrastructure of international trade to move illicit value across borders while preserving the appearance of legitimate commerce. Operationally, it relies on

manipulations of trade documentation and shipment attributes, including false invoicing, fabricated supporting documents, and misstatements of value, quantity, ownership, origin, or product characteristics. Reported typologies also include phantom shipments and multiple invoicing for a single consignment, which complicate verification and increase concealment capacity (Financial Action Task Force & Egmont Group, 2020).

The structural features of cross-border commerce create particularly favorable conditions for laundering proceeds derived from environmental crime. Consistent with Becker's (1968) rational choice framework, TBML reflects strategic behavior that exploits opacity in supply chains, the multiplicity of intermediaries, and the administrative complexity of trade finance and customs procedures (Batayneh et al., 2022; Mavrellis, 2021a, 2021b). By embedding illicit value within routine trade flows, criminal networks can circumvent AML controls and weaken domestic revenue mobilization, particularly in developing economies. Evidence from the Environmental Investigation Agency's crime tracker indicates a marked increase in recorded illegal timber trade incidents over time, rising from 27 incidents in 2006 to 2010, to 423 in 2011 to 2015, 849 in 2016 to 2020, and 809 in 2021 to 2025. This pattern suggests that illegal timber trade has become more pervasive and systematically documented in recent years. However, these figures should be interpreted with caution because the EIA crime tracker is a relatively new database and early observations, especially before 2005, are sparse or unavailable. As a result, the reported incidents are unlikely to capture the full scale of the problem. Further evidence from Indonesia-Singapore trade discrepancies shows that systematic export under-invoicing generated an estimated USD 563 million in forgone tax revenue over four years (Rusydi et al., 2023). These vulnerabilities are compounded by oversight is uneven across trade intermediaries and financial institutions, enabling illicit actors to penetrate the formal financial system through weaknesses in governance and supervision (Masciandaro, 2013; Naheem, 2017).

Empirically, TBML measurement remains contested, and the literature has therefore developed along complementary qualitative and quantitative lines. Case-based research has been important in clarifying practical laundering mechanisms that are not captured in aggregate statistics (Hataley, 2020; Morshed & Rahman, 2021; Sinno et al., 2023; Tiwari et al., 2024). Quantitative studies, in turn, use bilateral trade records to construct indicators of exposure, often through models designed to detect anomalies consistent with illicit value transfer. Within this strand, trade misinvoicing is typically defined as deliberate falsification of prices, quantities, or product attributes in official documentation to transfer value across borders while maintaining an outwardly legitimate transaction record (Kwaramba et al., 2016; Patnaik et al., 2012; Umar, 2023). (Global Financial Integrity, 2023) identifies misinvoicing as the dominant operational method and reports that it accounts for 63 percent of documented cases.

Trade misinvoicing is commonly implemented through under-invoicing or over-invoicing of declared import and export values (McSkimming, 2010; Soudijn, 2014; Zdanowicz, 2017). Over-invoicing inflates declared values to justify outward transfers beyond the true commercial payment obligation. Under-invoicing suppresses declared values to reduce customs duties and tax liabilities, while enabling covert capital movement. Both

practices weaken trade controls, reduce fiscal capacity, and facilitate laundering while transactions retain documentary features consistent with lawful trade (Kravchenko & Duval, 2022; Tandon & Rao, 2017; Umar, 2023). Developmental implications are especially severe in settings where enforcement capacity and fiscal space are constrained. Longitudinal evidence for 134 developing economies over 2009 to 2018 documents persistent and geographically concentrated discrepancies, with several Southeast Asian economies among those exhibiting large divergences between reported bilateral trade values (Global Financial Integrity, 2023). Such patterns are consistent with the view that misinvoicing is structurally embedded within illicit financial flows rather than an episodic irregularity, with cumulative losses limiting public investment and progress towards the Sustainable Development Goals (SDGs).

The TBML and environmental crime nexus further intensifies evidentiary and enforcement challenges because falsification often extends beyond valuation to product identity, legality, and provenance. Trade documentation can be used to reclassify illegally extracted resources as lawful commodities, thereby enabling criminal proceeds to enter formal trade channels (Financial Action Task Force, 2021). Illustrative cases include minerals shipped under invoices that misstate origin, rosewood misdeclared as tea leaves, and illegal timber concealed within otherwise legitimate consignments (Mugyenyi et al., 2023). These examples indicate that laundering in environmental crime settings frequently combines price manipulation with product misdescription, obscuring both illicit value transfer and the unlawful ecological origin of the goods.

Despite its analytical usefulness, the literature cautions against interpreting bilateral trade discrepancies as direct measures of TBML volumes. Gaps can arise from reporting lags, valuation conventions, timing mismatches, classification errors, and non-criminal capital flight dynamics (Soudijn, 2014). Alternative estimation approaches, including the Gross Excluding Reversals method, aim to reduce noise in trade-gap measures, yet debates persist regarding their validity across developing and transitional economies. Collin (2020) argues that this method may insufficiently account for legitimate structural sources of trade gaps and may therefore overstate illicit flows. On this basis, trade misinvoicing estimates are most defensible as indicators of elevated TBML exposure rather than one-to-one measures of laundering activity.

Institutional Asymmetry, Regulatory Arbitrage, and Digital Opacity in TBML

TBML is best understood not as a discrete compliance failure but as a mechanism for transferring illicit value through cross-border commercial transactions under conditions of weak observability. In this context, corruption is not merely a background risk. It is a structural enabler that lowers transaction costs for illicit actors and weakens the credibility of regulatory verification across the trade chain. By influencing customs inspection, invoice validation, licensing procedures, and enforcement discretion, corruption allows manipulated trade documents and mispriced transactions to be embedded within otherwise legitimate commercial activity (Cerutti et al., 2013). Its central role lies in reducing the probability that

discrepancies between the real and declared value of trade are detected and sanctioned. This risk is especially salient in Southeast Asia, where substantial variation in governance quality and political stability creates pronounced institutional asymmetries across jurisdictions (Schoeberlein, 2020). These asymmetries produce uneven regulatory intensity and fragmented monitoring capacity, which in turn create opportunities for regulatory arbitrage. Illicit actors can redirect trade flows, payment arrangements, and documentary practices towards jurisdictions characterized by weaker enforcement, lower transparency, or higher susceptibility to administrative capture. TBML, therefore, should not be viewed solely as transaction-level manipulation. It is also a regional phenomenon sustained by cross-country variation in state capacity and institutional integrity.

The persistence of TBML further reflects a widening gap between the sophistication of laundering techniques and the adaptive capacity of regulatory systems. Criminal networks increasingly rely on multi-layered invoicing practices, shell entities, third-party intermediaries, and fragmented logistics arrangements that obscure the economic substance of trade transactions (Nellemann et al., 2018). By contrast, supervisory institutions often remain constrained by limited data integration, weak inter-agency coordination, and resource-intensive monitoring procedures. This creates an enforcement lag in which illicit actors can innovate faster than regulators can respond. As a result, formal compliance frameworks may appear extensive while remaining limited in operational effectiveness. The related weakness concerns the architecture of AML reporting itself. Although broad disclosure requirements are intended to strengthen detection, excessive reporting can reduce informational efficiency by generating a high volume of low-value signals. Dalla Pellegrina et al. (2023) characterize this as a crying wolf problem in which regulators and financial intelligence units are overwhelmed by large quantities of low-quality reports, making it harder to isolate genuinely suspicious activity.

In the context of TBML, this is particularly problematic because illicit value transfer is often concealed within ordinary trade transactions and thus cannot be identified solely through volume-based reporting alone. When monitoring systems privilege quantity over precision, the net effect may be weaker, rather than stronger, detection. The literature, therefore, increasingly favors a risk-based regulatory approach that allocates supervisory resources according to transaction complexity, sectoral vulnerability, and jurisdictional exposure. Financial penalties remain relevant, but their effectiveness depends on stronger transparency requirements, better ownership disclosure, and closer coordination between customs, financial intelligence, and enforcement agencies (Mathuva et al., 2020). From this perspective, the regulatory gap is not simply the absence of rules. It reflects the limited ability of fragmented supervisory systems to respond to increasingly integrated and mobile forms of illicit finance.

Technological change compounds these vulnerabilities by creating new channels through which value can be transferred outside traditional banking structures. Cryptocurrencies are particularly important because they enable decentralized and partly anonymous cross-border transfers, thereby weakening the conventional link between trade transactions and regulated payment systems (Dupuis et al., 2022; Dupuis & Gleason, 2021;

Hossain, 2020; Usman et al., 2025). This development does not replace TBML. Instead, it expands its operational scope by allowing the financial side of a transaction to be settled through digital assets. In contrast, the trade side remains obscured through manipulated invoices, falsified shipment records, or misleading customs declarations.

In Southeast Asia, the increasing diversification of financing methods among illicit and extremist networks indicates that digital assets are becoming more relevant within regional laundering systems (Arianti et al., 2020). This convergence is also evident in Lao PDR, particularly in the Golden Triangle Special Economic Zone, where cyber-enabled fraud has been linked to money laundering and underground banking within broader transnational criminal networks (United Nations Office on Drugs and Crime, 2025). Their importance in the TBML context lies in their capacity to reduce reliance on conventional financial intermediaries and to weaken the evidentiary connection between declared trade values and actual financial flows. As a result, practices such as over-invoicing, under-invoicing, and false shipment arrangements become more difficult to detect through conventional anti-money laundering tools. This opacity is further intensified by the integration of crypto-assets into wider trade and payment infrastructures. Crypto-enabled interfaces, including virtual asset cash conversion points, create additional opportunities for layering and integration of illicit funds (Linares, 2022; Mohamed Yousop et al., 2024). When combined with shell companies, falsified trade documentation, and cross-border intermediaries, these mechanisms produce laundering structures that are increasingly fragmented and difficult to reconstruct. The regulatory challenge therefore extends beyond the detection of suspicious trade documents to the broader task of identifying how digital settlement mechanisms can detach the transfer of value from the formal trade record.

Conclusion

The link between TBML and environmental crime in Southeast Asia remains a major challenge for governance, enforcement, and measurement. Its persistence reflects not only the adaptability of illicit actors but also structural weaknesses in the systems designed to detect and deter illicit financial activity. Illegal logging, wildlife trafficking, illegal mining, and related environmental offenses generate substantial rents that can be concealed within seemingly legitimate trade transactions and then integrated into the formal economy. This issue should therefore be understood not merely as an environmental concern, but as a wider problem of institutional weakness and financial integrity, in which ecological harm is transformed into private gain through deficiencies in trade oversight, financial supervision, and cross-border enforcement.

A central obstacle is the limited availability of operational data and actionable intelligence on laundering networks. This restricts researchers' ability to develop robust typologies and limits practitioners' capacity to estimate exposure and evaluate enforcement effectiveness with confidence. The challenge is exacerbated by the fragmented distribution of information across customs authorities, financial intelligence units, environmental regulators,

law enforcement bodies, and private intermediaries involved in trade finance and logistics. Where these systems remain poorly connected, suspicious transactions can be embedded within ordinary commercial activity without generating a sufficiently clear risk signal. Enforcement consequently becomes reactive and episodic, relying on isolated intelligence rather than coordinated detection across agencies and jurisdictions.

The difficulty of detection is further compounded by persistent valuation problems. Environmental commodities often vary in quality, legality, origin, and marketability, while pricing is shaped by local market conditions, transport costs, and opaque supply chains. These characteristics make it difficult to construct reliable benchmarks for customs valuation and forensic accounting. Such uncertainty creates scope for deliberate mispricing, quantity manipulation, and product misclassification. More importantly, weak valuation benchmarks do not merely reduce technical precision. They also undermine evidentiary standards, complicate proof of intent, and weaken prosecutorial capacity. In effect, valuation gaps lower the expected cost of offending and preserve the profitability of environmental crime. These weaknesses reveal how institutional deficiencies in trade and financial governance can facilitate the translation of ecological destruction into apparently legitimate wealth.

This diagnosis points to a broader implication. TBML associated with environmental crime persists because illicit proceeds are concealed within governance systems that do not adequately connect environmental regulation, customs control, and anti-money laundering supervision. Policy responses that rely narrowly on compliance reporting or isolated enforcement actions are therefore unlikely to achieve durable results. What is required is a more integrated framework in which environmental crime is treated as a material predicate risk within trade and trade finance supervision. Such a shift would recognize that failures in environmental governance, border administration, and financial oversight are mutually reinforcing rather than analytically separate.

Recent regional developments suggest that this broader framing is emerging. The Association of Southeast Asian Nations (ASEAN) Leaders' Declaration on Combating Money Laundering, adopted at the 47th ASEAN Summit in Kuala Lumpur on 26 October 2025, indicates that money laundering is increasingly viewed as a regional security and governance concern rather than a narrow compliance matter. Public reporting surrounding the Summit highlighted stronger regulation, closer intelligence sharing, and deeper inter-agency coordination (Association of Southeast Asian Nations, 2025). The Chairman's statement also welcomed the establishment of the ASEAN Senior Officials Meeting on Transnational Crime Working Group on Money Laundering, providing a regional platform to address the links between laundering and other forms of transnational crime. This institutional development is especially important because it aligns regional priorities with SDG 16, particularly Target 16.4, which calls for a substantial reduction in illicit financial flows, stronger recovery and return of stolen assets, and more effective action against organised crime by 2030.

To translate these commitments into operational progress, AML frameworks in Southeast Asia need to incorporate environmental crime risk more explicitly into trade and trade finance supervision. Financial institutions and trade finance providers should recognize

environmental crime as a material predicate risk rather than a peripheral compliance issue. Where trade documents, routing patterns, beneficial ownership structures, or supply chain characteristics indicate elevated exposure, environmental risk indicators should be incorporated into customer due diligence, transaction monitoring, and escalation processes. This requires more than general regulatory expectations. Supervisors must provide clear typologies, sector-specific red flags, and practical guidance that enable institutions to connect documentary anomalies with potential environmental illegality. It also requires stronger capability across the wider network of gatekeepers, including banks, customs brokers, freight forwarders, and designated non-financial businesses. Without this operational translation, high-level commitments are unlikely to produce meaningful gains in detection or deterrence.

Improved supervision, however, depends on stronger measurement capacity. Illicit financial flows linked to environmental crime are inherently difficult to quantify because the evidentiary record spans trade documentation, payment systems, corporate ownership structures, and indicators of ecological harm. No single dataset or estimation method can capture the full scale of the problem. This makes measurement necessarily partial and methodologically plural. However, imperfect measurement should not be mistaken for analytical paralysis. For Southeast Asia, progress is likely to come from more effective governance of trade and payments data, stronger integration between customs and financial intelligence, and structured feedback loops through which insights from investigations are used to refine monitoring models and supervisory priorities. Measurement in this context is not simply descriptive. It is integral to institutional learning and to the improvement of prevention and enforcement strategies.

A related issue concerns how policy success is assessed. Asset recovery should be treated as a core outcome rather than a secondary by-product of enforcement. Indicators such as suspicious transaction reports, investigations initiated, or institutional reforms adopted remain useful, but they do not in themselves show that illicit gains are being effectively disrupted. Target 16.4 makes clear that reducing illicit financial flows is inseparable from the recovery and return of stolen assets. In the context of environmental crime, this is particularly salient because confiscating criminal proceeds weakens the financial incentives that sustain ecological destruction. It also provides a more demanding test of whether tracing mechanisms, cross-border cooperation, and inter-agency coordination are functioning effectively in practice. A credible regional strategy must therefore prioritize the capacity of competent authorities to identify, freeze, confiscate, and, where appropriate, return assets before they are dissipated or transferred beyond reach.

Future research should deepen the understanding of the interaction between TBML, corruption, enforcement capability, and technological change. More evidence is needed on the mechanisms through which governance quality affects misinvoicing risk, the extent to which digitalization in customs and payments enhances detection, and the forms of institutional coordination that produce stronger outcomes in investigation, confiscation, and prosecution. There is also a need to examine how environmental risk indicators can be incorporated into anti-money laundering systems without creating excessive false positives or imposing disproportionate burdens on legitimate trade. Advancing this research agenda would

strengthen the empirical foundations of policy reform and improve the alignment between regulatory ambition and operational feasibility.

To conclude, TBML arising from environmental crime in Southeast Asia is best understood as a systemic problem shaped by illicit market incentives, institutional fragmentation, and weak observability. The policy challenge does not lie simply in adopting stricter rules. It lies in building governance arrangements that connect environmental enforcement, trade oversight, and financial supervision in a coherent and timely manner. Stronger regional coordination, more integrated data systems, clearer supervisory expectations, and sustained investment in enforcement capabilities are essential for ASEAN member states. Together, these measures can reduce the opportunities through which environmental harm is transformed into laundered wealth. Strengthening the response to TBML is therefore not only a matter of financial integrity. It is also essential to improve governance quality, protect natural resources, and reinforce the credibility of sustainable development commitments.

Acknowledgment

The authors would like to express their sincere gratitude to Universiti Teknologi MARA and Universiti Putra Malaysia for their support. The authors also extend their appreciation to the editorial board of the Journal of ASEAN Studies for the opportunity to publish this article.

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