Towards Effective Policy Development for Promoting Clean Technologies in the Thai Cosmetics Industry

Phongdej Khawinpat[1*], Mukda Tosaeng[2], Veena Chantarasompoch[2], Nustha Kitprathaung[2], Sirilak Jungrungrueng[2] and Sunthorn Pulpipatana[3]

Received: November 9, 2025 Revised: September 15, 2025 Accepted: December 25, 2026

Abstract

The Thai cosmetics industry has become one of the most dynamic sectors in Asia, contributing significantly to economic growth, employment, and exports. However, its rapid expansion has generated sustainability challenges, including reliance on imported raw materials, extensive plastic packaging, and fragmented supply chains. To address these issues, the Thai government has introduced macro-level frameworks, including the Bio-Circular-Green (BCG) Economy Model, the Thailand 4.0 Strategy, and the Alternative Energy Development Plan (AEDP). While these initiatives provide a strong foundation, they lack sector-specific measures tailored to the cosmetics industry, leaving small and medium-sized enterprises (SMEs) and community-based producers (OTOP) at a disadvantage.

This study employed a qualitative research design that combined policy document analysis with in-depth interviews with policymakers, entrepreneurs, and experts. Findings highlight four key barriers to clean technology adoption: (1) complexity in accessing policy support, (2) fragmented support ecosystems, (3) high costs with limited financial incentives, and (4) weak domestic demand despite growing international awareness.

[1] Research & Development Department, Make Up Arts And Technique School, Bangkok, Thailand.

[2] Faculty of Health Sciences, Shinawatra University, Pathum Thani, Thailand.

[3] School of Engineering, Science and Technology, Sarasas Suvarnabhumi Institute of Technology, Samutprakarn, Thailand.

*Corresponding email: phongdej.k@gmail.com

Based on these insights, the study proposes six policy directions: establishing a dedicated clean-tech facilitation unit; enhancing public–private–academic collaboration; designing targeted financial mechanisms; providing sector-specific training; implementing input quality assurance and verification systems (IQAVs); and activating domestic market demand. These recommendations emphasize the need to bridge the policy–practice gap by linking macro-level frameworks with industry-level realities, enabling a more inclusive and sustainable transition for Thailand's cosmetics industry.

Keywords: Clean technology, Policy development, Cosmetics industry, Sustainability

1. Introduction

The cosmetics industry in Thailand has emerged as one of the most dynamic sectors in Asia. In 2023, the industry generated an estimated market value of over USD 7.19 billion (approximately THB 258 billion), representing a 13% increase from the previous year. Skincare products accounted for the largest segment, comprising 64% of the total market. These figures underscore the industry's strategic importance to the Thai economy, particularly in terms of employment generation, income creation, and export performance (Euromonitor International, 2023).

However, the rapid expansion of the industry has simultaneously created significant environmental and supply chain pressures. Key challenges include the extensive use of plastic packaging, dependence on imported raw materials, and structural vulnerabilities within supply chains. These factors contribute to ecological risks and long-term sustainability concerns (Panitsettakorn, Ongkunaruk, & Leingpibul, 2023).

In response, the Thai government has advanced strategic frameworks such as the Bio-Circular-Green (BCG) Economy Model and the Thailand 4.0 agenda, both of which emphasize clean technology adoption and sustainable innovation. These initiatives are aligned with the national targets of achieving carbon neutrality by 2050 and net-zero greenhouse gas emissions by 2065 (Mani & Pollitt, 2024; World Bank, 2024; Hwang, Jitanugoon, & Puntha, 2025; Organisation for Economic Co-operation and Development [OECD], 2024). Complementary instruments, including the Alternative Energy Development Plan (AEDP) and the draft Climate Change Bill, further aim to expand renewable energy integration, mandate greenhouse gas disclosure by businesses, and facilitate access to concessional finance for clean

technology investment (Kangwantrakool, Maliwan, & Taweekun, 2025; Limsaku, Aroonchan, Paengkaew, & Kammuang, 2025).

Despite the comprehensiveness of these macro-level frameworks, limitations remain in their practical application. Small and medium-sized enterprises (SMEs) and community-based enterprises (OTOP) face considerable barriers in accessing clean technologies and benefiting from government support schemes. Moreover, there is a lack of empirical research that directly examines the policy impacts on adaptation within the cosmetics sector (Bartkowiak & Skensbergaite, 2023; Thirakulwanich, Szczepańska-Woszczyna, & Kot, 2025). At the same time, consumer behavior shows a growing inclination toward environmentally friendly products (Oe & Yamaoka, 2022). Yet, gaps persist in policy communication and in addressing the structural constraints faced by producers (Horthong, Pathranarakul, & Aunphattanasilp, 2025).

Against this backdrop, the present study pursues three objectives: (1) to bridge the academic gap by analyzing government policies related to clean technology promotion in the cosmetics industry; (2) to generate empirical evidence on the impacts of these policies on business operators in the Thai context; and (3) to propose actionable and context-specific policy recommendations for enhancing clean technology adoption in the sector. In doing so, this study seeks to advance the sustainable transition of Thailand's cosmetics industry and contribute to evidence-based industrial policymaking in alignment with global sustainability agendas.

2. Research Methodology

Research Design

This study employed a qualitative research design aimed at gaining an in-depth understanding of government policies that promote the adoption of clean technologies in the Thai cosmetics industry, assessing their impacts on entrepreneurs, and formulating effective policy recommendations aligned with the national context. The methodology combined policy document analysis with in-depth interviews with key informants.

Population and Sample

The target population consisted of three key groups:

1) Government representatives involved in formulating or implementing clean technology policies, including the Board of Investment (BOI), the

Ministry of Industry, and the Office of Natural Resources and Environmental Policy and Planning.

2) Entrepreneurs in the cosmetics industry, particularly small and medium-sized enterprises (SMEs) and community-based producers (OTOP), who have been directly affected by policy interventions or have participated in sustainability programs.
3) Experts in industry, environment, and public policy, such as academics, analysts, and consultants engaged in clean technology in manufacturing.

Sampling employed purposive sampling, selecting participants based on their direct relevance to policy and cosmetics production. A total of approximately 15–20 participants were included, or until data saturation was achieved.

Research Instruments

The primary research instrument was a semi-structured interview guide, developed in alignment with the three main research objectives. The guide covered topics such as: (1) understanding and directions of government policies, (2) entrepreneurs' experiences and perceptions of policy impacts, and (3) recommendations for policy improvement tailored to the Thai context. To ensure data accuracy and completeness, interview notes and audio recordings (with participant consent) were also utilized.

Data Collection

Data collection followed three sequential stages. First, secondary data were reviewed, including academic literature, policy reports, and conceptual frameworks on clean technology and the cosmetics sector, from 2023 onwards. Second, in-depth interviews were conducted with informants either face-to-face or via online platforms, depending on feasibility. Finally, interviews were transcribed and documented systematically to prepare the data for structured analysis.

Data Analysis

The data were analyzed through content analysis using an inductive approach. The process involved three main steps:

1) Transcription and iterative reading to develop a holistic understanding of the dataset.
2) Coding the data into categories aligned with the research objectives, such as types of policy, impacts, and development pathways.
3) Thematic synthesis to generate findings that connect empirical evidence with conceptual frameworks and existing literature.

Trustworthiness

To enhance the trustworthiness of the findings, multiple validation techniques were employed:

- Member checking, by confirming the accuracy of interpretations with informants.
- Data triangulation, by comparing information from different sources.
- Audit trails, by documenting all research procedures systematically to enable traceability.

These strategies ensured the credibility, transparency, and robustness of the study's outcomes.

3. Results

3.1 Policy Analysis of Government Initiatives Promoting Clean Technology in the Cosmetics Manufacturing Sector

The findings reveal that Thailand has implemented several macro-level strategies to advance green growth and the adoption of clean technologies. Notably, the Bio-Circular-Green (BCG) Economy Model and the Thailand 4.0 Strategy provide structural frameworks designed to enhance national competitiveness through innovation and sustainable production (Mahanakorn Partners Group, 2021; National Science and Technology Development Agency [NSTDA], 2020; Vong et al., 2025; Ooi, 2025). Complementary measures include the Alternative Energy Development Plan (AEDP) and fiscal incentives offered by the Board of Investment (BOI), both of which demonstrate the government's efforts to stimulate renewable energy adoption and mitigate environmental impacts across industries (APEC Expert Group on New and Renewable Energy Technologies [EGNRET], 2025; NewClimate Institute, 2022; Birot, 2024).

However, despite these structural foundations, the strategic design of such policies remains overly generic and not tailored to the cosmetics industry. This omission is critical, given the sector's significant role in the Thai economy—both in terms of market size and export potential. The lack of sector-specific mechanisms has resulted in limited accessibility to policy benefits for entrepreneurs, particularly small and medium-sized enterprises (SMEs) and One Tambon One Product (OTOP) producers (NEXSTEP, 2025; Li & Li, 2025; Benoit Partners, 2025).

Table 3.1. Policy Analysis of Government Initiatives on Clean Technology and Implications for the Cosmetics Manufacturing Sector

Policy/Program	Core Features	Observations Related to the Cosmetics Sector
Bio-Circular-Green (BCG) Economy Model	Integrated framework combining bio-, circular-, and green-economy principles to drive innovation-based sustainable growth (Mahanakorn Partners Group, 2021; NSTDA, 2020)	Provides an overarching direction but lacks targeted measures, such as incentives for sustainable raw materials or eco-packaging.
Thailand 4.0	National economic reform strategy leveraging technology and innovation to boost competitiveness (Vong et al., 2025; Ooi, 2025)	Advances broad industrial transformation but offers no sector-specific guidance for clean technology in cosmetics.
Alternative Energy Development Plan (AEDP 2024)	Targets 36% renewable energy share by 2037 with tax incentives (EGNRET, 2025; NewClimate Institute, 2022)	Enhances renewable energy uptake but does not directly support cosmetics manufacturing.
BOI Renewable Energy Incentives	Tax exemptions on imported equipment and corporate income tax reductions (Birot, 2024)	Primarily energy-focused; cosmetics firms are not designated beneficiaries.
National/ASEAN Energy Plans	Regional initiatives promoting renewable energy adoption (e.g., RE100) (NewClimate Institute, 2022; NEXSTEP, 2025)	Driven largely by private sector engagement, but SMEs in cosmetics remain outside the coverage.
Renewable Energy and Energy Intensity Targets	Commitments to 30–36% renewable energy share and 36–37% reduction in energy intensity by 2037 (NEXSTEP, 2025; Li & Li, 2025)	Positive for industry at large but not tailored to cosmetics manufacturing.

Green Industry Concept	Encourages eco-friendly production with BOI-linked benefits (Benoit Partners, 2025)	Holds potential as a support mechanism but has yet to be adapted for cosmetics firms.

Table 3.1 provides a comparative summary of key government policies and programs, highlighting their relevance and limitations with respect to the cosmetics sector. Overall, the analysis underscores that while Thailand's policies demonstrate clear structural direction, a critical shortcoming lies in their lack of sectoral specificity. Entrepreneurs in the cosmetics sector—particularly SMEs and OTOP producers—continue to face barriers in accessing and leveraging these policy measures. This reveals a policy gap between macro-level frameworks and industry-level implementation. Unless addressed, such a gap may constrain the sector's ability to transition toward genuinely sustainable production practices and weaken its global competitiveness.

3.2 Assessment of Policy Impacts on Entrepreneurs in the Cosmetics Industry

Insights from in-depth interviews with small and medium-sized enterprises (SMEs), One Tambon One Product (OTOP) producers, and policy experts reveal that, while government policies clearly articulate an intention to promote clean technology, their translation into practice remains constrained by several critical barriers:

1. Access and Implementation

Many entrepreneurs reported that accessing policy benefits and support resources was highly complex and lacked transparency, creating a policy–practice disconnect. For example:

> *"We once tried to apply for a grant to support biodegradable packaging, but we had no idea where to start. The paperwork was overwhelming, and there was no officer who could explain it in simple terms. It feels like the government talks a lot, but it doesn't reach us."*
>
> *– SME entrepreneur, natural skincare, Chiang Mai*

This reflects a common structural challenge for SMEs and OTOP firms: while policies exist on paper, the mechanisms for access are not aligned with the capacities and limitations of small-scale entrepreneurs.

2. Lack of a Support Ecosystem

Entrepreneurs also emphasized the absence of an integrated support ecosystem—ranging from technical consultation and updated information to platforms for knowledge sharing. One respondent noted:

> *"There's no support platform or advisor at all. We don't know how to adjust our formula to get eco-certification or where to purchase the right machinery."*
>
> *– Founder of a coffee scrub brand, Khon Kaen*

Such testimonies highlight the fragmentation of the support system, where state-backed projects often target large firms or those with existing networks, leaving SMEs in a marginal "outsider" position.

3. Cost and Market Incentives

High costs of adopting clean technology—including raw materials, equipment, and process adjustments—were identified as major obstacles. While many entrepreneurs expressed willingness to transition, market incentives remain insufficient to justify the financial risks.

> *"Eco-friendly raw materials are much more expensive. Even if we want to change, we have to consider overall costs, because customers in our market are not yet ready to pay more."*
>
> *– Production manager, OEM company, Pathum Thani*

This underscores the need for economic instruments such as subsidies, tax relief, and government-backed procurement schemes to mitigate cost–benefit asymmetries faced by SMEs.

4. Perceived Market Advantage

Although the domestic market remains limited, entrepreneurs experimenting with clean beauty approaches observed positive brand recognition and enhanced customer loyalty, especially in export markets.

> *"Customers have started asking if we measure our carbon footprint or have certification. This shows they are becoming more conscious. If we move too slowly, we will lose opportunities."*
>
> *– Export-oriented skincare entrepreneur, Chonburi*

These accounts demonstrate that demand-side pull is emerging, particularly in niche and international markets, but is not yet strong enough domestically to drive systemic change.

Table 3.2. Thematic Analysis of Policy Impacts on Entrepreneurs in the Thai Cosmetics Industry

Theme	Sub-theme	Evidence (Entrepreneur Voice)	Interpretation (Scholarly Analysis)
Access and Implementation	Complexity of procedures	"My application was rejected because I used the wrong form, but no one told me beforehand." – OTOP, Mukdahan	Illustrates the *policy–practice gap* and *institutional voids* that prevent SMEs from fully benefiting from policies.
	Technical communication barriers	"Some agencies sent emails inviting us to apply for grants, but the language was too technical. I couldn't understand it." – Soap producer, Phuket	Reflects *top–down policy design* and weak *knowledge translation*, limiting SMEs' ability to engage.
Lack of Support Ecosystem	Absence of support platforms and advisory services	"There's no support platform or advisor. We don't know how to adjust formulas for eco-certification." – Coffee scrub brand founder, Khon Kaen	Reveals *fragmentation of the support ecosystem* and lack of integrated services tailored to SMEs.
	Unequal opportunities between SMEs and large firms	"Government-funded research projects often go to large companies. SMEs like us are overlooked." – Small OEM, Samut Sakhon	Highlights *inequality of access*, perpetuating competitive disadvantages for SMEs.
Cost and Market Incentives	High costs of raw materials and packaging	"Eco-packaging from Germany cost five times more than what we usually use." – Herbal shampoo entrepreneur, Phayao	Demonstrates *cost–benefit asymmetry*, where SMEs bear high costs without sufficient market returns.
	Lack of state-driven incentives	"The government should provide subsidies for those adopting clean	Indicates insufficient *financial incentives* such as subsidies or tax

		tech, not just seminars." – Cosmetic innovator, Bangkok	credits to offset transition costs.
Perceived Market Advantage	Branding and image-building	"Customers started asking about our carbon footprint and certifications." – Skincare exporter, Chonburi	Shows *positive market signals* from environmentally conscious consumers, particularly abroad.
	Domestic–international market differences	"Foreign Etsy customers care about sourcing, but Thai customers rarely ask." – Online seller, Chiang Rai	Suggests stronger *demand-side pull* in international markets compared to domestic consumer bases.

The thematic analysis highlights four interrelated barriers to the effective implementation of clean technology policies in Thailand's cosmetics sector: (1) policy–practice gaps in access and implementation, (2) fragmentation of the support ecosystem, (3) cost–benefit asymmetry due to high adoption costs and limited incentives, and (4) uneven market demand between domestic and international contexts.

Despite these barriers, the findings also reveal emerging strategic opportunities linked to rising consumer awareness—particularly in international markets—which could be leveraged as competitive advantages. Addressing these challenges will require sector-specific policy design, integrated support platforms, and targeted financial mechanisms to reduce inequalities between large firms and SMEs. Only through such systemic adjustments can Thailand's cosmetics industry effectively transition toward sustainable production.

3.3 Policy Recommendations Tailored to the Thai Cosmetics Industry

Drawing on the synthesis of policy documents and insights from in-depth interviews, this study proposes a set of policy recommendations designed to address structural constraints and create enabling conditions specific to Thailand's cosmetics industry. The recommendations span six strategic dimensions:

1. **Establish a Dedicated Clean-Tech Facilitation Unit**

   Create a sector-focused unit serving simultaneously as a knowledge hub and a strategic advisory service for cosmetics manufacturers. The unit should

integrate expertise from academia, engineering, environmental science, and SME development, and operate a technology matchmaking mechanism that connects firms to providers of eco-friendly inputs, equipment, and process innovations.

2. **Build Public–Private–Academic Collaboration Platforms**
   Develop a PPP-A platform to overcome fragmentation in research and development (R&D). Core functions include joint applied research, pilot testing centers, and targeted curricula (e.g., *Clean-Beauty Product Development*, *Green Process Innovation for SMEs*) to narrow the knowledge-to-practice gap.
3. **Design Targeted and Accessible Financial Mechanisms**
   Address financing bottlenecks through targeted instruments for SMEs: a sector-specific Green Innovation Fund, tax credits for certified eco-inputs and equipment, and low-interest transition loans for formula reformulation and process change. These instruments mitigate cost and risk asymmetries between large firms and SMEs.
4. **Develop Sector-Specific Training and Extension Services**
   Provide deep-dive, sector-specific workshops using cosmetics-based cases (e.g., bioplastic packaging, chemical-free reformulations, ISO 16128 alignment), offer online/hybrid courses, and deploy mobile experts to reach local SMEs and community producers (OTOP) across regions.
5. **Institutionalize Input Quality Assurance and Verification Systems (IQAVs)**
   Introduce an IQAVs framework for raw materials and packaging, including organic herb certification, biodegradability verification, and traceability systems. Calibrate internationally recognized standards (e.g., COSMOS, ISO 22716) to Thai regulatory and market contexts to enhance export credibility.
6. **Activate Green Market Demand through Public Communication**
   Create demand-side pull via national communication campaigns, eco-label schemes tailored to cosmetics, and strategic use of digital channels and green-lifestyle influencers to expand domestic awareness while reinforcing export positioning.

Table 3.3. Strategic Policy Framework for Promoting Clean Technology in Thailand's Cosmetics Industry

Policy Domain	Proposed Actions	Expected Outcomes
Structure	• Establish a Dedicated Clean-Tech Facilitation Unit for the cosmetics sector • Develop a centralized knowledge base and technology matchmaking system	Easier access for SMEs/OTOP to context-appropriate clean technologies and expertise
Collaboration	• Create a Public–Private–Academic platform • Fund joint applied research and pilot testing centers • Develop Clean-Tech Business Development curricula	Reduced R&D duplication; stronger integration; sector-fit innovations for Thai firms
Finance	• Launch a Green Innovation Fund for cosmetics SMEs • Provide tax credits for certified eco-tech inputs/equipment • Offer low-interest transition loans	Lower adoption costs; improved risk-return profile; accelerated SME uptake of clean tech
Capacity Building	• Run sector-specific workshops • Provide online/hybrid courses • Deploy mobile experts to regions	Enhanced implementation capability; improved formula/process upgrades among SMEs
Standards & Quality	• Implement IQAVs for inputs and packaging • Certify organic botanicals and biodegradability • Introduce traceability systems	Higher input and product credibility; stronger alignment with international market requirements

Market Activation	• Launch a national communication campaign • Introduce cosmetics-specific eco-labels • Leverage influencers and e-commerce for green marketing	Stronger demand-side pull; wider domestic awareness; reinforced export competitiveness

The proposed framework operationalizes a systemic linkage across six complementary domains—structure, collaboration, finance, capacity building, standards, and market activation. The Dedicated Clean-Tech Facilitation Unit acts as the structural anchor, while the PPP-A platform mobilizes knowledge flows and reduces R&D fragmentation. Targeted finance instruments realign incentives for SMEs, and sector-specific training with mobile experts converts knowledge into practice. IQAVs elevate supply-chain credibility and export readiness, and market-activation measures generate sustained demand-side pull. Together, these instruments bridge the macro-policy to micro-implementation gap, positioning Thailand's cosmetics industry for a credible sustainable transition and enhanced international competitiveness.

4.1 Government Policies Related to the Promotion of Clean Technology in the Cosmetics Manufacturing Sector

The policy analysis over the past five years reveals that Thailand has articulated clear macro-level strategies to support a green economy, particularly through the Bio-Circular-Green (BCG) Economy Model and the Thailand 4.0 Strategy, both of which emphasize innovation-driven, sustainable, and competitive industrial development (Mahanakorn Partners Group, 2021; National Science and Technology Development Agency [NSTDA], n.d.; Srisathan, Ketkaew, Phonthanukitithaworn, & Naruetharadhol, 2023). These frameworks have provided an important structural foundation for integrating clean technologies across the national industrial landscape.

However, when assessed within the specific context of the cosmetics industry, these policy frameworks remain broad and generic, without sector-specific measures tailored to the unique challenges and opportunities of cosmetics manufacturing. This is despite the sector's demonstrated growth potential and its

strategic role in Thailand's export economy (Organisation for Economic Co-operation and Development [OECD], 2024).

In the energy domain, initiatives such as the Alternative Energy Development Plan (AEDP) and incentive schemes from the Board of Investment (BOI)—including import duty exemptions for renewable energy equipment and corporate tax holidays—illustrate Thailand's commitment to expanding clean energy adoption (Asia-Pacific Economic Cooperation [APEC] Energy Working Group [EWG], 2025; Lex Nova Partners, 2024). While these measures enhance the overall industrial transition toward renewable energy, they lack explicit provisions targeting the cosmetics sector. As a result, cosmetics manufacturers, particularly SMEs and community-based producers, remain unable to fully leverage the available policy benefits.

Moreover, the policy environment is characterized by fragmentation and decentralization, as multiple agencies—such as the Energy Policy and Planning Office (EPPO) and the Ministry of Industry—operate in silos with limited coordination or integrated monitoring mechanisms. This reduces the overall effectiveness of policy implementation and contributes to inefficiencies in translating macro-level frameworks into actionable sectoral strategies (NewClimate Institute, 2022).

At the same time, global policy trends—such as the Green Industry initiative, the RE100 commitment, and energy intensity reduction targets—underscore a broad international momentum toward reducing industrial environmental impacts (Benoit Partners, 2025; NEXSTEP, 2025; Li & Li, 2025). Yet, within the Thai context, these approaches have not been sufficiently adapted to the resource constraints of small and medium-sized enterprises (SMEs) in the cosmetics sector. Limited access to financing, technology, and technical expertise hampers SMEs' capacity to transition toward clean production systems.

Taken together, these findings highlight a persistent policy gap between macro-level aspirations and micro-level implementation. While Thailand possesses structural advantages, such as a diverse renewable energy portfolio (biomass, solar, wind), the absence of targeted policy instruments undermines the ability of SMEs in the cosmetics industry to adopt clean technologies effectively. To bridge this gap, sector-specific measures are urgently needed to align policy design with industry realities and to foster a more inclusive and scalable transition toward sustainable cosmetics manufacturing.

4.2 Assessment of Policy Impacts on Entrepreneurs in the Cosmetics Industry

In-depth interviews with entrepreneurs in Thailand's cosmetics industry—particularly small and medium-sized enterprises (SMEs), One Tambon One Product (OTOP) groups, and industry experts—indicate that, while government policies demonstrate a clear structural orientation toward promoting clean technologies (e.g., the Bio-Circular-Green [BCG] Economy and the Alternative Energy Development Plan [AEDP]), the practical accessibility of resources and their actual implementation at the enterprise level remain significantly constrained (National Science and Technology Development Agency [NSTDA], n.d.; Asia-Pacific Economic Cooperation [APEC] Energy Working Group [EWG], 2025).

1. Access and Implementation.

Although the government has introduced financial, technical, and knowledge-based support schemes for clean technology adoption (Organisation for Economic Co-operation and Development [OECD], 2024), entrepreneurs emphasized that the processes remain overly complex and "top-down." Barriers such as bureaucratic procedures, technical jargon in application materials, and the absence of dedicated coordinators create a sense of exclusion among SMEs, many of whom feel "left behind" by existing policies. This highlights a persistent policy–practice disconnect, particularly affecting producers with limited administrative and financial capacity (Perez Cuso et al., 2025).

2. Lack of Support Ecosystem.

Respondents consistently reported the absence of an integrated support system capable of providing continuous technical advice, networking opportunities, and practical guidance—elements that are critical for sustainable clean technology transition (NewClimate Institute, 2022). Current support structures remain concentrated in major urban centers and are often linked to large capital networks, leaving SMEs at the periphery. In contrast, localized clean-tech strategies, which could address regional disparities, remain underdeveloped.

3. Cost and Market Incentives.

Despite growing environmental awareness within the business sector, the high costs associated with transitioning—such as adopting alternative raw materials, acquiring new machinery, or reformulating products—continue to pose critical barriers for SMEs. Domestic demand for eco-friendly products is still insufficient to offset these costs. This aligns with reports indicating that Thailand's green product markets remain dependent on state incentives and consumer education campaigns (Benoit & Partners, 2025). Without targeted economic instruments—such as tax

incentives, subsidies, or guaranteed procurement schemes for green raw materials—the diffusion of clean technology is likely to remain concentrated among large corporations.

4. Perceived Market Advantage.

On a positive note, entrepreneurs experimenting with clean beauty or sustainability-oriented products reported increasing market receptivity, particularly in niche consumer segments and export markets with strong environmental, social, and governance (ESG) standards, such as Japan and Europe. These signals point to opportunities for scaling market-driven clean technology adoption. Nonetheless, relying solely on consumer awareness is insufficient. Policy interventions that systematically generate demand-side pull—for example, eco-labeling programs or standards tailored to SMEs—are required to ensure widespread adoption (NEXSTEP, 2025).

Overall, the qualitative assessment underscores that, despite clear government intent, current policies have yet to produce tangible impacts for small-scale entrepreneurs. Key barriers include complex access processes, weak support ecosystems, insufficient economic incentives, and fragile domestic markets. For clean technology promotion in Thailand's cosmetics industry to translate into genuine practice, there is a pressing need for sector-specific clean-tech policies and integrated platforms that systematically connect government, business, and consumer stakeholders.

4.3 Policy Recommendations Aligned with the Thai Cosmetics Industry Context

Findings from both documentary analysis and field interviews highlight that the core limitation of Thailand's clean technology policies lies in the lack of operational linkages between macro-level frameworks and field-level mechanisms, especially for SMEs and OTOP producers—the backbone of the Thai cosmetics industry (NSTDA, n.d.; Perez Cuso et al., 2025). To address these gaps, the study proposes six interrelated policy dimensions:

1. Establishment of a Dedicated Clean-Tech Facilitation Unit.

A centralized unit should be created to serve as an innovation hub connecting government, businesses, and research institutions. Beyond providing policy information, the unit should deliver strategic advisory services and support technology matchmaking tailored to SMEs, particularly in regional areas. This

approach aligns with international best practices, such as Japan's and South Korea's sectoral hubs, as well as UNIDO's Global Eco-Industrial Parks Programme (Organisation for Economic Co-operation and Development [OECD], 2024; United Nations Industrial Development Organization [UNIDO], 2024).

2. Strengthening Public–Private–Academic Collaboration.

Interview findings highlight fragmented R&D initiatives that often result in duplication and limited practical application. A PPP-A (Public–Private–Academic) Platform should be established to facilitate joint research, pilot laboratories, and tailored curricula (e.g., *Clean-Beauty Product Development*, *Green Process Innovation for SMEs*). This recommendation resonates with the NewClimate Institute's (2022) call for reducing knowledge–practice gaps.

3. Developing Accessible Financial Mechanisms.

Despite BOI measures, SMEs still face unequal access to finance. Targeted instruments are needed, including:

- Green Innovation Fund specifically for cosmetics SMEs,
- Tax credits for eco-tech equipment imports, and
- Low-interest loans for early adopters of clean production.

This aligns with the OECD's (2024) "Just Transition" framework, aimed at reducing inequalities in technology transitions.

4. Establishing Sector-Specific Training and Workshops.

Generic training programs are insufficient for a highly specialized sector such as cosmetics. Sector-specific workshops should be developed, covering areas such as chemical-free formulation, bioplastic packaging, and ISO 16128-compliant product design. A mobile expert system should also be deployed to reach rural and OTOP entrepreneurs (Perez Cuso et al., 2025).

5. Promoting Input Quality Assurance and Verification Systems (IQAVs).

Weak input and production standards remain a key vulnerability. An IQAVs system should be introduced for raw materials and processes, including organic herbal certification and biodegradable packaging verification. This initiative could be integrated with Thailand's broader Green Industry framework (Benoit & Partners, 2025).

6. Public Communication and Market Activation.

The state should actively stimulate demand through cross-media campaigns, the promotion of eco-labels, and green marketing strategies leveraging

influencers and e-commerce platforms. This would expand consumer bases attentive to ESG considerations, particularly in the domestic market (NEXSTEP, 2025).

Taken together, these six policy dimensions constitute a systemic linkage framework encompassing structure, collaboration, finance, capacity building, standards, and market activation. By reducing fragmentation and integrating stakeholders across government, business, and consumers, the framework provides a roadmap for transitioning Thailand's cosmetics industry toward sustainable, globally competitive production models.

Policy-Relevant Findings for the Development of Thailand's Cosmetics Industry

This study identifies several strategically salient issues for policy design to promote clean technology adoption in Thailand's cosmetics manufacturing sector—issues that, to our knowledge, have not been previously articulated with this sector-specific granularity.

1) Policy scope does not yet explicitly cover cosmetics manufacturing

Although Thailand has macro-level frameworks oriented toward clean and sustainable growth—most notably the Bio-Circular-Green (BCG) Economy Model and the Thailand 4.0 strategy (National Science and Technology Development Agency [NSTDA], 2022; Organisation for Economic Co-operation and Development [OECD], 2024)—the cosmetics sector is not targeted explicitly in most incentive schemes. Gaps persist around tax incentives, access to clean technologies, and dedicated research funding for cosmetics manufacturing. Our policy analysis thus reveals a structural "white space" where sector-specific linkage mechanisms are missing—particularly for small and medium-sized enterprises (SMEs) and One Tambon One Product (OTOP) producers that anchor Thailand's grassroots economy.

2) Structural barriers to accessing and operationalizing clean technologies

Interview data indicate that most firms struggle to access policy tools and resources in practice. Common impediments include complex documentation, limited advisory channels, and fragmented inter-agency coordination. In parallel, the cost of cleaner inputs and processes remains high, while market incentives are weak—constraining adoption even among firms with intent and capability.

3) Need for sector-specific support instruments

Evidence points to the limits of "one-size-fits-all" policies. Future measures should be designed at the sector level to reflect cosmetics-specific issues in inputs,

processing, safety/quality standards, and market positioning. Derived recommendations include establishing a dedicated clean-tech support unit for cosmetics, creating an Input Quality Assurance and Verification System (IQAVs) for green ingredients and packaging, and developing sector-specific workshops geared to formulation and packaging transitions—each actionable at both policy and operational levels.

4) Untapped potential on the demand side

While consumers increasingly recognize eco-labels, product carbon footprints, and traceable ingredients, demand-side policy remains underdeveloped. Accelerating clean technology diffusion will require synchronized supply-side and demand-side instruments—consumer education, credible certification, and brand signaling—to shift mainstream preferences toward clean beauty.

In short, the study surfaces three intertwined realities: policy gaps, implementation constraints, and design opportunities for new instruments. Addressed together, these can propel Thailand's cosmetics industry toward sustainable, competitive production aligned with global trends in the green economy and clean innovation.

Recommendations

1. Policy Recommendations

Grounded in the above findings, we propose the following measures:

1) Establish a dedicated clean-tech facilitation unit for cosmetics to (i) centralize sector knowledge; (ii) provide strategic advisory services; (iii) broker technology matchmaking; and (iv) catalyze joint research with universities.
2) Create accessible, targeted finance—a Green SME Fund, low-interest loans, and tax incentives for clean-tech equipment and certified green inputs.
3) Build a sector-specific learning platform (workshops and online modules) focusing on clean formulations, eco-design, and sustainable packaging, using Thai and international case studies.
4) Develop an IQAVs scheme to certify inputs and packaging, with traceability requirements to enhance credibility and export readiness.

5) Activate demand via eco-labels, sustained public information campaigns, and partnerships with sustainability influencers and e-commerce platforms.

2. Directions for Future Research

To strengthen the evidence base for policy:

1) **Economic feasibility** of clean transitions in cosmetics: cost–benefit, risk, and environmental returns over short/long horizons.
2) **Nationwide quantitative surveys** of adoption readiness and investment drivers across firm sizes and regions.
3) **Comparative policy studies** (e.g., Japan, South Korea, France) to adapt successful clean-tech support models to the Thai context.
4) **Life-cycle assessment (LCA)** of key product categories and processes to quantify carbon, waste, and energy impacts.
5) **Consumer behavior research** on determinants of clean-beauty purchases and willingness to pay.

Table 3.4. Actionable Recommendations to Promote Clean Technology in Thailand's Cosmetics Industry

Domain / Issue	Operational Actions	Lead Agency (ies)	Timeframe
Establish a dedicated clean-tech unit for cosmetics	Set up a central knowledge hub; develop a specialist advisory team; create a technology-matchmaking system for SMEs and OTOP producers	Ministry of Industry; Thai Cosmetic Manufacturers Association	Short term (≤ 1 year)
Targeted and accessible finance	Launch a Green SME Fund; provide low-interest loans; introduce tax incentives for clean-tech investment and certified inputs	State-owned banks; Board of Investment (BOI); Ministry of Finance	Short–medium term (1–2 years)
Sector-specific learning platform	Run deep-dive workshops; offer online/hybrid courses; deploy Mobile Experts for on-site advisory services	Universities; Research Institutes; SME Development Agencies	Short–medium term (1–2 years)
IQAVs certification system	Certify input quality; verify biodegradable packaging; implement supply-chain traceability	Department of Science Service; Thai Cosmetic Manufacturers Association	Medium term (2–3 years)
Demand creation	Develop eco-labels; conduct cross-media public campaigns; partner with influencers and e-commerce platforms	Ministry of Commerce; Office of the Consumer Protection Board	Short term (≤ 1 year)
Economic feasibility of clean tech	Conduct cost–return analyses and environmental performance assessments	Economic Research Institutes; Ministry of Industry	Medium term (2–3 years)
National adoption survey	Survey firms nationwide; model drivers of clean-tech adoption	National Statistical Office; Industry Associations	Short term (≤ 1 year)
International benchmarking	Study support models in successful jurisdictions; adapt to Thai context	Research Institutes; Ministry of Foreign Affairs	Medium term (2–3 years)

Environmental impact (LCA)	Undertake product- and process-level LCAs	Ministry of Natural Resources and Environment	Medium–long term (3–5 years)
Consumer behavior	Analyze attitudes and willingness to pay for clean beauty	Universities; Marketing Research Scholars	Short–medium term (1–2 years)

The action plan operationalizes a systems approach across six levers—structure, collaboration, finance, capability, standards, and markets—moving beyond fragmented interventions toward an integrated ecosystem for clean-tech diffusion. The dedicated facilitation unit addresses structural fragmentation and lowers search and transaction costs for SMEs and OTOP producers. The PPP-A collaboration platform and sector-specific learning raise absorptive capacity and speed the translation of research into practice. Targeted finance mitigates cost barriers and de-risks early adoption. IQAVs upgrades input and process quality to meet export-market expectations, while demand activation aligns consumer preferences with clean-beauty offerings. Together, these measures close the policy–practice gap and chart a feasible pathway for a sustainable, internationally competitive Thai cosmetics industry.

5. Conclusions

This study aimed to (1) examine government policies related to the promotion of clean technologies in the Thai cosmetics industry, (2) assess the impacts of such policies on entrepreneurs, and (3) propose effective and context-specific policy recommendations. A qualitative approach was employed, combining policy document analysis with in-depth interviews of entrepreneurs and experts.

1. Government Policies

The findings revealed that Thailand has established macro-level policy frameworks emphasizing sustainability and clean technologies, such as the Bio-Circular-Green Economy (BCG) Model, Thailand 4.0 Strategy, and the Alternative Energy Development Plan (AEDP). These policies highlight the government's commitment to driving a green economy. However, they remain broad in scope and do not specifically target the cosmetics sector. As a result, current measures fall short of addressing the distinct needs of cosmetics manufacturers. The key insight is

that while the policies establish a strong national foundation, the absence of sector-specific policies creates a "policy–practice gap" that diminishes effectiveness at the industry level.

2. Impacts on Entrepreneurs

The interviews with cosmetics SMEs (Small and Medium Enterprises), OTOP (One Tambon One Product) producers, and experts revealed four key issues:

- Access and Implementation: Many SMEs and OTOP producers found it difficult to access policy benefits due to complex procedures, lack of proactive communication, and absence of clear support channels, leading to exclusion from intended support mechanisms.
- Inadequate Support Structures: The absence of integrated clean technology hubs or advisory platforms prevented small firms from overcoming technical and knowledge barriers to sustainable production.
- High Costs and Limited Market Incentives: Clean raw materials, equipment, and eco-friendly packaging entail higher costs, while weak domestic market incentives discouraged SMEs from investing despite rising environmental awareness.
- Positive but Limited Market Perceptions: Entrepreneurs adopting clean beauty approaches or eco-packaging gained traction in niche markets and international exports, but widespread domestic acceptance remains limited.

The central finding is that despite clear policy intentions, limited accessibility, weak support ecosystems, and insufficient economic incentives hinder SMEs from transitioning toward clean technology in practice.

3. Policy Recommendations

Based on the synthesis of policy documents and field data, the following policy directions are proposed:

- Establish a Dedicated Clean-Tech Facilitation Unit for the cosmetics sector to serve as a knowledge hub, advisory center, and technology matchmaking platform.
- Develop targeted financial mechanisms, including a Green Innovation Fund, tax credits, and low-interest loans, to reduce cost burdens for SMEs.

- Introduce sector-specific training platforms such as workshops and online courses tailored to clean technology applications in formulations and packaging.
- Create an Input Quality Assurance and Verification System (IQAVs) to certify raw materials, packaging, and traceability standards.
- Stimulate demand through eco-labels, cross-media campaigns, and green marketing via e-commerce platforms.

The key conclusion is that effective policy design must shift from broad, generic frameworks toward sector-specific approaches, emphasizing systemic linkages between the state, industry, and consumers to strengthen the competitiveness of the Thai cosmetics industry in the global market.

6. Limitations and Future Research

Research Limitations

1. Qualitative Methodological Constraints: The study relied on in-depth interviews with a limited number of key informants. Although data saturation was achieved, findings reflect specific experiences and perspectives that may not capture all industry dimensions.
2. Limited Generalizability: As a qualitative study, the findings cannot be generalized to all cosmetics entrepreneurs but instead highlight trends and in-depth insights.
3. Temporal and Policy Context: The policy analysis focused on the past five years (2023–2025), meaning results reflect current frameworks that may evolve rapidly with changing economic, political, and technological contexts.
4. Consumer Perspectives: The study primarily explored the views of entrepreneurs and experts, while consumer attitudes toward clean cosmetics were not examined in depth.

Recommendations for Future Research

1. Quantitative Surveys: Large-scale surveys of entrepreneurs across regions should be conducted to validate qualitative insights and assess broader adoption patterns of clean technology.

2. Cross-Country Comparisons: Comparative studies of successful cases (e.g., Japan, South Korea, the European Union) could inform context-appropriate adaptations for Thailand.
3. Economic and Feasibility Analysis: Future studies should employ cost–benefit analysis and life cycle assessment (LCA) to quantify the economic and environmental impacts of clean technology adoption.
4. Consumer Behavior Research: Investigations into consumer willingness to pay (WTP) and attitudes toward sustainable cosmetics would provide valuable insights for demand-side policies and green marketing strategies.
5. Participatory Research Approaches: Co-creation of knowledge involving entrepreneurs, policymakers, and consumers should be emphasized to ensure policy recommendations are practical, accepted, and effectively implemented.

References:

APEC Energy Working Group (EWG). (2025, May 23). **Update on Thailand's Alternative Development Plan (AEDP).** Retrieved September 10, 2025, from https://www.egnret.ewg.apec.org/Upload/20250523111191175bf1.pdf

Bartkowiak, W., & Skensbergaite, M. (2023). Exploring European Union Corporate Sustainability Reporting Directive's (CSRD) integration process implications on business strategy. **Sustainability, 15**(3), 1552.

Benoit & Partners. (2025, April 28). **Green industry in Thailand: Investing for a sustainable future.** Retrieved September 10, 2025, from https://benoit-partners.com/green-industry-thailand/

Birot, V. (2024, May 17). BOI incentives for renewable energy in Thailand – Here's what you need to know for 2025. **LexNova Partners**. Retrieved September 10, 2025, from https://lexnovapartners.com/boi-incentives-for-renewable-energy-thailand/

Euromonitor International. (2023). **Beauty and personal care in Thailand**. ITA Bangkok Office.

Horthong, Y., Pathranarakul, P., & Aunphattanasilp, C. (2025). An examination of factors enhancing sustainable renewable energy consumption in Thailand during 2000–2020. **Journal of Public Administration, Public Affairs, and Management, 23(**1), 1–32.

Hwang, B. N., Jitanugoon, S., & Puntha, P. (2025). AI integration in service delivery: Enhancing business and sustainability performance amid challenges. **Journal of Services Marketing, 39**(2), 250–265.

Kangwantrakool, N., Maliwan, K., & Taweekun, J. (2025). A study on wind–wind energy for electric vehicles charging station on the Southern Highway of Thailand. **Journal of Advanced Research Design, 133(**1), 124–146.

Li, J., & Li, S. (2025). Thailand's journey: Unveiling the interplay between population, FDI, carbon emissions, and renewable energy for building a sustainable future. **Renewable Energy, 221***,* 124102. https://doi.org/10.1016/j.renene.2025.124102

Limsaku, A., Aroonchan, N., Paengkaew, W., & Kammuang, A. (2025). Climate change adaptation implementation and governance in Thailand: Increased resilience and potential conflicts. **In Risks, resilience and interdependency: Developing countries in the age of uncertainties** (pp. 89–110). Springer Nature Singapore.

Mahanakorn Partners Group. (2021, October 7). **The bio-circular-green economic model.** Retrieved September 10, 2025, from https://mahanakornpartners.com/the-bio-circular-green-economic-model

Mani, M., & Pollitt, H. (2024). **Towards a green and resilient Thailand. Washington,**

DC: World Bank.National Science and Technology Development Agency (NSTDA). (2020, December 16).

What is BCG economy model? Retrieved September 10, 2025, from https://www.nstda.or.th/home/knowledge_post/what-is-bcg-economy-model/

National Science and Technology Development Agency (NSTDA). (n.d.). **Thailand's BCG Economy: Creating sustainable competitiveness.** Retrieved September 10, 2025, from https://www.nstda.or.th/en/bcg-economy

NewClimate Institute. (2022, November). **Long-term energy strategy assessment – Thailand.** Retrieved September 10, 2025, from https://newclimate.org/sites/default/files/2022-11/2022-11-08_th_ltes_-_full_report.pdf

NEXSTEP. (2025, April 3). **Thailand energy outlook – National targets and policy integration.** Retrieved September 10, 2025, from https://nexstepenergy.org/web/node/194113

Oe, H., & Yamaoka, Y. (2022). The impact of communicating sustainability and ethical behaviour of the cosmetic producers: Evidence from Thailand. **Sustainability, 14**(2), 882.

Ooi, R. W. G. (2025). **Building ASEAN's regenerative economy through strategic capital and innovation ecosystems.**

Organisation for Economic Co-operation and Development (OECD). (2024, June 10). **Clean energy finance and investment roadmap of Thailand. Green Finance and Investment.** OECD Publishing. https://doi.org/10.1787/d0cd6ffc-en

Panitsettakorn, W., Ongkunaruk, P., & Leingpibul, T. (2023). The present state of the cosmetics supply chain in Thailand and the prospective role of Independent Quality Assurance Verifiers (IQAVs) within the supply chain. **Heliyon, 9**(10), e20531.

Perez Cuso, M., Blanco, I. J., Tewes-Gradl, C., Engels, S., Beekman, S., Oduor-Engels, J., & Covaiselvan, S. S. (2025). **The inclusive business case for governments.**

Srisathan, W. A., Ketkaew, C., Phonthanukitithaworn, C., & Naruetharadhol, P. (2023). Driving policy support for open eco-innovation enterprises in Thailand: A probit regression model. **Journal of Open Innovation: Technology, Market, and Complexity, 9**(3), 100084. https://doi.org/10.1016/j.joitmc.2023.100084

Thirakulwanich, A., Szczepańska-Woszczyna, K., & Kot, S. (2025). Policy instruments and green indicators in the diffusion of green innovation: A comparative analysis of Poland and Thailand. **Challenges in Sustainability, 13**(1), 35–47.

United Nations Industrial Development Organization (UNIDO). (2024, June). **Results and lessons learnt from GEIPP Phase I: Global Eco-Industrial Parks Programme (Lessons Learnt Series No. 6).** Retrieved September 10, 2025, from https://hub.unido.org/sites/default/files/publications/GEIPP%20Lessons%20Learnt%20Report%206-GEIPP%20I%20Results.pdf

Vong, K. C., Udomvitid, K., Ueki, Y., Intalar, N., Pongsathornwiwat, A., Pannakkong, W., ... & Jeenanunta, C. (2025). Strategic human resource development for Industry 4.0 readiness: A sustainable transformation framework for

emerging economies. **Sustainability, 17**(15), 6988. https://doi.org/10.3390/su17156988

World Bank. (2024). **Towards a green and resilient Thailand.** World Bank.