

THE ROLE OF HIGHER EDUCATION IN SUPPORTING SUSTAINABLE DEVELOPMENT IN THE TROPICAL RAINFOREST REGION

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ABSTRACT

Tropical rainforest regions, exemplified by the island of Borneo and the Indonesian province of East Kalimantan, sit at the intersection of accelerating environmental change and rapid economic transformation. Between 1973 and 2010, Borneo lost roughly 30% of its 1973 forest cover, and national monitoring data indicate that Indonesian deforestation surged again in 2025, reversing several years of decline. Higher education institutions (HEIs) are increasingly recognised as pivotal actors in reconciling ecological protection with development, through their three-fold mandate of education, research, and community service. This article examines how HEIs situated in and around tropical rainforest regions, using East Kalimantan as an illustrative case, contribute to sustainable development through curriculum integration, applied research on forest and community systems, and structured community engagement that incorporates indigenous ecological knowledge. Drawing on an integrative review of peer-reviewed literature, institutional reports, and policy documentation, the article synthesises the mechanisms, opportunities, and constraints that shape the sustainability contribution of HEIs in this setting, with particular attention to the pressures and opportunities created by the relocation of Indonesia's national capital (Ibu Kota Nusantara, IKN) to East Kalimantan. The findings indicate that HEIs contribute most effectively to sustainable development when the three pillars of the Tri Dharma Perguruan Tinggi are deliberately integrated rather than pursued separately, and when community-engagement programmes are co-designed with local and indigenous communities rather than delivered to them. The article concludes with practical recommendations for strengthening the sustainability role of HEIs operating in tropical rainforest regions.

Keywords: Higher Education, Sustainable Development, Tropical Rainforest, Tri Dharma Perguruan Tinggi, Education For Sustainable Development, Community Engagement, East Kalimantan

ABSTRAK

Kawasan hutan hujan tropis, yang dicontohkan oleh pulau Kalimantan dan provinsi Kalimantan Timur di Indonesia, berada di persimpangan antara percepatan perubahan lingkungan dan transformasi ekonomi yang pesat. Antara tahun 1973 dan 2010, Kalimantan kehilangan sekitar 30% dari tutupan hutannya pada tahun 1973, dan data pemantauan nasional menunjukkan bahwa deforestasi di Indonesia kembali melonjak pada tahun 2025, membalikkan penurunan selama beberapa tahun. Lembaga pendidikan tinggi (PT) semakin diakui sebagai aktor penting dalam

mendamaikan perlindungan ekologi dengan pembangunan, melalui mandat tiga rangkapnya yaitu pendidikan, penelitian, dan pengabdian masyarakat. Artikel ini mengkaji bagaimana PT yang berlokasi di dalam dan sekitar kawasan hutan hujan tropis, dengan menggunakan Kalimantan Timur sebagai studi kasus, berkontribusi pada pembangunan berkelanjutan melalui integrasi kurikulum, penelitian terapan tentang sistem hutan dan masyarakat, serta keterlibatan masyarakat yang terstruktur yang menggabungkan pengetahuan ekologi masyarakat adat. Dengan mengacu pada tinjauan integratif literatur yang ditinjau sejawat, laporan institusional, dan dokumentasi kebijakan, artikel ini mensintesis mekanisme, peluang, dan kendala yang membentuk kontribusi keberlanjutan lembaga pendidikan tinggi (HEI) di lingkungan ini, dengan perhatian khusus pada tekanan dan peluang yang diciptakan oleh relokasi ibu kota negara Indonesia (Ibu Kota Nusantara, IKN) ke Kalimantan Timur. Temuan menunjukkan bahwa HEI berkontribusi paling efektif terhadap pembangunan berkelanjutan ketika tiga pilar Tri Dharma Perguruan Tinggi diintegrasikan secara sengaja daripada dijalankan secara terpisah, dan ketika program keterlibatan masyarakat dirancang bersama dengan masyarakat lokal dan masyarakat adat daripada diberikan kepada mereka. Artikel ini diakhiri dengan rekomendasi praktis untuk memperkuat peran keberlanjutan HEI yang beroperasi di wilayah hutan hujan tropis.

Kata Kunci: Pendidikan Tinggi, Pembangunan Berkelanjutan, Hutan Hujan Tropis, Tri Dharma Perguruan Tinggi, Pendidikan untuk Pembangunan Berkelanjutan, Keterlibatan Masyarakat, Kalimantan Timur.

A. Introduction

Tropical rainforests cover a small fraction of the Earth's land surface yet harbour a disproportionate share of its terrestrial biodiversity and store vast quantities of carbon that are central to global climate stability. Borneo, the third-largest island in the world and shared between Indonesia, Malaysia, and Brunei, is one of the most biologically diverse landscapes on the planet, home to species such as the orangutan, the clouded leopard, and the pygmy elephant. Yet the island has also experienced one of the fastest large-scale forest

transformations recorded anywhere in the tropics. Satellite-based analysis covering the period 1973–2010 estimated that Borneo's forest cover declined from 75.7% to about 52.8% of the island's land area, with the steepest rates of loss recorded in the Indonesian province of Kalimantan and the Malaysian state of Sabah ^[1]. Complementary satellite monitoring by the World Wide Fund for Nature found that 56% of protected lowland rainforest in Kalimantan was cleared between 1985 and 2001 alone, an area larger than Belgium ^[2]. More recent monitoring data show that this

pressure has not disappeared: after several years of decline, Indonesia's national deforestation rate rose by 66% in 2025 compared with the previous year, with losses concentrated in Kalimantan, Sumatra, and increasingly Papua ^[3].

These figures describe more than an ecological problem; they describe a development problem, because the same forests that store carbon and shelter biodiversity also underpin the livelihoods, water security, and cultural identity of millions of people who live in and around them, including numerous Dayak indigenous communities across Kalimantan. Reconciling economic development with forest protection in these regions requires institutions capable of producing relevant knowledge, training capable professionals, and engaging directly with the communities whose decisions shape the forest on a daily basis. Higher education institutions (HEIs) are among the few types of institution positioned to do all three of these things simultaneously.

Globally, the role of HEIs in sustainable development has moved from the margins of institutional strategy to a central expectation.

UNESCO's Education for Sustainable Development (ESD) programme frames education as a tool for equipping people with the knowledge, skills, values, and attitudes needed to live and work in ways compatible with a stable environment, a viable economy, and a just society ^[4]. In parallel, a growing body of scholarship documents the "third mission" of universities, alongside teaching and research, as active agents of regional sustainability transitions, working with governments, industry, and civil society to translate research findings into practice ^[5,6]. Dzvimbo and colleagues, writing on climate and disaster governance in Zimbabwe, argue that HEIs occupy a distinctive position because they can simultaneously build professional capacity, generate policy-relevant research, and shape public understanding of environmental risk ^[5]. A systematic review of the regional sustainability transition literature by Hinterleitner and colleagues similarly finds that universities most often contribute to sustainable regional development through co-created projects and applied research partnerships that are embedded in the specific ecological and social

conditions of their host region, rather than through generic institutional policy alone ^[6].

Indonesia presents a particularly instructive setting in which to examine this role. The country holds one of the largest expanses of tropical rainforest on Earth, is undergoing rapid economic and infrastructural change, and is simultaneously relocating its national capital, Ibu Kota Nusantara (IKN), into East Kalimantan, a province defined ecologically and culturally by its rainforest. This relocation, intended in part to be built as a low-carbon "forest city," has generated renewed government and academic attention to the demand for higher education capacity in the region, including proposals for new tertiary institutions in areas bordering IKN. Local institutions, including health, education, and applied-science colleges such as Politeknik Kesehatan (Poltekkes) Kemenkes Kalimantan Timur and Universitas Mulawarman, sit directly within this transition and are increasingly called upon to align their teaching, research, and community-service functions with sustainable development priorities.

This article examines how HEIs situated in tropical rainforest regions,

with East Kalimantan as an illustrative case, support sustainable development, and identifies the structural conditions under which that contribution is strengthened or constrained. The article addresses three specific questions. First, how does the ecological and developmental context of a tropical rainforest region shape the sustainability mandate of HEIs operating within it? Second, through which concrete mechanisms curriculum, research, and community engagement do HEIs translate that mandate into practice? Third, what challenges and opportunities does the ongoing relocation of Indonesia's capital to East Kalimantan create for the sustainability role of regional HEIs? In addressing these questions, the article aims to move beyond a general statement of universities' importance to sustainable development and toward a more specific account of how that importance is realised, or left unrealised, in a tropical rainforest setting.

B. Research Method

This article is based on an integrative narrative review rather than

a systematic review with pre-registered inclusion criteria, reflecting its purpose: to synthesise cross-disciplinary evidence, drawn from conservation science, higher education research, and Indonesian policy documentation, into a coherent account of the sustainability role of HEIs in a specific tropical rainforest region.

Sources were identified through structured searches of peer-reviewed literature, institutional and multilateral reports (UNESCO, the World Wide Fund for Nature, the United Nations Environment Programme, and the Center for International Forestry Research and World Agroforestry [CIFOR–ICRAF]), and Indonesian government and university documentation relating to East Kalimantan and the Ibu Kota Nusantara relocation. Search terms combined three clusters of keywords: (i) higher education, universities, Tri Dharma Perguruan Tinggi, education for sustainable development; (ii) tropical rainforest, deforestation, Borneo, Kalimantan, indigenous knowledge; and (iii) sustainable development goals, green campus, community engagement.

Sources were included if they provided empirical data, institutional documentation, or peer-reviewed analysis relevant to (a) the ecological or developmental condition of tropical rainforest regions, with particular emphasis on Borneo and Kalimantan; (b) the functions of higher education institutions in sustainability, whether globally or in comparable regional contexts; or (c) the specific institutional and policy context of East Kalimantan, including the IKN relocation. Sources with no clearly identifiable authorship, publisher, or verifiable data were excluded to preserve traceability. Where quantitative figures were reported by multiple independent sources for example, Borneo-wide forest-cover statistics the article reports the range and notes the differing methodologies rather than reconciling them into a single number.

The synthesis follows the logic used in previous systematic reviews of higher education's regional sustainability role ^[6], organising findings into the three conventional pillars of the Indonesian higher-education mandate education and curriculum, research, and community service (Tri Dharma Perguruan Tinggi)

while adding a cross-cutting analysis of indigenous knowledge integration, given its particular salience in a Dayak-majority rainforest region. Findings are presented descriptively

C. Result and Discussion

1. The Ecological and Developmental Context of Tropical Rainforest Regions

Understanding the sustainability role of HEIs in a tropical rainforest region requires first establishing the scale and trajectory of environmental change in that region, because it is this trajectory that defines the problems institutions are being asked to help solve.

Multiple independent lines of satellite-based evidence converge on the same broad picture for Borneo. An island-wide LANDSAT analysis estimated that forest cover fell from 75.7% of Borneo's land area in 1973 to 52.8% in 2010, a net loss of about 168,000 km², with the steepest proportional losses recorded in the Malaysian state of Sabah (39.5%) and the Indonesian province of Kalimantan (30.7%) ^[1]. WWF's independent satellite assessment found that 56% of protected lowland rainforest in Kalimantan alone was cleared between 1985 and 2001, driven

and thematically in the Results section, with the constraints and opportunities they imply discussed in the Discussion section

substantially by the expansion of oil-palm cultivation, which grew from around 600,000 hectares in Indonesia in 1985 to more than 6 million hectares by 2007 ^[2]. A separate CIFOR–ICRAF analysis of the 2000–2017 period found that 6.04 million hectares of old-growth forest were lost across Borneo, about half of which was subsequently converted to industrial oil-palm or pulpwood plantations, though the same analysis noted a genuine slowdown in the rate of clearing after 2016, attributed to lower palm-oil prices, improved fire management, and stronger regulatory moratoria ^[7].

That slowdown, however, has not proven permanent. National monitoring data compiled for 2025 recorded a 66% year-on-year increase in Indonesian deforestation, reversing several years of decline, with losses concentrated in Kalimantan and Sumatra and an emerging eastward shift into Papua as land becomes scarcer elsewhere ^[3]. Roughly 44% of 2025 clearing occurred inside licensed

forestry, mining, or oil-palm concessions, underscoring that a large share of ongoing forest loss remains tied to legally sanctioned economic activity rather than illegal encroachment alone ^[3]. Earlier historical estimates place the scale of change in even starker terms: Borneo's forests were being cleared at roughly twice the rate of the rest of the world's humid tropical forests during the peak clearing decades of the 1980s and 1990s ^[9], and cumulative habitat loss on the island since the 1970s, accounting for both clearance

and heavy logging, has been estimated by various assessments at between 30% and 50% of original forest cover ^[1,8].

Table 1 summarises comparative figures reported across these independent sources, illustrating both the general consistency of the trend — sustained, large-scale forest loss concentrated in Kalimantan — and the genuine variation between studies that results from differing time periods, definitions of "forest," and remote-sensing methods.

Table 1. Reported forest-cover change in Borneo/Kalimantan across independent assessments.

Source	Period	Reported change	Primary driver identified
Gaveau et al. [1]	1973–2010	Borneo-wide forest cover fell from 75.7% to 52.8%; Kalimantan lost 30.7% of its 1973 forest area	Selective logging; conversion to industrial plantations
WWF [2]	1985–2001	56% of protected lowland rainforest in Kalimantan cleared (>29,000 km ²)	Timber extraction; oil-palm expansion
CIFOR–ICRAF [7]	2000–2017	6.04 million ha of old-growth forest lost island-wide; ~50% converted to plantations	Oil-palm and pulpwood plantation expansion

Source	Period	Reported change	Primary driver identified
Mongabay historical analysis [9]	1973–2012 (est.)	~30% cumulative forest loss across Borneo; losses concentrated in Kalimantan (31%) and Sabah (40%)	Commodity-driven logging-road expansion
National monitoring data [3]	2024–2025	National Indonesian deforestation rose 66% year-on-year in 2025; 43% within conservation-relevant areas	Forestry, mining, and oil-palm concessions; agricultural programmes

These figures matter for the discussion that follows because they define the operating environment in which HEIs in East Kalimantan function. Universities and health-science colleges in Samarinda and Balikpapan train the nurses, midwives, teachers, agricultural technicians, foresters, and engineers who will manage the interface between forest and settlement for the coming decades; conduct research on the biodiversity, hydrology, and human-health consequences of forest change; and are embedded in communities, including numerous Dayak villages, whose customary land-use systems have historically combined resource extraction with deliberate conservation ^[13]. The scale of ongoing change described above is

therefore not a background fact for these institutions but a direct determinant of curriculum priorities, research agendas, and community-engagement design.

Beyond biodiversity loss, the trajectory summarised in Table 1 carries direct climate implications that further extend the relevance of this context to HEIs whose mandate is not primarily environmental. Standing tropical forest sequesters and stores atmospheric carbon; when forest is logged, burned, or converted to plantation, a portion of that stored carbon is released, and the land's future carbon-absorption capacity is reduced. Historical fire episodes associated with forest clearing and drought, including the major 1997–1998 El Niño-linked fires that

produced transboundary haze across Brunei, Malaysia, Indonesia, and Singapore, illustrate how land-use decisions in Kalimantan can generate acute public-health and environmental consequences well beyond the immediate site of clearing. For institutions such as Poltekkes Kemenkes Kalimantan Timur, whose graduates provide frontline maternal, neonatal, and community-health services, this connection between forest-region land use and downstream population health is not an abstract environmental concern but a recurring feature of the clinical and public-health environment in which their alumni practise, reinforcing the case made in Section 3.4 for treating public-health research and forest-region environmental research as a single, interconnected research agenda rather than as separate academic domains.

2. Roles of Higher Education Institutions in Sustainable Development

Internationally, the contribution of HEIs to sustainable development is most often described through three interlocking functions: education and curriculum, research, and societal or community engagement. In the Indonesian system, these three

functions are formalised as the Tri Dharma Perguruan Tinggi education and teaching, research and development, and community service a statutory obligation for every higher education institution rather than a voluntary strategic choice.

An analysis of HEIs in Zimbabwe's climate and disaster governance system illustrates how these three functions interact in practice. Dzvimbo and colleagues find that HEIs strengthen sustainable development not primarily by declaring institutional commitments, but by producing professionals trained specifically for climate-relevant roles, contributing policy-relevant research to national disaster-risk frameworks, and engaging directly in public education on climate risk functions that correspond closely to the education, research, and service pillars of the Tri Dharma model ^[5]. The authors describe this as a "core mission" that is most effective when pursued as an integrated whole rather than as three separate reporting requirements ^[5].

A systematic review of higher-education contributions to regional sustainability transitions across a large international literature base reaches a similar structural conclusion

from a different angle. Reviewing publications from 2007 onward, Hinterleitner and colleagues find that HEIs most often influence regional sustainability not through generic policy statements but through what earlier scholarship has termed a "third mission" direct, often place-specific collaboration with regional governments, local companies, and civil-society organisations on concrete projects, ranging from applied research partnerships to co-designed community initiatives [6]. Their review also identifies a persistent challenge: the literature on HEIs' regional sustainability role remains fragmented across disciplines, and institutions frequently struggle to translate isolated project successes into an institution-wide sustainability identity [6].

For a tropical rainforest region such as East Kalimantan, this structural finding that regional sustainability contribution depends on integration across teaching, research, and engagement rather than on any single function — has direct practical implications. A health-sciences institution such as Poltekkes Kemenkes Kalimantan Timur, for example, is positioned to contribute to

sustainable development in ways that extend well beyond conventional environmental science. Midwifery and public-health curricula that address the health consequences of deforestation-linked haze, waterborne disease following upstream forest loss, and the nutritional and reproductive-health needs of remote riverine and indigenous communities represent a direct translation of the education pillar into the region's sustainability agenda. Applied research on maternal and child health outcomes in forest-adjacent communities contributes evidence relevant to health and wellbeing goals in a way that is inseparable from the region's forest and land-use dynamics. Community-service placements that send students into Dayak villages and transmigration settlements for structured fieldwork constitute the community-engagement pillar in a form that is directly shaped by, rather than incidental to, the region's ecological context.

At the same time, the international literature cautions against treating HEIs as sufficient actors in themselves. Hinterleitner and colleagues note that HEIs' influence

on regional sustainability outcomes typically depends on the strength of their partnerships with government, industry, and civil society, rather than on institutional action in isolation ^[6]. In a rainforest region where forest governance, indigenous land rights, and industrial concessions are simultaneously negotiated by national ministries, provincial government, customary (adat) institutions, and private companies, the sustainability contribution of a university or polytechnic is therefore best understood as one node within a wider governance network rather than as an independent driver of outcomes.

3. Curriculum, Green Campus Practice, and Education for Sustainable Development

The education pillar of HEI sustainability contribution operates at two distinct levels: what is taught, and how the institution itself is run.

At the level of curriculum content, UNESCO's Education for Sustainable Development framework calls for sustainability competencies systems thinking, anticipatory reasoning, and collaborative problem-solving to be integrated across disciplines rather than confined to dedicated environmental-science courses ^[4]. UNESCO's more recent guidance

similarly encourages countries to adopt "greening curriculum" standards that embed sustainability content, climate literacy, and disaster-risk awareness into existing programmes of study, alongside a "green school" quality standard intended to apply the same logic to campus operations ^[11]. For institutions training health, education, and technical professionals rather than environmental specialists, as is the case for most HEIs in East Kalimantan, this model implies embedding sustainability content within existing professional curricula for example, environmental determinants of health within a midwifery curriculum, or sustainable resource management within an agricultural-technology programme rather than establishing sustainability as a separate, elective field of study.

At the level of institutional operation, the UI GreenMetric World University Ranking, established by Universitas Indonesia in 2010, has become the most widely used tool in Indonesia and internationally for benchmarking campus sustainability performance. The ranking evaluates institutions across six categories campus setting and infrastructure, energy and climate change, waste

management, water management, transportation, and education and research on sustainability drawing responses from more than 1,400 universities in over 90 countries as of the most recent ranking cycle ^[12].

Table 2 summarises these six

categories and their principal indicators, illustrating the operational dimensions, beyond curriculum content, through which an HEI's sustainability performance is typically assessed.

Table 2. UI GreenMetric assessment categories and their principal focus.

Category	Principal focus
1. Setting and Infrastructure	Green campus area ratio, open space, campus master planning for environmental sustainability
2. Energy and Climate Change	Energy-efficient buildings, renewable-energy use, greenhouse-gas reduction programmes
3. Waste Management	Recycling programmes, hazardous- and organic-waste treatment, waste-reduction policy
4. Water Management	Water conservation, water-recycling programmes, water-quality monitoring
5. Transportation	Policies limiting private vehicle use; provision of public and non-motorised transport on campus
6. Education and Research	Number of sustainability-related courses, research output, and community outreach activities on sustainability themes

Source: adapted from the UI GreenMetric World University Rankings framework

For a health-oriented or applied-science institution operating in a tropical rainforest region, the "Education and Research" category is likely to be the most directly attainable, since it can be satisfied through curriculum integration and applied community research, of the kind described in Section 3.2, rather than

requiring large capital investment in campus infrastructure. The "Setting and Infrastructure," "Energy," and "Water" categories, by contrast, are more directly relevant to institutions with larger physical campuses, such as Universitas Mulawarman, and illustrate a genuine division of sustainability labour that can exist

between institutions of different type and scale operating in the same region.

4. Research and Knowledge Production for Tropical Forest Sustainability

The research pillar of HEI sustainability contribution is where the specific ecological character of a tropical rainforest region is most directly engaged, because much of the knowledge required to manage that landscape sustainably does not yet exist in codified, generalisable form and must instead be produced locally.

A substantial part of that knowledge already exists, but outside the university system, held by indigenous Dayak communities whose customary land-use practices have historically combined resource extraction with deliberate, rule-based conservation. A preliminary study of indigenous ecological knowledge among Dayak communities in Kutai Barat, East Kalimantan, documents a mosaic of customary land-use systems, including swidden agriculture, mixed fruit orchards, and managed rattan and rubber plots, governed by customary law that regulates the extraction of forest products from communally and

individually held resources ^[13]. The same study notes that this body of knowledge, and the customary institutions that sustain it, is under direct threat from uncontrolled logging, mining, and land-use conflict, and risks disappearing faster than it can be documented ^[13]. A related case study from Sintang Regency, West Kalimantan, examining the Dayak community of Ensaid Panjang village, finds that conservation-education outcomes improve substantially when government and civil-society actors treat customary institutions as genuine partners in forest governance rather than as subjects of top-down environmental education, though the same study documents persistent power imbalances in which government entities continue to dominate formal decision-making ^[14].

For universities and research institutions situated in this landscape, these findings imply a specific research role: not simply generating new environmental data through remote sensing or biodiversity survey though this remains valuable, as the studies synthesised in Section 3.1 demonstrate but systematically documenting, validating, and, where communities consent, integrating

indigenous ecological knowledge into formal natural-resource management and public-health planning before that knowledge is lost. This is a task that international conservation organisations and government agencies are typically not well positioned to perform alone, because it requires sustained local presence, language and cultural competence, and long-term trust relationships of the kind that a regional university, with students and staff drawn substantially from the province itself, can plausibly build over years rather than the duration of a single donor-funded project.

Applied research relevant to sustainable development in this setting extends beyond forest ecology in the narrow sense. Public-health and midwifery research on the health consequences of deforestation transboundary haze exposure during peat and forest fires, water-quality changes following upstream logging, and the reproductive and maternal-health needs of remote riverine and indigenous communities represents a directly complementary research agenda situated within the same regional sustainability challenge, even

though it is rarely categorised alongside conservation science.

Given that institutions such as Poltekkes Kemenkes Kalimantan Timur train much of the province's midwifery and community-health workforce, research generated within such institutions has a direct pathway into practice through professional training and clinical placement, a pathway that purely academic environmental research, however rigorous, does not always possess.

5. Community Engagement, Indigenous Knowledge Integration, and the East Kalimantan/IKN Case

The relocation of Indonesia's national capital, Ibu Kota Nusantara (IKN), from Jakarta to East Kalimantan represents the most significant recent development pressure and, potentially, sustainability opportunity affecting the region's higher education sector. Formalised under Indonesian Law No. 3 of 2022 on the National Capital, the relocation is officially framed around a "forest city" and "sustainable, smart, and livable city" concept, with green-building standards, renewable-energy targets, and biodiversity-conservation commitments embedded in the city's planning documents ^[16]. IKN's

development authority projects that the new capital and its surrounding "Three-City Ecosystem," linking IKN, Balikpapan, and Samarinda, will drive the creation of 4.3 to 4.8 million jobs in East Kalimantan by 2045, organised around six planned economic clusters that explicitly include sustainable agriculture, low-carbon energy, and ecotourism alongside clean technology and pharmaceuticals ^[16].

This planning language, however, sits alongside genuine and openly acknowledged risk. A biodiversity-focused review convened at Universitas Gadjah Mada in late 2025 concluded that, despite IKN's "forest city" branding, environmentally grounded sustainability studies remain essential to ensuring that vision is actually realised during the current intensive construction phase, given that Kalimantan is globally recognised as a centre of ecosystem diversity requiring particular protective attention ^[17]. The Nusantara Capital Authority (OIKN) has separately confirmed its intention to expand higher-education capacity within the new capital, including plans for a university and an integrated school, and to facilitate investment inflows into the regional

education sector as part of the broader relocation ^[15]. A community-perception study conducted in Samarinda in 2023 found that residents of the city, which sits directly within the IKN buffer zone, expressed measurable support for the establishment of new tertiary institutions in the area, reflecting local recognition that the capital relocation is generating direct demand for expanded higher-education capacity even before construction is complete ^[18].

For existing HEIs in the province, including Universitas Mulawarman and Poltekkes Kemenkes Kalimantan Timur, this convergence of infrastructural investment, workforce demand, and heightened environmental scrutiny creates a distinctive form of community-engagement opportunity that did not exist a decade ago. Table 3 summarises the principal points of intersection between the IKN relocation and the sustainability functions of regional HEIs identified across the sources reviewed for this article.

Table 3. Points of intersection between the IKN relocation and regional HEI sustainability functions.

IKN-related development	Implication for regional HEIs	Source(s)
Designation of IKN as a "forest city" with formal green-building and biodiversity commitments	Demand for locally generated environmental and biodiversity monitoring data to verify commitments during construction	[17]
Planned economic clusters including sustainable agriculture, ecotourism, and low-carbon energy	Curriculum and vocational-training demand in fields directly aligned with existing polytechnic and university programmes	[16]
OIKN commitment to expand tertiary education capacity within the new capital	Potential for partnership, articulation, or twinning arrangements between new and existing regional institutions rather than pure competition for students	[15]
Documented community support for new tertiary institutions in the Samarinda/IKN buffer zone	Local legitimacy and demand base for HEIs that position themselves as engaged regional partners rather than distant providers	[18]
Continued national-level deforestation pressure despite IKN's stated sustainability framing	Continued, arguably heightened, need for independent, locally produced research and public-health monitoring rather than reduced urgency for HEI environmental engagement	[3,17]

Community engagement in this setting cannot, however, be reduced to a response to the IKN relocation alone. The broader evidence on indigenous knowledge integration reviewed in Section 3.4 indicates that

durable, trust-based partnership with Dayak and other indigenous communities, built through sustained community-service placements, participatory research, and long-term presence rather than single-visit

outreach events, remains the precondition for any of the opportunities summarised in Table 3 to be realised in a way that benefits rather than marginalises local communities ^[13,14]. The same literature cautions that government-led environmental and conservation-education programmes, including those associated with major infrastructure projects, risk replicating the power imbalances documented in West Kalimantan's customary-forest governance, in which formal decision-making authority remains concentrated with government and corporate actors despite nominal community involvement ^[14]. HEIs are, in principle, well placed to help correct this imbalance, given their intermediate position between government, industry, and community, but only if their community-engagement activities are designed and evaluated as genuine, long-term partnerships rather than as short-term compliance exercises attached to individual courses or funding cycles.

Discussion

The evidence synthesised above supports three broad conclusions about the sustainability role of higher

education institutions in tropical rainforest regions, each with direct implications for institutions such as Poltekkes Kemenkes Kalimantan Timur and Universitas Mulawarman.

First, the scale and persistence of forest change in Borneo whether measured over four decades ^[1], across a single recent decade ^[7], or in the most recent single year for which national data are available ^[3] confirms that the region's HEIs are operating within an environment of ongoing, not historical, ecological transformation. This has a direct implication for institutional planning: sustainability curricula, research agendas, and community-engagement programmes designed around a static understanding of "the rainforest problem" risk becoming outdated within a single academic planning cycle. The 66% year-on-year increase in national deforestation recorded for 2025, following several years of apparent decline ^[3], is a particularly clear illustration of how quickly the underlying trend can reverse, and argues for building monitoring and adaptive capacity directly into institutional research programmes rather than treating environmental

data as a fixed input established once and referenced indefinitely afterward.

Second, the international literature's central structural finding that HEIs contribute most effectively to regional sustainability when their education, research, and engagement functions are deliberately integrated rather than pursued as separate reporting obligations ^[5,6] maps closely onto the existing Tri Dharma Perguruan Tinggi framework that already governs Indonesian higher education. This is, in one sense, an advantage: Indonesian HEIs are not being asked to adopt an unfamiliar sustainability framework imported from elsewhere, but to apply an existing statutory structure with greater intentionality and cross-referencing between its three pillars. In practice, however, the Tri Dharma pillars are frequently implemented as parallel, independently reported activities a teaching load here, a research output there, a community-service report elsewhere rather than as a genuinely integrated programme. The regional sustainability evidence suggests that closing this gap between formal structure and integrated practice, for example by designing community-service

placements that directly generate data for ongoing faculty research programmes, which in turn inform curriculum content, would likely represent one of the highest-value, lowest-cost changes available to institutions in the region.

Third, the case of indigenous knowledge integration, discussed in Sections 3.4 and 3.5, illustrates both the distinctive contribution HEIs can make in a rainforest region and the risk of that contribution being superficial. The documented erosion of Dayak customary ecological knowledge under pressure from logging, mining, and land conflict ^[13], combined with evidence that formal conservation-education initiatives often fail to shift real decision-making power toward indigenous institutions ^[14], suggests that the value of HEI community engagement in this setting lies specifically in its capacity for sustained, trust-based, long-duration presence a capacity that neither short-term donor projects nor purely regulatory government programmes typically possess. Realising this value, however, requires community-service programmes to be resourced and evaluated over multi-year horizons rather than single-semester

placements, and requires research partnerships with indigenous communities to be governed by principles of free, prior, and informed consent and benefit-sharing rather than extraction of local knowledge for purely academic output.

The IKN relocation adds urgency and opportunity to all three of these points simultaneously. On one hand, the relocation is explicitly framed around sustainability commitments forest-city design, biodiversity protection, low-carbon economic clusters that create genuine demand for the kind of applied, locally grounded research and workforce training that regional HEIs are positioned to supply ^[15–17]. On the other hand, independent academic assessment of the relocation cautions that these commitments require continuous, environmentally grounded verification rather than being assumed to follow automatically from planning documents ^[17], a caution reinforced by the broader national deforestation data showing that stated sustainability intentions and measured environmental outcomes have diverged before, and could diverge again, in Kalimantan ^[1–3]. HEIs in the province are therefore positioned less

as passive beneficiaries of IKN-related investment and more as one of the few institutional actors capable of providing the independent, sustained monitoring and workforce development that the relocation's own stated sustainability goals require.

This analysis has clear limitations. As an integrative narrative review rather than a systematic review or primary empirical study, it synthesises secondary evidence and cannot establish causal relationships between specific HEI activities and measurable sustainability outcomes in East Kalimantan; such causal evaluation would require dedicated longitudinal research, ideally tracking specific institutional programmes against environmental and community-wellbeing indicators over time. In addition, because the IKN relocation and Indonesia's national deforestation trends are both still unfolding, several of the sources drawn on here describe intentions, plans, or early-stage observations rather than completed outcomes, and future research should revisit these findings as construction and land-use change in the region progress.

Practical Recommendations

Translating the analysis above into institutional practice suggests several concrete steps for HEIs operating in East Kalimantan and comparable tropical rainforest regions. First, curriculum committees in health, education, and technical programmes should be asked to map where forest-region environmental and social context already enters existing coursework, and where it could be added without displacing core professional competencies, rather than treating sustainability content as a separate elective track. Second, community-service coordinators should be encouraged to design multi-year placement sites in partnership with the same villages over time, so that successive cohorts of students build on, rather than repeat, prior institutional relationships and data collection, an approach consistent with the trust-based, long-duration model of engagement identified as most effective in the indigenous-knowledge literature reviewed in Section 3.4 [13,14]. Third, research offices should actively seek co-funding and co-publication arrangements with IKN-related agencies and

conservation organisations already active in the province, both to expand the resource base available for applied research and to ensure that independently generated monitoring data, rather than developer-supplied figures alone, inform public understanding of the relocation's environmental performance [15–17]. Finally, institutional leadership should consider whether existing Tri Dharma reporting systems could be restructured to track integration across the three pillars directly, for example by recording which research outputs originated in community-service placements and which curriculum revisions drew on recent applied research, rather than reporting teaching, research, and service loads as three unconnected figures.

D. Conclusion

Higher education institutions situated in tropical rainforest regions occupy a structurally distinctive position: they are simultaneously training grounds for the professionals who will manage the interface between forest and settlement, sites of applied research capable of documenting rapid and locally specific environmental change, and long-term

community partners positioned to support rather than displace indigenous ecological knowledge. In East Kalimantan, a province defined by persistent, large-scale forest change and by the unprecedented governance experiment of the IKN capital relocation, this position carries particular weight. The evidence reviewed here indicates that HEIs contribute most effectively to sustainable development in this setting not through isolated sustainability initiatives or symbolic institutional commitments, but through the deliberate integration of teaching, research, and community engagement an approach already mandated in principle by Indonesia's Tri Dharma Perguruan Tinggi framework, but not always realised in institutional practice. For institutions such as Poltekkes Kemenkes Kalimantan Timur and Universitas Mulawarman, this implies embedding environmental and community context directly into professional curricula rather than treating sustainability as an elective add-on; designing applied research programmes, particularly in public health and natural-resource management, that both document ongoing forest-region change and

feed directly back into teaching; and resourcing community-service engagement with Dayak and other indigenous communities as sustained, multi-year partnerships rather than short-term placements. As East Kalimantan moves through the most significant institutional transformation in its modern history, regional HEIs have an opportunity, and arguably an obligation, to ensure that the province's stated sustainability commitments are matched by independently verified environmental and social outcomes a role for which their combined mandate of education, research, and community service makes them uniquely well suited.

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