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From Green Transition to Green Employability: A Comparative Policy Analysis of Green Skills Development in ASEAN Higher Education

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ABSTRACT: Employers across Southeast Asia are beginning to demand skills that match a greening economy, not only in environmental professions but across finance, manufacturing, construction, and services. Higher education systems in the region, however, differ sharply in how they equip graduates for this shift. This article compares green skills development policies in six ASEAN countries: Singapore, Malaysia, Thailand, Indonesia, the Philippines, and Vietnam. Drawing on national policy documents, institutional strategies, and the scholarly literature, the comparison is organised around four dimensions: the depth of policy integration, the spread of sustainability content in curricula, investment in faculty development, and the strength of industry links for green skills. The findings show a wide gap between countries where green skills policy is coordinated at the system level (Singapore, Malaysia) and those where ambitious national targets have not yet produced widespread curriculum change (Vietnam, Philippines). Three bottlenecks cut across all six cases: the absence of discipline-specific green competency frameworks outside science and engineering, inadequate investment in training faculty to teach sustainability, and weak mechanisms for channelling green labour market intelligence into curriculum design. The article maps the current policy terrain and identifies leverage points for national reform, institutional strategy, and regional cooperation, including the potential of a regional qualifications framework for green competencies.

KEYWORDS: Green skills, higher education, ASEAN, comparative policy analysis, green employability, education for sustainable development, curriculum greening

1. INTRODUCTION

The energy transition is creating demand for a different kind of graduate. Across finance, manufacturing, construction, and services, employers need people who understand carbon accounting, circular supply chains, green building standards, ESG reporting, and the regulatory architecture emerging around net-zero commitments. This demand is no longer speculative. It is appearing in hiring data, in investment patterns, and in national legislation implementing the Paris Agreement and the Sustainable Development Goals (ILO, 2019; OECD, 2023).

Universities are caught in the middle of several simultaneous pressures. They are expected to teach sustainability, research it, and demonstrate it in their own operations, all while under the usual constraints of funding, staffing, and institutional inertia (Lozano et al., 2017; Leal Filho et al., 2019). Competency frameworks such as the European GreenComp (Bianchi et al., 2022) and the UNESCO Education for Sustainable Development roadmap (UNESCO, 2021) describe what sustainability-capable graduates should look like. They are useful reference points. Translating them into the messy reality of a national higher education system is another matter entirely.

That difficulty, the gap between framework and practice is especially acute in developing and middle-income economies, where resources are constrained and policy coordination is often weak. The ASEAN region is well suited for studying this problem. Its member economies range from high-income Singapore to lower-middle-income Vietnam and the Philippines, with corresponding variation in higher education capacity and

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governance. The region is also one of the most climate-exposed in the world. Rising sea levels, extreme weather, and threats to agricultural productivity mean that the green transition in ASEAN is not a policy option; it is a survival imperative (Asian Development Bank, 2021).

Yet we know very little about how ASEAN higher education systems are responding. Most published work examines single countries. Nearly all of it focuses on technical and vocational education rather than universities (ILO, 2020). There is no systematic comparison of how different ASEAN member states design, fund, and implement green skills policies in their higher education sectors and no analysis of what the pattern of convergence and divergence implies for regional cooperation.

This article provides that comparison. It examines six countries: Singapore, Malaysia, Thailand, Indonesia, the Philippines, and Vietnam, chosen to capture variation in economic development, governance models, and green policy maturity. Together they account for over ninety percent of ASEAN's population and tertiary enrolments. Brunei, Cambodia, Laos, and Myanmar are excluded because accessible policy documentation was insufficient for the present analysis. The article asks three questions. How do green skills policies in the higher education sectors of the six countries differ in design, instruments, and implementation? What patterns and divergences characterise these policy approaches? And what do the findings imply for national policy, institutional strategy, and regional cooperation? The next section situates these questions in the relevant literatures. Section 3 describes the methodology. Section 4 presents the comparative findings country by country, followed by a cross-cutting analysis. Section 5 discusses the implications, and Section 6 concludes.

2. LITERATURE REVIEW

2.1 Conceptualising Green Skills

The meaning of ‘green skills’ has expanded considerably. Early work in environmental economics and labour studies used the term narrowly: operating pollution control equipment, conducting environmental impact assessments, installing solar panels. The ILO now defines green skills more broadly as ‘the knowledge, abilities, values and attitudes needed to live in, develop and support a sustainable and resource-efficient society’ (ILO, 2019). UNESCO frames them within Education for Sustainable Development as competencies that enable action on environmental, economic, and social dimensions of sustainability (UNESCO, 2021). The shift matters for this study because it means green skills cannot be confined to environmental science departments. They are relevant wherever graduates will make decisions that affect resource use, emissions, or environmental quality, which is to say, nearly everywhere.

The study draws on three theoretical perspectives. Human capital theory, in its classic formulation (Schultz, 1961; Becker, 1964), treats education as investment in productivity and directs attention to the labour market returns to sustainability competencies. The Theory of Planned Behaviour (Ajzen, 1991) adds a psychological dimension: attitudes, social norms, and perceived behavioural control interact to produce or block sustainable behaviour, which explains why environmental knowledge does not reliably lead to environmental action. The Capability Approach (Sen, 1985; Nussbaum, 2011) broadens the frame beyond economic returns, asking how green skills expand people's substantive freedom to live the lives they value within environmental constraints. None of these perspectives alone is sufficient; together they capture the economic, psychological, and normative dimensions of the green skills problem.

On the operational side, two competency frameworks have shaped curriculum design internationally. The European GreenComp organises twelve competences into four groups: embodying sustainability values, embracing complexity, envisioning sustainable futures, and acting for sustainability (Bianchi et al., 2022). UNESCO's ESD framework takes a similar approach but situates the competencies within a broader educational transformation agenda (UNESCO, 2021). Though developed primarily for European and global policy contexts respectively, both have influenced sustainability education work in ASEAN (Brundiers et al., 2021).

2.2 Green Skills in Higher Education

The empirical literature on green skills in higher education is concentrated in developed economies. Lozano et al. (2017) reviewed competences and pedagogical approaches across the sector, documenting a shift from transmitting knowledge to problem-based and community-engaged pedagogies. Brundiers et al. (2021) synthesised this work into a consensus framework of key sustainability competencies, systems thinking, anticipatory, normative, strategic, and interpersonal, that are distinct from domain-specific content knowledge.

Leal Filho et al. (2019) surveyed teaching practices internationally and found a persistent disciplinary skew: sustainability content appeared most often in environmental science and engineering programmes, with considerably weaker integration in business, law, humanities, and social science. This pattern matters for ASEAN because the fastest-growing tertiary enrolments in the region are in business, economics, and social sciences rather than technical disciplines (UNESCO Institute for Statistics, 2024). If the disciplinary skew holds, the students most likely to encounter sustainability content are not the students entering the sectors where green employment is growing fastest.

National approaches vary. The United Kingdom mandates climate education across all levels and requires universities to publish sustainability strategies (Department for Education, 2022). Germany pursues a whole-institution approach through its National Strategy for ESD (BMBF, 2023). Singapore places the Ministry of Education as a co-lead agency of its Green Plan 2030, alongside environment and economic ministries (Government of Singapore, 2021). Across these examples, a consistent finding emerges: green skills policy reflects national governance traditions and political economy at least as much as it reflects international frameworks. This makes comparative analysis useful precisely because it surfaces those contextual influences rather than treating them as noise.

2.3 The ASEAN Higher Education Context

ASEAN higher education is diverse. Tertiary enrolment rates run from roughly fifteen percent in Cambodia and Myanmar to above forty-five percent in Singapore and Thailand (UNESCO Institute for Statistics, 2024). Governance ranges from centralised state direction in Vietnam to autonomous university models backed by strong quality assurance in Singapore and Malaysia. Private provision accounts for a large share of enrolments in Indonesia and the Philippines.

Regional cooperation frameworks exist but are thin on green skills. The ASEAN Work Plan on Education 2021–2025 mentions sustainable development as a cross-cutting theme but sets no green skills indicators and allocates no dedicated resources. The ASEAN Qualifications Reference Framework enables mutual recognition of qualifications but does not incorporate green competency standards. The ASEAN Declaration on

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Promoting Green Jobs (2018) and the ASEAN Green Jobs Guidelines (2019) signal political will, though implementation in higher education as opposed to TVET, remains limited (ILO, 2020).

The literature identifies several recurring difficulties. Green growth strategies and higher education plans are often developed in separate policy silos. University curriculum structures resist the interdisciplinary character of sustainability. Faculty capacity for sustainability teaching is thin, and mechanisms for translating industry green skill demands into curriculum content are weak. These are not problems unique to ASEAN, but the region's institutional diversity makes it a valuable setting for examining how governance context shapes green skills policy outcomes.

3. METHODOLOGY

3.1 Research Design

This study uses a qualitative comparative policy analysis design (George & Bennett, 2005; Yin, 2018). It combines document analysis of national policies and institutional reports with a structured cross-country comparison of six ASEAN higher education systems.

3.2 Case Selection

The six countries: Singapore, Malaysia, Thailand, Indonesia, the Philippines, Vietnam, were selected to reflect variation on three dimensions: economic development, higher education governance model, and green policy maturity. Together they represent over ninety percent of ASEAN's population and tertiary enrolments. Brunei, Cambodia, Laos, and Myanmar were excluded because accessible documentation was inadequate for equivalent depth of analysis.

3.3 Data Sources and Collection

Three categories of documents were analysed. National policy documents included green growth strategies, education development plans, climate change commitments, and sectoral green skills frameworks. Institutional documents included university sustainability strategies, green campus plans, and programme specifications. The third category comprised reports and frameworks from international organisations active in ASEAN green skills work, principally the ILO, ADB, UNESCO, and OECD.

Documents were located through systematic searches of government websites, university portals, international organisation repositories, and the academic databases Scopus, Web of Science, and Google Scholar. A document was included if it directly addressed green skills, sustainability competencies, or environmental education in higher education, or contained provisions applicable to the sector. Documents in Vietnamese, Thai, and Bahasa Indonesia were consulted through official English translations where available or through secondary scholarly sources.

3.4 Analytical Framework

The analysis used directed qualitative content analysis (Hsieh & Shannon, 2005), with a coding framework structured around four dimensions drawn from the literature reviewed above:

D1—Policy Integration Depth: the extent to which green skills are embedded in national education plans, qualifications frameworks, and accreditation standards.

D2—Curriculum Greening: the presence and scope of sustainability content in university curricula, mandatory modules, green programme offerings, interdisciplinary provision.

D3—Faculty and Institutional Capacity: policies and programmes that develop faculty expertise in sustainability education and that build institutional infrastructure for green teaching and research.

D4—Industry-Academia Linkages: the mechanisms, advisory boards, skills forecasting, work-integrated learning, that align green skills provision with labour market demand.

These four dimensions serve as the organising structure for the country-level analysis in Section 4 and the cross-case synthesis in Section 4.7.

For each country, a structured profile was constructed covering macroeconomic context, higher education governance, key green skills policy frameworks with higher education provisions, institutional implementation examples, and documented challenges. Cross-case comparison used pattern matching and explanation building to identify convergent trends, divergent pathways, and common bottlenecks.

3.5 Limitations

Several limitations apply. The reliance on documentary evidence may miss informal practices, especially where green skills innovation occurs through individual academics rather than formal policy. The quality and accessibility of policy documents vary across the six countries; English-language documentation is stronger for Singapore and Malaysia than for Vietnam or Indonesia. No primary data were collected from policymakers or institutional actors. Four ASEAN member states were excluded, so the regional picture is incomplete. These constraints are addressed through transparent reporting of sources and caution in comparative claims.

4. FINDINGS

4.1 Singapore: The Integrated Ecosystem Model

Singapore operates the closest thing to an integrated green skills ecosystem in ASEAN. Policy runs vertically from whole-of-government strategy to institutional implementation, and horizontally across ministries. Under the Singapore Green Plan 2030 (launched 2021, updated 2024), the Ministry of Education is a co-lead agency alongside the ministries responsible for sustainability, trade, transport, and national development (Government of Singapore, 2021). Education is built into the national sustainability architecture, not treated as a downstream delivery function.

The SkillsFuture Singapore framework connects green economy priorities to education and training. Its Skills Framework for Green Economy maps career pathways, carbon management, sustainable finance, ESG reporting, green building, clean energy and specifies competency requirements for each (SkillsFuture Singapore, 2022). The Enterprise Sustainability Programme, run by Enterprise Singapore, supports companies in building sustainability capabilities and generates demand signals that reach universities and polytechnics.

Institutions have responded. Nanyang Technological University launched a fifteen-year Sustainability Manifesto in 2021 and committed to carbon neutrality by 2035, issuing what it described as the first sustainability-linked university bond (NTU, 2025). The National University of Singapore hosts the Sustainable and Green Finance Institute and the Centre for Nature-based Climate Solutions. It offers a Master of Science in Sustainable

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and Green Finance. The Monetary Authority of Singapore supports curriculum development in ESG investing, green bonds, and carbon markets (Monetary Authority of Singapore, 2021). Polytechnics offer green diplomas, Sustainable Built Environment, Green Building and Sustainability and the Institute of Technical Education embeds green skills modules across its technical programmes. The architecture spans the full qualification spectrum.

Singapore is not without problems. The supply of academics whose expertise bridges sustainability science and professional domains, green finance analytics, sustainable supply chain management is thin, as recent institutional reviews have noted. The pace of regulatory change in carbon trading and mandatory climate disclosure puts constant strain on curriculum cycles. But the structural advantage is clear: policy coherence, dedicated institutions, and established demand signals make Singapore the regional benchmark.

4.2 Malaysia: The Blueprint-Driven Approach

Malaysia anchors its green skills policy in two national frameworks. The National Green Technology Policy (2009, revised 2021) committed to integrating green technology into education at all levels (Malaysia Ministry of Energy, Green Technology and Water, 2009). The Malaysia Education Blueprint 2015–2025 (Higher Education) operationalised this through ten transformation shifts (Malaysia Ministry of Higher Education, 2015). Sustainability features explicitly: Shift 1 names environmental consciousness as a graduate attribute; Shift 3 includes green skills in lifelong learning provision; Shift 7 identifies sustainability as a research priority. Progress is tracked through annual performance reports.

Public universities have built substantial programmes. Universiti Malaya maintains a Sustainability Blueprint and a Sustainable Development Centre, targeting carbon neutrality by 2050. Universiti Kebangsaan Malaysia hosts LESTARI, the Institute for Environment and Development. Universiti Sains Malaysia, designated an APEX university with sustainability as its core mission, runs the Centre for Global Sustainability Studies. Several Malaysian universities appear consistently in the global top 100 of the UI GreenMetric rankings.

The polytechnic and community college sector, under the Department of Polytechnic and Community College Education (JPPKK), has adopted a Green Technology Module and Green Campus policy. The Malaysian Qualifications Agency has placed sustainability criteria in programme accreditation standards. The National Occupational Skills Standard now includes green job standards, and the Green Technology Competency Programme prepares TVET instructors to teach green skills.

Two challenges persist: the gap between leading research universities and smaller, less-resourced institutions, and the uneven depth of green skills integration in business and social science programmes compared with engineering and environmental science.

4.3 Thailand: The BCG Economy Model

Thailand's approach is shaped by the Bio-Circular-Green (BCG) Economy Model, adopted as a national agenda for 2021–2027 (Ministry of Higher Education, Science, Research and Innovation [Thailand], 2021). The BCG Model targets four sectors, agriculture and food, health and medicine, energy and biochemicals, tourism and creative economy and designates the Ministry of Higher Education, Science, Research and Innovation (MHESI) as lead implementing agency. Giving the higher education ministry direct responsibility for green economic transformation is unusual among the cases examined and creates strong institutional incentive to align university research and teaching with BCG priorities.

Higher education provisions under the BCG Model include research funding tied to priority sectors, talent development programmes, and integration of BCG principles into university strategic plans. MHESI's Reinventing University System groups universities into strategic categories, including an ‘Area-based and Community Engagement’ track for sustainability-oriented institutions.

Thai universities have earned international recognition for campus sustainability. Chulalongkorn University has committed to carbon neutrality by 2040 and runs the Chula Zero Waste programme. King Mongkut's University of Technology Thonburi consistently ranks first in Thailand on the UI GreenMetric, with an integrated Energy, Environment, Safety and Health management system. Mahidol University has embedded sustainability across its health sciences curricula. The Green University Network of Thailand facilitates peer learning and resource sharing.

Two challenges stand out: extending green skills work beyond the leading research universities to the broader sector, and converting the high-level BCG framework into programme-specific learning outcomes. Some initiatives depend on time-limited donor funding, raising questions about sustainability when external support concludes.

4.4 Indonesia: Green Aspirations in a Decentralised System

Indonesia's case illustrates the difficulty of implementing national sustainability goals across a decentralised higher education sector that spans thousands of institutions. The National Medium-Term Development Plans (RPJMN 2020–2024, 2025–2029) embed low-carbon development as a national paradigm. A Green Economy Index has been developed. Indonesia issued the world's first sovereign green sukuk in 2018, a clear signal of high-level commitment.

The principal higher education reform, Merdeka Belajar-Kampus Merdeka (Freedom to Learn–Independent Campus, launched 2020), allows students to earn up to twenty credits outside their core programme, including sustainability-themed community projects, green industry internships, and environmental research. University Key Performance Indicators include metrics on community service and off-campus student experience, creating incentives for sustainability engagement (Kemendikbudristek, 2020).

Indonesia is the originator of the UI GreenMetric World University Rankings, developed at Universitas Indonesia and now the most widely adopted international green campus benchmarking system. This provides visibility and institutional motivation. Institut Teknologi Bandung runs a Centre for Environmental Studies and a renewable energy research centre. Universitas Gadjah Mada has mandatory environmental courses through its Centre for Environmental Studies. Institut Pertanian Bogor hosts the Centre for Climate Risk and Opportunity Management.

The structural obstacles are significant. University autonomy under Indonesian law, combined with the sheer scale of the sector, makes coordinated green skills integration difficult. While leading universities have aligned with national priorities, many smaller private institutions may lack the resources for substantial curriculum reform. The Kampus Hijau (Green Campus) initiative has engaged over one hundred institutions but concentrates on campus operations rather than curriculum change.

4.5 The Philippines: Legislative Foundation, Fragmented Implementation

The Philippines possesses one of ASEAN's strongest legislative bases for green skills. The Philippine Green Jobs Act of 2016 (Republic Act No. 10771) defines green jobs as ‘employment that contributes to preserving or restoring the quality of the environment,’ mandates a national Green

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Jobs Human Resource Development Plan, provides fiscal incentives for enterprises creating green jobs, and establishes an Inter-Agency Green Jobs Council with CHED as a member (Green Jobs Act of 2016, 2016).

For higher education, CHED Memorandum Order No. 2 (2016), issued under the National Environmental Awareness and Education Act of 2008 (Republic Act No. 9512), requires integration of environmental education across all undergraduate programmes. CHED has issued further policies on environmental education and mandates that all institutions include disaster risk reduction and climate change adaptation in their curricula.

Several universities have built strong programmes. The University of the Philippines system operates a Sustainable Development Framework and multiple environmental research centres. Ateneo de Manila University, working from its Jesuit tradition and the Laudato Si' encyclical, has established an Institute of Sustainability and produces annual sustainability reports. De La Salle University runs a Sustainable Development Office and a green technology incubator. Silliman University maintains long-standing programmes in marine and coastal sustainability.

Implementation, however, is constrained. The Green Jobs Act's higher education provisions have been only partially operationalised; dedicated funding for curriculum redesign and faculty development is limited. CHED's environmental education mandate, while strong on paper, relies on institutional initiative rather than enforcement. The Philippine Green Jobs Mapping Study identified growth areas, renewable energy, solid waste management, sustainable agriculture, eco-tourism but mechanisms for channelling these findings into programme design remain underdeveloped.

4.6 Vietnam: Policy Ambition, Implementation Gaps

Vietnam shows a wide gap between national policy ambition and higher education practice. The National Green Growth Strategy for 2021–2030 (Decision 1658/QĐ-TTg, October 2021) sets targets for reducing greenhouse gas intensity, greening economic sectors, and developing green human resources (Chính phủ Việt Nam, 2021). The Net Zero 2050 commitment, announced at COP26, further strengthens the mandate. In the banking sector, Decision 1604/QĐ-NHNN (2018) approved a green banking development scheme requiring training institutions under the State Bank, including universities to strengthen green finance curricula (Ngân hàng Nhà nước Việt Nam, 2018).

Translation into curriculum, however, is limited. Data from a 2025 survey of 209 students at a Vietnamese public economics and finance university illustrates the gap. Students showed positive environmental attitudes (mean 3.90 on a five-point scale), but their cognitive understanding of green economy concepts was lower (mean 3.65). Professional green skills, analysing green financial products, assessing environmental risk in lending, averaged 3.80. The influence of formal curriculum on green skill formation received the lowest rating among all factors examined (mean 3.69), suggesting students were developing green awareness more through extracurricular channels than through their degree programmes.

Several universities are developing green programmes. Vietnam National University, Hanoi runs a Centre for Environmental and Natural Resources Studies and a climate change programme. The University of Economics Ho Chi Minh City has launched a Green University project. Hanoi University of Science and Technology maintains research programmes in green technology and renewable energy. Across the sector, sustainability content is concentrated in environmental science and engineering, with little integration in business, finance, and law.

Structural constraints include the absence of a national green competency framework for higher education, minimal sustainability content in accreditation standards, and a shortage of faculty with interdisciplinary expertise in sustainability and professional practice. The centralised governance model, while theoretically suited to top-down reform, has not yet produced the regulatory instruments and resource allocations needed to convert policy ambition into curriculum change.

Table 1: Comparative Summary of Green Skills Policy Integration Across Six ASEAN Higher Education Systems

Country	D1: Policy Integration Depth	D2: Curriculum Greening	D3: Faculty & Institutional Capacity	D4: Industry-Academia Linkages	Distinctive Feature
Singapore	High	High	Medium-High	High	MOE co-leads Green Plan 2030; SkillsFuture maps green career pathways across sectors
Malaysia	High	Medium-High	Medium	Medium	Blueprint-driven; MQA sustainability criteria in accreditation; Green Technology Competency Programme
Thailand	Medium-High	Medium	Medium	Medium	BCG Economy Model; MHESI as lead agency; strong research university engagement
Indonesia	Medium	Medium	Medium-Low	Low-Medium	Merdeka Belajar enables sustainability projects; UI GreenMetric origin; scale limits systemic reform
Philippines	Medium	Medium	Low-Medium	Low	Green Jobs Act (2016) provides legislative mandate; CHED environmental education requirement partially implemented
Vietnam	Medium-Low	Low-Medium	Low	Low	Strong national ambitions (Net Zero 2050, Green Growth Strategy) but limited curriculum translation

Note: Ratings reflect the degree of systematic policy implementation at the higher education level as documented in available policy documents, institutional reports, and scholarly sources. "High" indicates coordinated system-wide integration; "Low" indicates fragmented or early-stage implementation.

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4.7 Cross-Cutting Patterns and Divergences

Table 1 provides a summary comparison across all six countries and four analytical dimensions. Several patterns recur across the cases.

Governance capacity and policy integration are tightly coupled. Singapore and Malaysia align national sustainability strategies with higher education planning more effectively than the others. This is not a simple income effect: Malaysia's green skills policy maturity exceeds what per capita GDP alone would predict. Sustained policy attention, visible in successive national plans over two decades appears to matter independently of income.

National qualifications frameworks that incorporate sustainability competencies are associated with greater curriculum integration. Malaysia's MQA standards and Singapore's Skills Framework for Green Economy create pathways through which sustainability requirements reach individual programmes. Where such provisions are absent—Vietnam, the Philippines—the level of systematic curriculum greening is lower.

Faculty capacity is a bottleneck in every country examined. Even Singapore reports shortages in the supply of academics who can bridge sustainability science and professional domains. In lower-income ASEAN countries the constraint is more acute, with limited budgets for faculty development in sustainability.

Industry-academia linkages for green skills are weak across the board. Formal mechanisms for channelling green labour market intelligence into higher education, advisory boards with sustainability mandates, green skills anticipation exercises, structured work placements in green sectors are rare. Singapore's SkillsFuture ecosystem is the regional best practice, but even there the primary mechanisms target TVET and continuous education rather than degree programmes.

ASEAN-level cooperation on green skills in higher education is thin relative to the scale of the challenge. The ASEAN Work Plan on Education references sustainable development but lacks indicators, resources, and monitoring. Regional cooperation remains largely project-based and donor-funded, driven by the ILO, ADB, and GIZ rather than institutionalised.

Across all six countries, TVET systems have moved faster than universities to integrate green skills, driven by closer links to labour markets and industry training funds. The divergence is least pronounced in Singapore, where education and economic planning are more tightly integrated across qualification levels.

5. DISCUSSION

5.1 What Explains the Variation?

The large variation in green skills policy approaches from Singapore's coordinated ecosystem to the fragmented realities in Vietnam and the Philippines can be traced to three interacting factors.

Economic structure matters because it shapes both fiscal capacity and the character of labour market demand. Singapore's diversified, service-oriented economy generates employer demand for green skills in finance, professional services, and technology, creating a pull that motivates universities to respond. In economies where green employment concentrates in agriculture, manufacturing, and energy, the breadth of green labour market signals reaching higher education is narrower.

Governance architecture determines whether coordination across education, environment, labour, and economic ministries is possible. Singapore places the Ministry of Education inside the Green Plan's leadership. Where education ministries are not formal partners in green growth governance, the more common pattern sectoral fragmentation results. Thailand's designation of MHESI as the lead BCG agency is an innovative variation worth further study; it embeds responsibility for green economic transformation inside the higher education ministry itself.

The role of international development partners is a double-edged feature. In Thailand, Indonesia, and Vietnam, green skills initiatives in higher education depend heavily on donor-funded projects, ADB technical assistance, ILO programmes, GIZ partnerships. This creates islands of activity that may not outlast project funding. The pattern is familiar in developing-country education reform but is especially consequential for green skills, which need sustained, cross-disciplinary curriculum development rather than one-off interventions.

5.2 The Policy-Implementation Gap

The gap between what green skills policies promise and what is delivered in universities is the most consistent finding across the six cases. It is most visible in Vietnam and the Philippines but present everywhere to some degree. Four dimensions of the gap recur: curriculum provisions that exist on paper but are not operationalised in teaching; faculty development policies without dedicated funding; industry advisory bodies that meet irregularly and do not influence programme design; and monitoring systems that track whether policies have been adopted rather than whether learning outcomes have changed.

This is not simply a resource problem. In centralised systems, line ministries may issue green skills directives without providing the pedagogical resources, faculty training, or assessment frameworks that institutions need. In more autonomous systems, the gap between central mandates and institutional capacity produces uneven implementation. The pattern is characteristic of cross-cutting policy mandates in systems where incentives are organised around disciplinary norms and traditional academic outputs. Addressing it requires changing programme accreditation criteria, faculty evaluation systems, and funding models not issuing more directives.

Table 2: Key Policy Instruments for Green Skills Development in ASEAN Higher Education by Country

Country	National Green Strategy (with HE provisions)	HE-Specific Green Policy	Qualifications / Accreditation Tool	Faculty Development Programme	Industry Linkage Mechanism
Singapore	Singapore Green Plan 2030 (MOE as co-lead)	Skills Framework for Green Economy (SSG)	SkillsFuture credit system; green career pathway maps	Enterprise Sustainability Programme (ESG)	Industry Transformation Maps;

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					Job Transformation Maps
Malaysia	National Green Technology Policy (2009, rev. 2021)	MEB-HE 2015-2025 (Shift 1, 3, 7)	MQA sustainability criteria; NOSS green job standards	Green Technology Competency Programme	Sectoral skills councils; industry advisory panels
Thailand	BCG Economy Model (2021-2027)	MHESI Reinventing University System	TQF sustainability learning outcomes (emerging)	BCG research funding; challenge-based projects	Eastern Economic Corridor work-integrated learning
Indonesia	RPJMN 2020-2029 (low-carbon development)	Merdeka Belajar-Kampus Merdeka (2020)	BAN-PT accreditation (green criteria emerging)	Kampus Hijau initiative (100+ institutions)	Green industry internships (MBKM partner scheme)
Philippines	Green Jobs Act 2016 (RA 10771)	CHED Memo No. 2 s.2016; RE Act 9512 (2008)	CHED environmental education requirement (all programmes)	Limited dedicated funding; project-dependent	Inter-Agency Green Jobs Council (CHED member)
Vietnam	Green Growth Strategy (Decision 1658, 2021)	Decision 1604 green banking; Net Zero 2050 commitment	No green competency framework for HE	No dedicated HE faculty programme	Limited formal mechanisms; project-based partnerships

Note: Instruments listed are those with documented higher education provisions. Abbreviations: MOE = Ministry of Education; SSG = SkillsFuture Singapore; MEB-HE = Malaysia Education Blueprint (Higher Education); MQA = Malaysian Qualifications Agency; NOSS = National Occupational Skills Standard; MHESI = Ministry of Higher Education, Science, Research and Innovation (Thailand); TQF = Thailand Qualifications Framework; BAN-PT = National Accreditation Board for Higher Education (Indonesia); MBKM = Merdeka Belajar-Kampus Merdeka; CHED = Commission on Higher Education (Philippines).

5.3 Implications

The findings, summarised in Table 2, point to several concrete implications.

For national policy, the experience of Malaysia and Singapore indicates that embedding green skills criteria in qualifications frameworks and accreditation standards provides effective leverage for systemic change. Dedicated funding for faculty development in sustainability pedagogy along the lines of Malaysia's Green Technology Competency Programme, could be adapted for higher education across the region.

For institutions, dedicated sustainability education units with cross-faculty mandates appear more effective than relying on individual faculty champions. Integrating sustainability learning outcomes into all programme specifications, not only those in environmental disciplines, would address the disciplinary skew documented in the literature.

For ASEAN, a regional green skills qualifications reference framework would facilitate mutual recognition of sustainability competencies. A regional green faculty mobility programme could help address capacity gaps in lower-income member states. Including specific green skills benchmarks in the next ASEAN Work Plan on Education would signal political commitment and enable progress tracking.

For international partners, shifting from project-based support to long-term systemic partnerships aligned with national frameworks is likely to improve impact. Open-access green skills curriculum resources, adapted to diverse ASEAN contexts, could reduce the duplication that characterises the current donor-funded landscape.

6. CONCLUSION

This article has compared green skills development policies across six ASEAN higher education systems, examining them through four analytical dimensions: policy integration, curriculum greening, faculty capacity, and industry-academia linkages. The comparison reveals large divergence from Singapore's coordinated ecosystem to the more fragmented approaches in lower-income member states while identifying challenges that cut across the region.

The paper maps green skills policy architectures in a region that has received little attention in comparative education policy research, despite its climate vulnerability and economic significance. The four-dimension framework is applicable beyond ASEAN. And the analysis identifies specific instruments, qualifications framework integration, dedicated faculty development funding, cross-faculty sustainability units that are consistently associated with more systematic green skills provision.

The analysis is limited by its reliance on documentary evidence, which will miss informal innovation at the level of individual academics. Four ASEAN member states are not included; future research should incorporate them as documentation becomes accessible. The paper does not assess outcomes graduate competencies, employer satisfaction, green employment rates which is the logical next step for research connecting policy inputs to measurable results.

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The green transition in ASEAN is underway, driven by climate commitments, trade shifts, and environmental exposure. How well the region's higher education systems equip graduates with technical knowledge, certainly, but also with the capacity to work across disciplines and to connect sustainability principles to professional practice will shape the trajectory of this transition. The policy foundations are being laid. The distance between policy intent and classroom practice is what remains.

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Conflict of Interest Declaration
The author declares that there are no conflicts of interest, financial, professional, or personal, that could have influenced the research, analysis, or writing of this manuscript. The author has no affiliations with or involvement in any organisation or entity with a financial or non-financial interest in the subject matter discussed in this manuscript.

Data Availability Statement
All data analysed in this study are drawn from publicly available policy documents, institutional reports, and published academic literature. The list of documents consulted and the analytical framework used are described in the Methodology section. Additional details on document sources are available from the corresponding author upon reasonable request.

Ethical Approval Statement
This study is a comparative policy analysis based exclusively on documentary evidence. It does not involve human participants, animal subjects, or the collection of primary data from individuals. Institutional ethical approval was not required for this type of research. The survey data cited in Section 4.6 were drawn from a separate institutional study conducted under the Banking Academy of Vietnam's Eureka Scientific Research Programme, which received appropriate institutional approval.

Declaration of Originality
This manuscript is original, has not been published previously in whole or in part, and is not currently under consideration for publication elsewhere. The author has read and approved the final version of the manuscript and agrees with its submission to the Global Journal of Education, Finance and Management (GJEFM).

Notes for the Editor
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