

ASEAN as a *Science Region*

Current Status

A science nation and regional research insights report
Bibliometric analysis based on Scopus and SciVal, 2021–2025

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This report was produced by Elsevier's Global Strategic Networks Associate Mia Yamakawa Lewis during March to October 2026. Other contributors: Dr. Anders Karlsson, VP Academic and Research Relations Asia Pacific; Alvin Ding, Senior Data Analyst, Research Collaboration Unit



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Preface

In this section, Elsevier and ASEAN's academic and policy leaders share their reflections on the findings presented in this report. We sincerely thank all contributors for sharing their valuable perspectives.

The ASEAN University Network (AUN) welcomes Elsevier's "ASEAN as a Science Region" report and appreciates the opportunity to contribute its perspective. AUN is honoured to be included in this analysis of ASEAN's research development and grateful for the recognition given to its member universities and their academic partnerships.

The report presents an encouraging picture of the region's growing contribution to global scholarship. From ASEAN's research output of approximately 228,000 publications in 2025 to citation impact that exceeded the world average, these findings demonstrate the international visibility of the region's scholarship and the sustained work of researchers, academic teams, and institutions across ASEAN.

The collaboration analysis is particularly valuable. Internationally co-authored publications account for approximately 43% of ASEAN's output and are associated with around twice the field-weighted citation impact (FWCI) of nationally co-authored work. The expansion of research connections within ASEAN is equally encouraging. Together, these findings highlight the value of connecting expertise across institutions and countries, supported by lasting academic relationships.

AUN particularly appreciates the examination of its member universities and their substantial contribution to regional scholarship. Their publications, highly cited research and international partnerships illustrate the collective strengths of ASEAN higher education. Cooperation with China, Japan, the Republic of Korea and partners worldwide further broadens the opportunities for shared learning and joint research.

For AUN, these findings affirm the importance of its mission to bring universities together and support continued academic cooperation. They also encourage further attention to early-career researchers, institutions with fewer research resources, and partnerships that connect academic knowledge with community and industry needs. AUN supports the report's contribution to informed dialogue and hopes it will encourage sustained investment in inclusive cooperation for the benefit of ASEAN and beyond.

Prof. Dr. Thanapan Laiprakobsup,
AUN Executive Director



"A well-functioning science and innovation ecosystem underpins economic prosperity, societal wellbeing and security. Southeast Asia, where every sovereign nation is an ASEAN member is today among the world's fastest growing research regions, with output up almost 20-times since 2000. It is also among the most diverse: member states differ sharply in scale, research maturity and development stage, yet share a common agenda. This report therefore presents both aggregate and country-level analysis. Understanding the diversity is what makes the commonalities actionable. Two signals stand out: international collaboration now accounts for over 40 per cent of the region's research and roughly doubles its academic impact, and collaboration within the region is rising. Part of Elsevier's Science Nation and Region series, this report is intended as a discussion starter on how science and innovation can advance ASEAN's shared future."

Dr. Anders Karlsson

Vice President Asia Pacific, Global Strategic Networks, Elsevier



ASEAN as a Science Diplomacy Region

The ASEAN region is rapidly shifting toward internal cohesion. While global heavyweights like China, US and the EU remain vital research allies of ASEAN member states, the true story lies in how SEA is converting its demographic capabilities into autonomous resilience.

Achieving this unified resilience requires confronting disparities across the bloc. While core nations like Singapore, Malaysia, and Indonesia drive the vast majority of publication volume, smaller systems like Laos, Cambodia, and Myanmar remain lightly integrated. To maximize the upcoming ASEAN Plan of Action on STI (APASTI) 2026-2035, regional policy must move beyond bilateral clusters. Establishing progression pathways and incentivizing multilateralism will ensure that ASEAN's rising scientific tide lifts all member nations equally as a region.

Strategically, co-authored research functions as a powerful instrument of science diplomacy, bridging geopolitical divides by pooling cross-border scientific data-driven insights. Joint scientific discovery should serve as a diplomatic anchor, establishing a shared platform for peace and security while directly addressing transnational vulnerabilities like climate risks, transboundary haze and resource strains. By synchronizing national policy and establishing deep regional consortia, member states can assert a strong and collective impact. This structural shift elevates SEA from a collection of isolated partners into a unified, self-determined scientific bloc capable of negotiating global challenges on its own terms.

Distinguished Professor Tan Sri Dr Zakri Bin Abdul Hamid, FASc
Founder Chairman,
International Institute for Science Diplomacy & Sustainability (IISDS)
UCSI University

Towards ASEAN Research Autonomy and Sovereignty

International collaboration appears to be the ultimate driver for scientific research in SEA. While the region's overall FWCI stands comfortably at 1.11 above the global average, a large proportion of it appears to be primarily driven by international co-authorship. For smaller, emerging countries like Cambodia, Laos, and Brunei, this global integration and networking serves as a critical catalyst.

The reliance on external partnerships exposes a stark concern between ASEAN's soaring industrial footprint and its research maturity. Despite evolving into a high-growth talent hub, boasting the world's fifth-largest economy and a massive tertiary student population, the region struggles to translate its academic output into tangible economic value. This bottleneck is evident as academic-industry co-authorship hovers at a low 2.5%, with only 1% of total regional research being cited in patents.

This is further compounded by a widening misalignment within strategic technology sectors. While research output in AI, health and clean energy is surging with high citation impact, scholarly output in semiconductors and advanced manufacturing has remained largely stagnant. This represents a severe strategic gap despite ASEAN commanding a dominant global position in semiconductor packaging and assembly. Ultimately, its domestic research output remains dangerously disconnected from industrial reality, keeping the region dependent on foreign frontier technologies.

ASEAN's systemic over reliance on external partnerships and funding may have influenced and skewed its regional research priorities, which may not necessarily align with domestic interest. For example, ASEAN's research shows intense specialization in specific SDGs related to health, industry and energy and consumption, while domestically-relevant critical areas like climate and water remain under-researched. Therefore, achieving true scientific sovereignty requires a stronger GERD commitment coupled with a realignment between foreign agendas and safeguarding local vulnerabilities.

Professor Ts. Dr. Lionel In Lian Aun
Director,
International Institute for Science Diplomacy & Sustainability (IISDS)
UCSI University

Building a Stronger ASEAN Research Community

ASEAN research output has significantly increased in 2025. While this is encouraging, the long-term value will rely on the ability of the region to build its research institutions, and to meet scientific and local societal needs.

International scientific networks have also been growing worldwide. Approximately 43% of this output is internationally co-authored publications, which have significantly higher citation impact compared to nationally co-authored publications. This indicates a growing influence of international scientific networks in the ASEAN region, which provides opportunities to build local capabilities and develop sustainable research capacity especially in smaller member states.

About 2.5% of the academic output in the region comes from academic-corporate collaboration. While these co-authorships only accounts for a fraction of university-industry relations, it does nevertheless.

Distinguished Chair Professor
Ts. Dr. Ooi Keng Boon, FASc
Distinguished Chair Professor and Director,
Centre for Business Informatics and Industrial Management (CBIIM)
UCSI University



Executive summary

Southeast Asia is home to eleven sovereign states, all of which are members of the Association of Southeast Asian Nations (ASEAN): Brunei Darussalam, Cambodia, Indonesia, Laos (Lao PDR), Malaysia, Myanmar, the Philippines, Singapore, Thailand, Timor-Leste and Viet Nam. ASEAN, as this collective entity of nations will be referred to throughout the report, is emerging as one of the world's fastest-growing research regions, spanning a wider economic scale and research system maturity than any comparable economic grouping.

With science and research constituting a strategic pillar of ASEAN's economic resilience, societal wellbeing and geopolitical relevance, this report draws on publication and citation data from Elsevier's Scopus and SciVal for the period 2021–2025 to present a science landscape analysis of the ASEAN region. It further examines the role of the ASEAN University Network (AUN) as a key vehicle for education and research collaboration in strengthening the region's science and innovation competitiveness. This report presents both aggregate and country-level analysis. Understanding the diversity is what makes the commonalities actionable.

- **ASEAN as a growing talent and research hub of global interest.** The countries of the Association of Southeast Asian Nations (ASEAN) as a collective form the world's fifth-largest economy with a combined GDP of US$3.9 trillion, 3.5% of the global economy. Gross Expenditure on R&D stands at approximately 1.03% (UIS, 2023) vs an OECD total of 2.72% (OECD MSTI, 2024). ASEAN is home to 684 million people, 31.5% of them under 20 and a further 56% aged 20–59, nearly 600 million people under 60 (ASEAN Key Figures 2025), and a higher-education system already training some 22 million tertiary students (UNESCO Institute for Statistics, 2026).
- **ASEAN's research output is expanding rapidly.** Regional scholarly output, 2021–2025 constituted 4.2% of global scholarly output, and reached approximately 228k publications in 2025, up around 30.7% since 2021 and more than twenty-fold since 2000. Indonesia, Malaysia, Thailand and Singapore are the largest producers, while the Philippines, and smaller systems such as Brunei, Laos and Timor-Leste record some of the fastest growth. The core 30 university AUN network members stand for 42% of ASEAN total output.
- **Citation impact sits above the world average.** ASEAN's overall Field-Weighted Citation Impact (FWCI) is 1.11, meaning that publications are cited about 11% more than the world average. The academic impact is markedly higher in the region's strategic technologies, led by Artificial Intelligence (FWCI 1.87). The AUN network members FWCI is 1.41, meaning these 30 institutions contribute both in volume and high academic impact.
- **International collaboration is the strongest impact multiplier.** Around 43% of ASEAN output is internationally co-authored, and these papers carry an FWCI of about 1.61, roughly double that of nationally co-authored work (0.79). China, the United States and the United Kingdom are the leading external partners. The AUN members on average have 51.7% international co-authorship and FWCI of 1.93 for internationally co-authored paper, again almost double that of non-international publications.
- **Industry linkage and translation remain structural gaps.** Academic-corporate co-authorship remains close to the global average (2.7%) across the region at 2.5%; however, the joint academia-industry scholarly output has increased from 4k in 2021 to 5.5k in 2025 with 77% of the scholarly output being international. The academic impact is high at FWCI at 2.70. Only about 1% of ASEAN output is cited in patents (rising to 4% in Singapore).
- **Research aligns strongly with sustainability priorities.** ASEAN shows strengths in selected SDG research areas, with impact and activity in Good Health and Well-being (SDG 3, RAI ≈ 6.7), Peace, Justice and Strong Institutions (SDG 16, RAI ≈3.0) and Responsible Consumption and Production (SDG 12, RAI ≈2.19).
- **Frontier technologies show a mixed picture.** AI and clean energy expand quickly with above-average impact; biotechnology and health form the largest volume; while semiconductor and advanced-manufacturing output is essentially flat, a strategic gap given rising global demand.

Introduction

The countries of the Association of Southeast Asian Nations (from here-on abbreviated as ASEAN) form the world's fifth-largest economy. ASEAN is home to 684 million people, 31.5% of them under 20 and a further 56% aged 20–59, nearly 600 million people under 60 (ASEAN Key Figures 2025), and a higher-education system already training some 22 million tertiary students (UNESCO Institute for Statistics, 2026), one of the largest research talent pools on the planet. Every major power is racing to embed itself in that talent pool through science and technology partnerships. ASEAN's own ambition, which the ASEAN University Network (AUN) is central to advancing, is to convert that scale into self-determined strength, building the research base to shape strategic technologies on its own terms rather than remain someone else's supply chain or research periphery.

How well then does ASEAN perform in science, and how does its research activity support regional competitiveness? This report examines that question through the lens of scholarly publications and their impact. It analyses the volume and academic impact of ASEAN's research, together with its international and cross-sector collaboration, its influence on policy and sustainability, and its position in key strategic technologies. The aim is to provide insights that inform evidence-based policymaking, particularly as ASEAN governments implement the ASEAN Plan of Action on Science, Technology and Innovation (APASTI) 2026–2035. We further analyse the role and performance of the ASEAN University Network (AUN), which is one of the coordinating mechanisms and the region's university network flagship platform linking among core members of 30 leading universities to build shared research capacity and standards. While APASTI names social inclusion and gender mainstreaming as a cross-cutting supporting initiative, and understanding talent mobility is of importance, it is beyond the scope of the current report.

> *"One Vision, One Identity, One Community"*
>
> **ASEAN Charter, article 36, 2007**

The report is structured as follows. Chapter 1 assesses ASEAN's position in the global scientific landscape. Chapter 2 examines the role of international and cross-sector collaboration, including the role of AUN. Chapter 3 explores research influence on policy and alignment with the Sustainable Development Goals. Chapter 4 investigates ASEAN's emerging and frontier technologies, Artificial Intelligence, Biotechnology & Health, Clean Energy & Climate Technologies, and Semiconductors & Advanced Manufacturing, alongside the institutional landscape. Chapter 5 provides insights into the performance of the ASEAN University Network across some of the key indicators investigated for the ASEAN group of countries. Finally, Chapter 6 summarises key findings with five recommendations. The report concludes with appendices covering definitions and data sources.

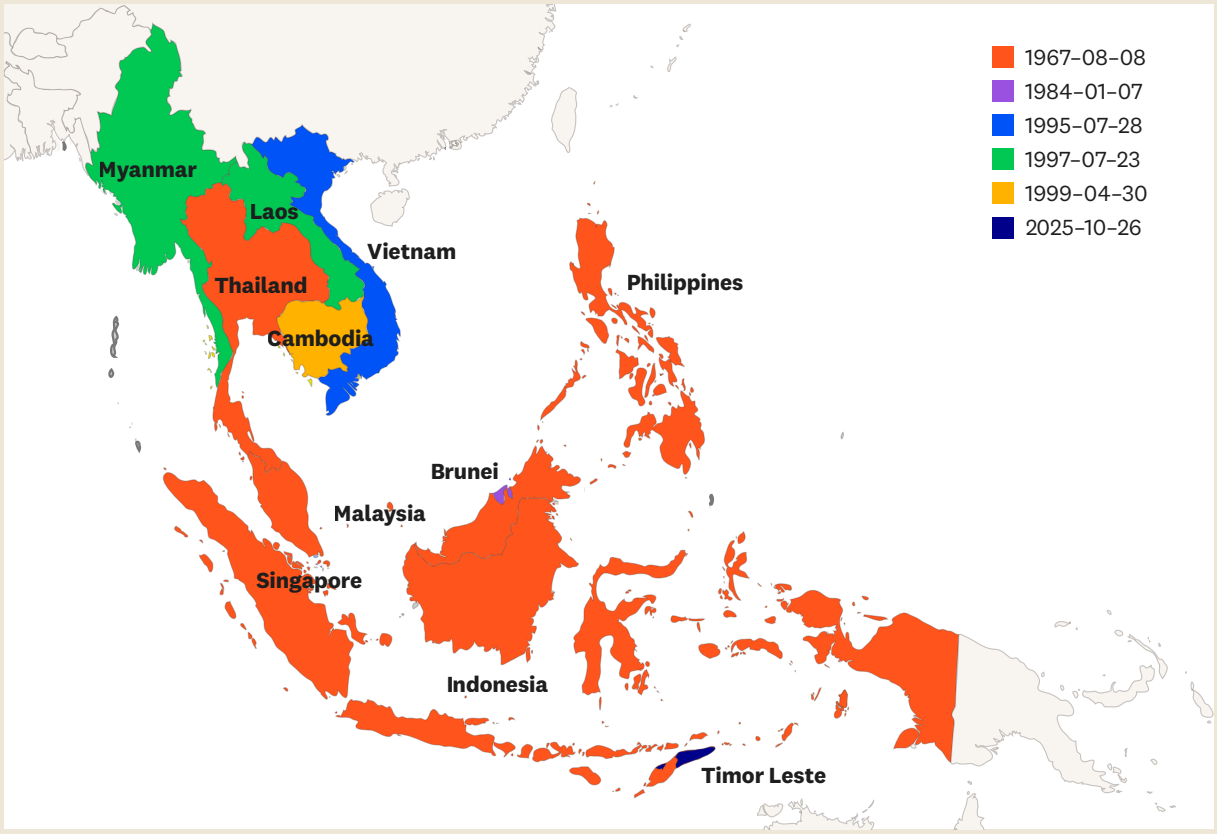
This report is part of Elsevier's Science Nation series of research-landscape analyses, which spans country and regional studies, with the aim to stimulate discussion and support evidence-based policymaking. All analysis is based on Elsevier's Scopus and SciVal (see Appendix 1 for clear definition on metrics used and details also around limitations in terms of coverage), using whole counting and the 2021–2025 publication window unless otherwise stated.

ASEAN member states covered: Brunei Darussalam, Cambodia, Indonesia, Laos (Lao PDR), Malaysia, Myanmar, the Philippines, Singapore, Thailand, Timor-Leste and Viet Nam. Timor-Leste joined ASEAN in October 2025, for simplicity we include it retrospectively in the analysis done.

What is ASEAN?

The Association of Southeast Asian Nations (ASEAN) was established under the Bangkok Declaration of 1967 by five founding states (Indonesia, Malaysia, the Philippines, Singapore and Thailand), chiefly as a Cold War-era stability mechanism. Membership grew to ten with Brunei Darussalam, Viet Nam, Laos (Lao PDR), Myanmar and Cambodia, and to eleven with the admission of Timor-Leste in October 2025, the first enlargement in twenty-six years. ASEAN's political character rests on non-interference and consensus-based decision-making, the "ASEAN Way," formalised through the ASEAN Charter (2007, in force 2008), with the current framework set by ASEAN Community Vision 2045 (Kuala Lumpur Declaration, May 2025), structured around four pillars: Political-Security, Economic, Socio-Cultural and Connectivity. Science and innovation sit under the Economic pillar, where the ASEAN Committee on Science, Technology and Innovation (COSTI) sets programmes, coordinates sub-committees from biotechnology to space, and manages the ASEAN Science, Technology and Innovation Fund, its seed fund since 1989; alongside it sit the ASEAN University Network, the ASEAN-NDI (online search system) health R&D network, the ASEAN Talent Mobility platform and the Economic Research Institute for ASEAN and East Asia (ERIA), the independent policy research body serving ASEAN and the East Asia Summit. The benchmark for this report is APASTI 2026–2035, COSTI's decade-long agenda succeeding APASTI 2016–2025, built on five cross-sectoral strategies, from emerging technologies and space to talent mobility and two sector priorities in energy, the blue and circular economy, and agri-food, forestry and water, positioning ASEAN as a regional hub and centre of excellence.

Map of ASEAN



What is the ASEAN University Network (AUN)?

Established in 1995 following a proposal at the Fourth ASEAN Summit in 1992, AUN is ASEAN's flagship higher-education cooperation mechanism. Its Charter objective is to strengthen cooperation among ASEAN universities by promoting collaborative study and research programmes on priority areas identified by ASEAN, and to develop academic and professional human resources across the region. It comprises 30 core member universities plus more than 300 associate members across the ten pre-2025 ASEAN member states, with Timor-Leste's participation still to be formalised following its 2025 accession. Governance rests with a Board of Trustees — one representative from each member state, with the Secretary-General of ASEAN and the AUN Executive Director as ex-officio members — supported by a Secretariat at Chulalongkorn University in Bangkok. AUN runs quality assurance (AUN-QA) and thematic research networks that are among the region's most established vehicles for cross-border academic and scientific collaboration. Since November 2012 it has been complemented by the ASEAN+3 University Network (ASEAN+3 UNet), a sister network extending the same architecture to leading universities in China, Japan and the Republic of Korea, and today ASEAN's principal structured channel for higher-education and research cooperation with the three Northeast Asian partners. The analysis presented here covers the 30 core members.

How does ASEAN science perform on the global stage?

Relative to its share of the world's population, ASEAN's research footprint is smaller than its demographic weight but larger than its research investment would predict, and it is growing.

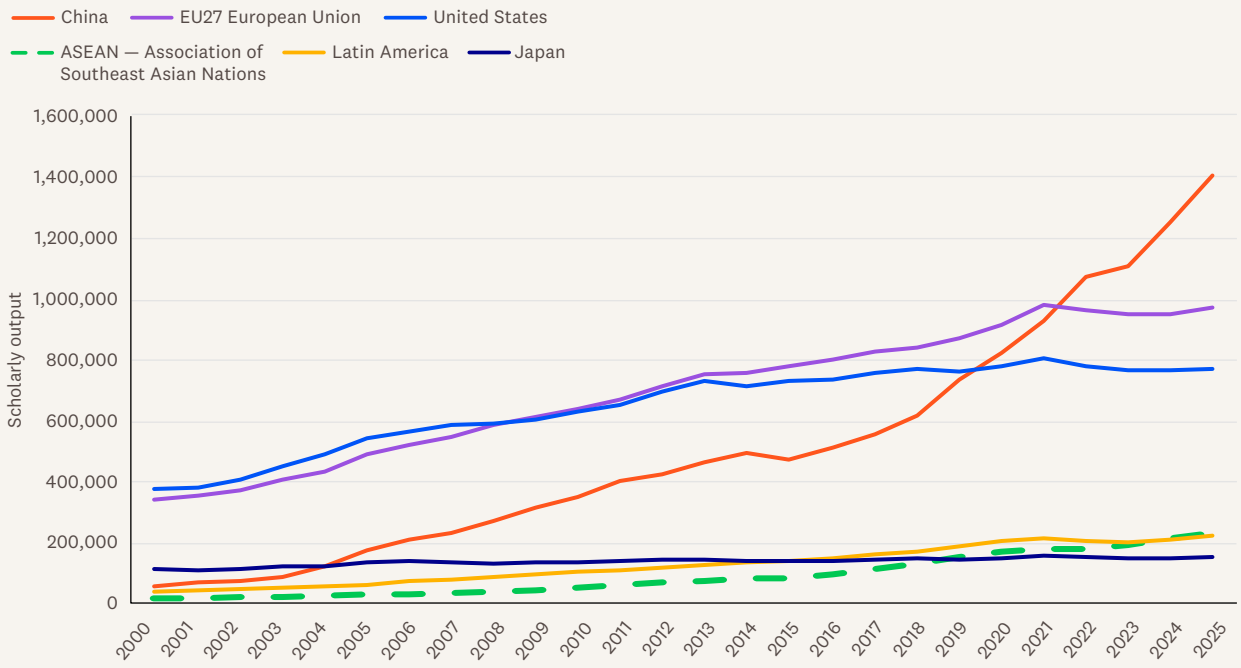
The region is home to 684 million people, 8.4% of the world's population, and generates about US$3.9 trillion in GDP, some 3.5% of global output (ASEAN Key Figures, 2025). ASEAN invests 1.03% of GDP in R&D, just over half the world average of 1.92% and well under half the OECD total of 2.72%, and fields 873 researchers per million inhabitants against a world average of 1k (UNESCO Institute for Statistics, 2023; OECD, 2024). Singapore leads the region, yet even its 1.81% (2022) falls below the world average.

Momentum is nonetheless real: gross R&D expenditure across ASEAN has quintupled from US$10.6 billion in 2002 to US$54.9 billion in 2023. The demographic base reinforces it: 31.5% of the population is under 20 and a further 56% aged 20 to 59 (ASEAN Key Figures, 2025), at a time when Japan, South Korea, China and increasingly the United Kingdom face ageing populations. Together these support ASEAN's claim to become the next research and innovation hub (ASEAN Secretariat, 2024).

Figure 1

Scholarly output per major global regions and nations, 2000–2025

Source: SciVal



Looking at the ASEAN's scholarly output compared to other regions and large research nations, on one hand it cannot compare to EU27, United States or China in volume. ASEAN's share of global scholarly output 2021–2025 is 4.2%, but its research output has grown dramatically over the past two decades, as illustrated in Figure 1.

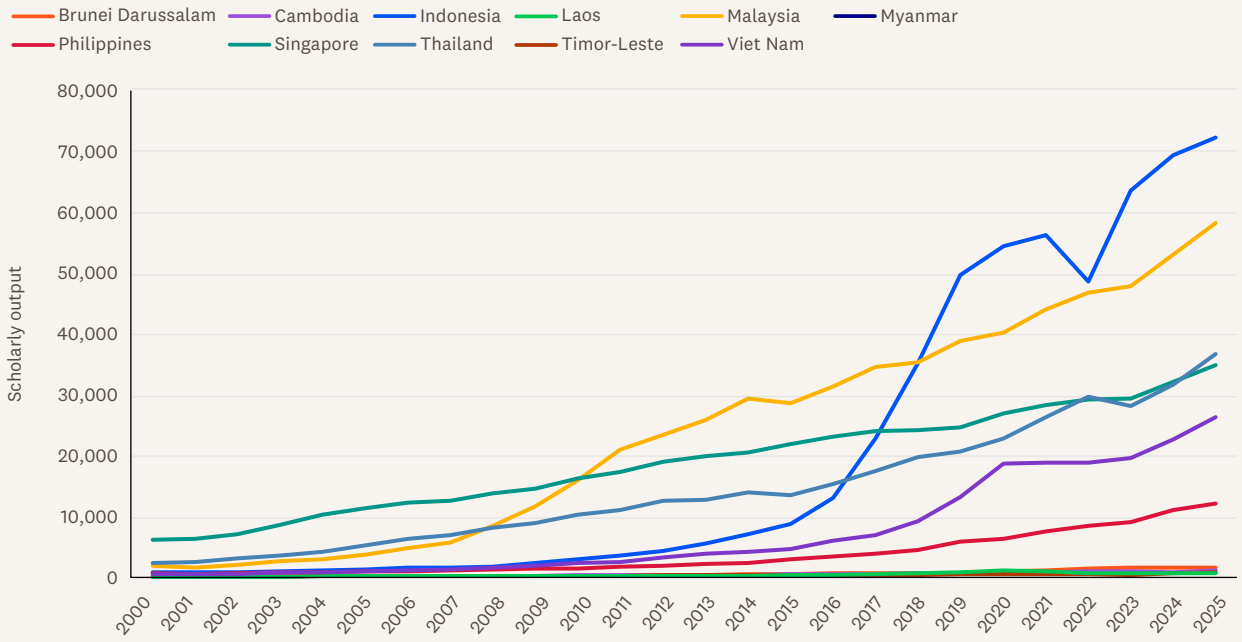
Regional scholarly output rises from around 12k publications in 2000 to approximately 228k in 2025, which is almost a 20-fold increase, and has grown by about 31% between 2021 and 2025 alone. This sustained expansion, means that in volume ASEAN has overtaken Japan and is slightly above Latin America as a whole.

Its growth outpaces the global average over the same period (14.9%) and can be interpreted as a reflection of rising investment in higher education and research capacity across the region, and as mentioned above, with a large and young population, the potential for stronger global influence depends on education, research careers and institutional support.

Figure 2

Scholarly output by leading ASEAN member state, 2000–2025

Source: SciVal. Note Timor-Leste accessed in October 2025, for simplicity we include them retrospectively in the analysis done



However, the region is highly diverse and at different stages of science and innovation development, reflected in Figure 2. Output is currently concentrated in a small number of member states, many of which are the larger economies: Indonesia, Malaysia, Thailand and Singapore together account for most of the regional output, with Viet Nam and the Philippines forming a fast-rising second tier. Smaller nations such as Timor-Leste, also the newest member of ASEAN, from a very small base record the highest relative growth at 131% growth from 2021–2025 (seen in Table 1 below), indicating a broadening research base across the region.

Ten of eleven member states saw a growth in output over the years between 2021 and 2025; Myanmar's decline over the same period is likely to be reflecting tertiary disruption to the national research and higher-education infrastructure, as publication data alone does not establish the cause of the decline. This is a pattern seen elsewhere when institutional systems are disrupted, but it does not necessarily reflect a loss of research capacity.

ASEAN's growing scholarly output and expanding research connections provide a strong foundation for further cooperation. Progress should also be assessed through the development of researchers, the participation of institutions with different capacities, and the relevance of research to national and regional needs.

Table 1

Scholarly output by member state

Source: SciVal, 2021–2025. Whole counting; country totals include intra-ASEAN co-authorship and therefore exceed the regional total. FWCI adjusts for field, publication year and document type, but national journal coverage, publication composition and international collaboration can still shape country-level values, so comparisons should be read with care. Further, see Appendix 1 for an expanded definition of FWCI.

Member state	Output 2021	Output 2025	Growth 2021–25	FWCI (2021–2025)
Brunei Darussalam	987	1551	+57% (+564)	2.54
Cambodia	677	1009	+49% (+332)	2.74
Indonesia	56064	72311	+29% (+16,247)	0.83
Laos	365	719	+97% (+354)	1.28
Malaysia	43909	58171	+32% (+14,262)	1.19
Myanmar	897	574	–36% (–323)	1.12
Philippines	7366	12264	+66% (+4,898)	1.16
Singapore	28104	34784	+24% (+6,680)	2.00
Thailand	26113	36562	+40% (+10,449)	1.08
Timor-Leste	59	136	+131% (+77)	0.77
Viet Nam	18674	26144	+40% (+7,470)	1.17

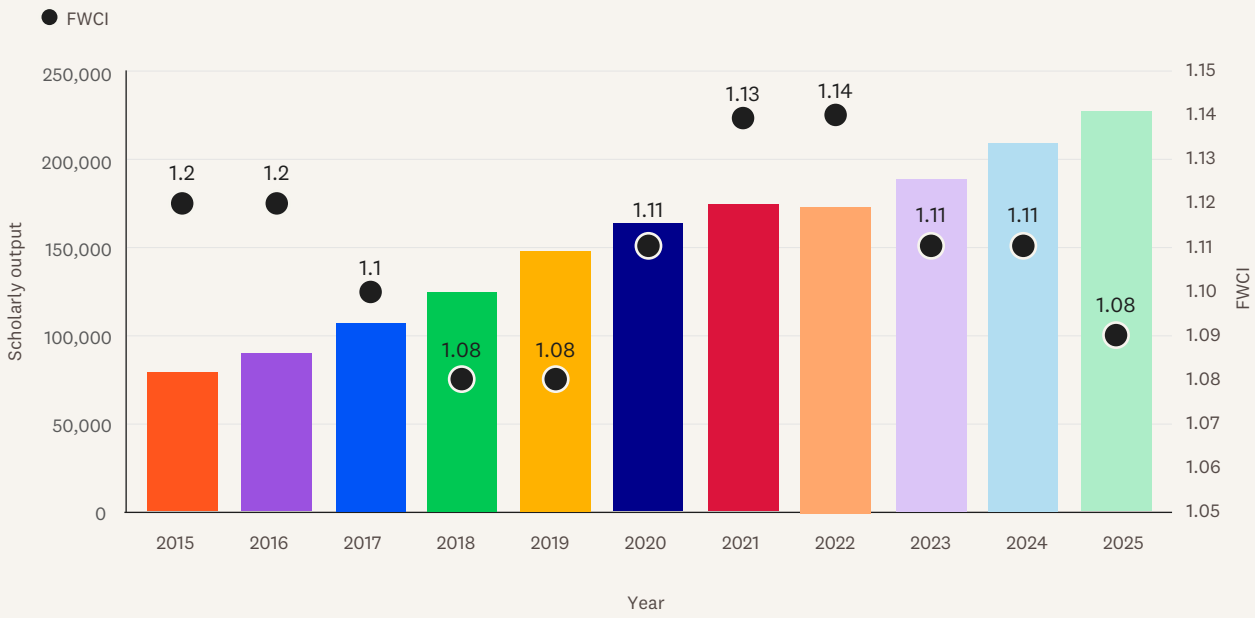
Eight of eleven member states grew output by more than 30%, an expansion that carries the integrity pressures common to all fast-scaling research systems: assessment regimes tied to publication counts, the proliferation of low-selectivity outlets, and the associated risks of predatory publishing and compromised authorship. These are global rather than regional challenges, and the region is well positioned to address them: the Singapore Statement on Research Integrity, agreed at the second World Conference on Research Integrity in July 2010, remains the foundational international framework for responsible research conduct, while APASTI's emphasis on harmonising standards and guidelines across member states. AUN's quality assurance assessment (AUN-QA) forms part of the shared responsibilities across the region, to promote, develop and implement quality assurance practices based on an empirical approach, where quality assurance practices are tested, evaluated, improved and shared (Guide to AUN-QA Assessment at Programme Level Version 4.0, 2020).

In terms of academic impact, Figure 3 uses the Field-Weighted Citation Impact (FWCI — The ratio of citations received relative to the expected world average for the subject field, publication type and publication year, where the world FWCI is 1.0) to gauge the impact ASEAN publications have globally. ASEAN's overall FWCI stands at approximately 1.08 in 2025 and has remained in a narrow 1.08–1.14 band over the past decade giving an average of 1.11, seen in Figure 3. The region's publications are therefore cited around 11% more than the world average across all fields. As the following chapters will explore, a large part of this citation impact is driven by international collaboration, notably for the smaller nations. Nations that see a larger volume of output, including Malaysia, the Philippines, Thailand and Indonesia, have more national publishing, resulting in narrower academic impact. Singapore is the exception here, where for publications with no international collaboration, FWCI is at 1.31. As a whole, growing the networks of collaboration within ASEAN as outside is a strong recommendation, to further harness the strengths of the region.

Figure 3

ASEAN scholarly output and FWCI by year, 2015–2025

Source: SciVal



What is the role of open science in ASEAN? UNESCO defines open science as making multilingual scientific knowledge openly available, accessible and reusable, and opening the processes of science beyond the research community. Open access is its most measurable component, and ASEAN is above the world average: 54.7% of regional output against 47.6% worldwide. This owes more to infrastructure, international collaboration than to mandates. Singapore is the exception, its funders requiring open access within twelve months since 2016; elsewhere the position rests on national journal ecosystems publishing largely without article processing charges, and on compliance via international co-authorship. National policy has meanwhile focused elsewhere: Indonesia's Law No. 11/2019 mandates deposit of publicly funded research data through the national repository RIN; Malaysia's Open Science Platform is likewise a research data initiative; Thailand has embedded open science in its National Science, Research and Innovation Plan 2023–2027. APASTI 2026–2035 addresses data-sharing frameworks and coordinated research on data governance and ethical practices.

Inter ASEAN collaboration

How has collaboration among ASEAN member states changed over the years? Naturally, this partly follows nations investments in higher education and research, with flagship institutions often serving as anchors of collaborations. The region is also moving towards a more integrated higher-education and research space, with growing attention to research quality assurance, digital research governance, and cross-border training and mobility under APASTI. Flagship institutions currently anchor output, but the rapid rise of newer entrants points to a broadening and increasingly competitive institutional base and offers a natural indicator against which to track the effect of governance reforms on output and impact.

ASEAN's strategic-technology research is concentrated in a small set of flagship institutions — notably Nanyang Technological University, the National University of Singapore and A*STAR in Singapore, alongside leading universities in Malaysia, Thailand and Indonesia — complemented by fast-emerging institutions such as Bina Nusantara University in AI. Public research organisations and national research and innovation agencies play a central role in cross-sector collaboration.

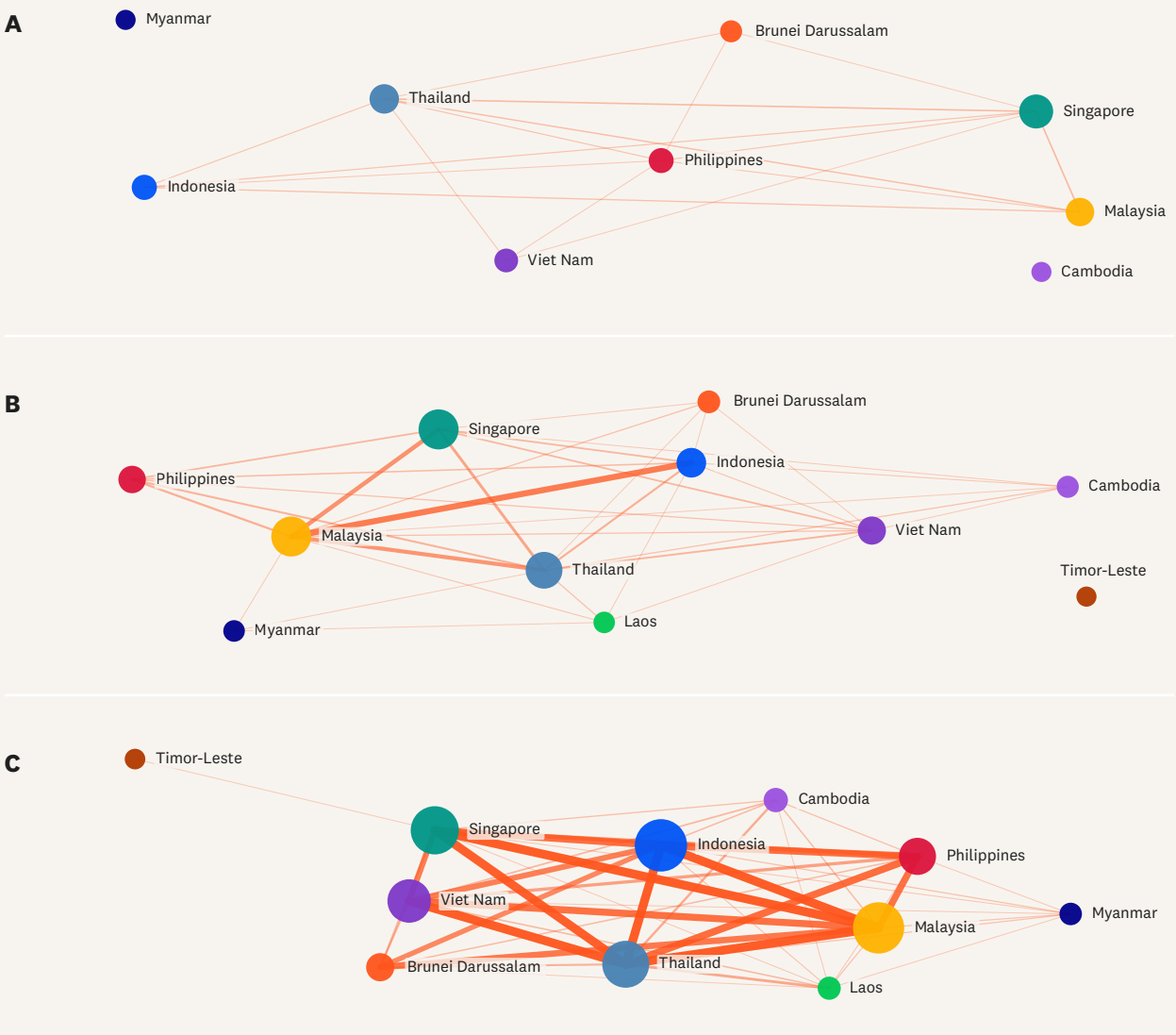
Chapter 5 offers a deep dive into the ASEAN University Network and international institutions that are trailblazers in collaboration. At a broader level, Figure 4 a, b and c below show the growing network within ASEAN over the past 25 years. To note, no line is drawn if there were less than 20 co-authored publications. Figures 1 and 2, showing a growth in ASEAN research is not only the result of individual nations, but the growing impact of an ever-more integrated research region. In 2000, Singapore, Malaysia and Thailand were leading the regional collaboration, in terms of their own scholarly output and amount of collaborative research.

By 2010, Indonesia has become one of the core three ASEAN members, acting as the key regional research hubs, with Thailand and Viet Nam as key powerhouses as well. These central, long-term research nations have well established relationships and collaboration networks, leading to substantial integration and growth of other ASEAN members throughout the years. In year 2025, we see a broadened network, interestingly with Malaysia serving as a strong hub.

Figure 4

Country-level network growth: a) 2000, b) 2010, c) 2025

Source: SciVal



How does collaboration amplify ASEAN's academic impact?

International collaboration is essential for any region seeking to operate at the frontier of science and innovation. In ASEAN, international co-authorship is strongly associated with higher academic impact. Note that internationally co-authored papers may differ in team size, subject mix, resources and participation in large consortia.

Around 43% of ASEAN's scholarly output is internationally co-authored, with a further 31% involving only institutional collaboration, 21% national collaboration, and about 5% single-authored. Crucially, internationally co-authored publications achieve an FWCI of approximately 1.61, roughly double the 0.79 recorded for nationally co-authored work, and well above institutional-only (0.71) and single-authored (0.77) output. International engagement therefore multiplies ASEAN's regional impact above regional baselines. For smaller nations, as will be seen below, international collaboration is the key driver behind the academic impact.

Major global partners

ASEAN's leading external research partners reflect both regional proximity and global science ties. In order of co-authored output, the top ten partners are:

Top 10 Collaborating Partners
China
United States
United Kingdom
Australia
India
Japan
Saudi Arabia
South Korea
Germany
Taiwan

Table 2: Source: SciVal, 2021–2025

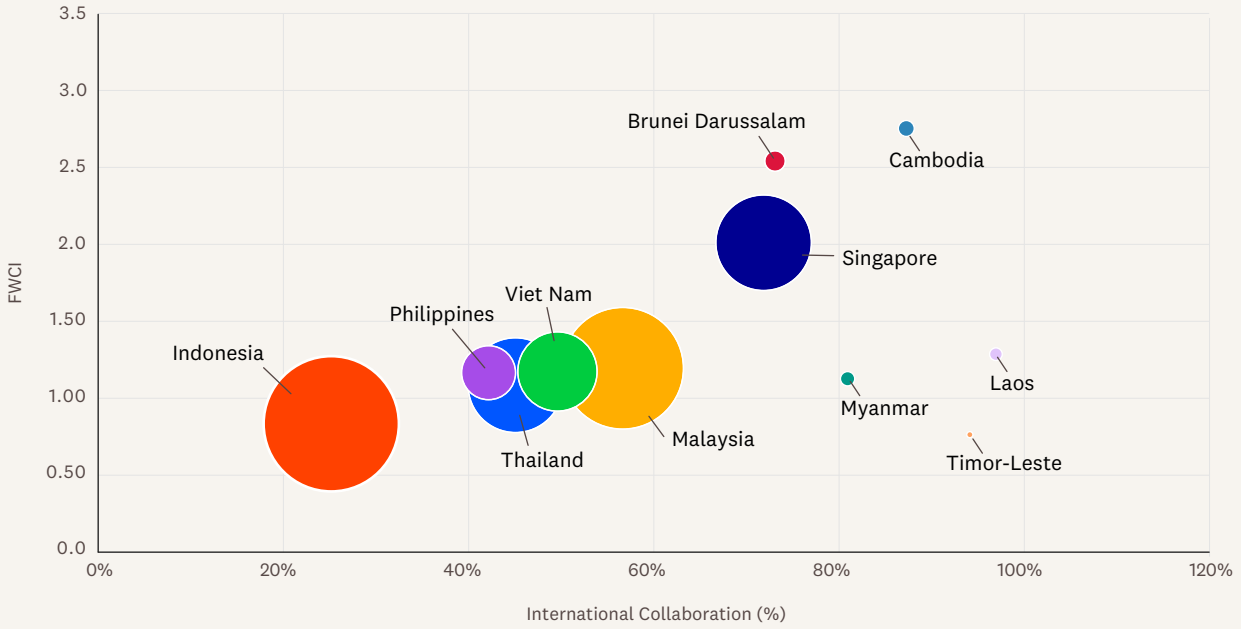
ASEAN's five largest research partners collaborations with ASEAN accounted for the equivalent of a third of the region's output in 2025, led by China at 12.4%, the United States at 6.8%, India at 5.5%, the United Kingdom at 5.0% and Australia at 4.1%, yet only China and India, compounding at 19.1% and 16.1% a year since 2021, grew faster than ASEAN's own research base, while the United States at 6.4%, the United Kingdom at 6.0% and Australia at 4.2% grew more slowly than the region they partner with. India's ascent is the sharper signal: it passed Australia in 2022 and the United Kingdom in 2024 to become ASEAN's third-largest partner by annual output, which suggests the region's scientific centre of gravity is shifting also within Asia rather than only between Asia and the West. China's engagement runs through a standing architecture, the China-ASEAN Science and Technology Partnership Programme (2012), the Technology Transfer Centre in Nanning, and, more recently, the China-ASEAN AI Innovation Cooperation Centre and a three-year AI capacity initiative (2025–2027). US engagement runs through the Comprehensive Strategic Partnership and US-ASEAN Science, Technology and Innovation Cooperation, alongside ongoing adjustments to US development-assistance and technology-transfer policy settings. EU engagement runs through the EU-ASEAN Dialogue on Science, Technology and Innovation and discussions on Horizon Europe association; Japan's runs through JICA- and JSPS-funded programmes and the ASEAN-Japan Comprehensive Strategic Partnership; and Korea's runs through the ASEAN-ROK Science and Technology Cooperation programme and the ASEAN+3 UNet, which links Korean, Japanese and Chinese universities into AUN's own network.

In terms of academic impact, international collaboration lets researchers pool ideas, data, talent and infrastructure, producing co-authored articles, joint patents, researcher exchanges and broader knowledge sharing, and it tends to lift quality and reach, leading to a correlation between international collaboration rate and FWCI. Figure 5 shows how this plays out across ASEAN. It is to be noted that countries with an overall small scholarly output and with high degree of international collaboration, for example 80%, strongly benefits from international collaborations in accessing expertise and infrastructure, balancing with local leadership and capacity for their science systems, and the high FWCI, likely more reflect researchers being part in larger international consortia, than a strong national base. A deeper understanding of international collaboration — whether that be intra-ASEAN, beyond ASEAN or both, along with the corresponding lead authorship, research training and continuity of institutional partnerships — is fertile ground for more detailed analysis which is beyond the scope of this report but beckons future attention.

Figure 5

ASEAN member nation international publication rate, relative to their share of world publications, visualized through bubble size

Source: SciVal, 2021–2025



Cross-sector collaboration and knowledge translation

Knowledge transfer allows academia and industry to collaborate on topics of common interest. Outcomes could range from academic-corporate co-publications, patents, licensing, contract research, talent transfer, or tacit knowledge transfer. In Figure 6, we look at the academia-corporate co-publications and patent citations as these indicators capture particular forms of interaction and do not measure all consultancy, licensing, clinical application, community engagement or knowledge exchange. Across ASEAN, academic–corporate co-authorship stands close to the world average (2.7%) at 2.5%, ranging from about 1.9% in clean energy to 4.1% in artificial intelligence among the strategic technologies examined in Chapter 4.

The most active industry partners span state-linked enterprises and research agencies, including MOH Holdings and the National Healthcare Group (Singapore), Petronas and Tenaga Nasional (Malaysia), FPT Group (Viet Nam) and PTT (Thailand), typically collaborating with national research and innovation agencies. It should be noted that corporate research may not be public, limiting the visibility of its impact. Across all forms of collaboration, international collaborative output (whether with corporate, academic, government or other collaborators), makes up 43% of total scholarly output and is the only segment of output which sees significantly higher impact than the world average.

Figure 6

Collaboration profile and citation impact by collaboration type

Source: SciVal

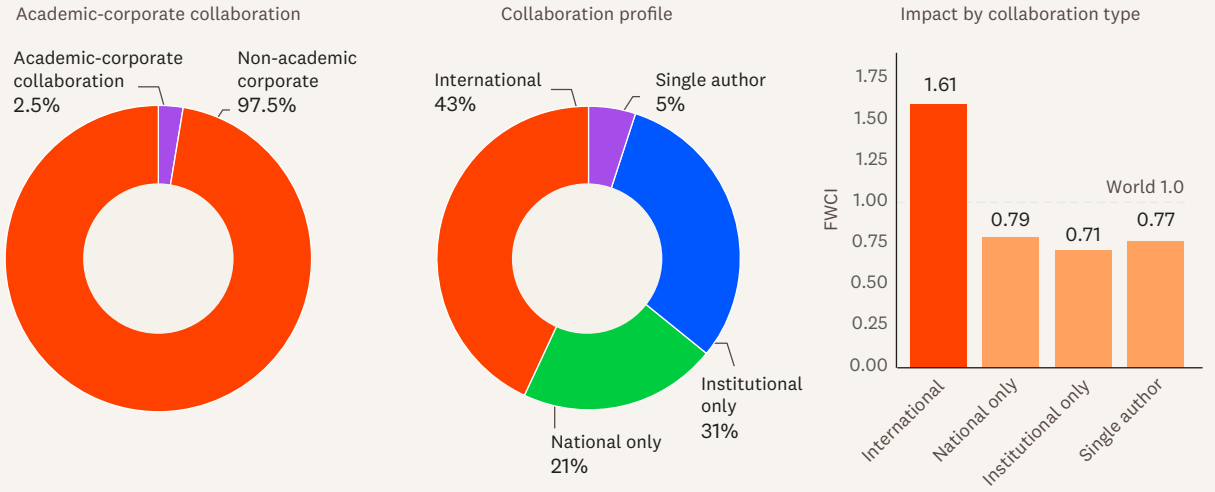


Table 3 below shows the top 10 collaborating government and corporate institutions for ASEAN. As explored through Figure 4 in Chapter 1, all of these institutions come from the 5 central nations within ASEAN, Singapore, Malaysia, Indonesia, Thailand and Viet Nam. As the ASEAN network continues to grow and research expertise is diversified even further across the regions, these collaborating institutions can be key leaders in making successful, cross-regional research projects.

Top 10 collaborating institutions

Government	Corporate
National Research and Innovation Agency Republic of Indonesia	MOH Holdings Pte Ltd. (SGP)
Agency for Science, Technology and Research, Singapore	FPT Group (VNM)
National Science and Technology Development Agency, Thailand	Petronas (MYS)
Ministry of Health Malaysia (MOH)	Tenaga Nasional Berhad (MYS)
Thailand Ministry of Public Health	National Healthcare Group Singapore (SGP)
Ministry of Higher Education, Science, Research and Innovation, Thailand	PTT Public Company Ltd. (THA)
Ministry of Health, Indonesia	MIMOS (MYS)
Department of Science and Technology, Philippines	Wilmar International Ltd. (SGP)
Chulabhorn Royal Academy, Thailand	IRD Global (SGP)
Viet Nam Posts and Telecommunications Group	Sime Darby Berhad (MLY)

Table 3: Source: SciVal, 2021–2025

Academic-corporate co-authorship and patent citation these indicators capture particular forms of interaction and do not measure all consultancy, licensing, clinical application, community engagement or knowledge exchange, and in both cases the counterparty may lie outside the region, describing how industry in or outside ASEAN draws on research produced in ASEAN. ASEAN's academic-corporate co-authorship at 2.5% of output sits close to the world rate of 2.7%, while about 1% of ASEAN output is cited in patents against a world rate of 1.9%.

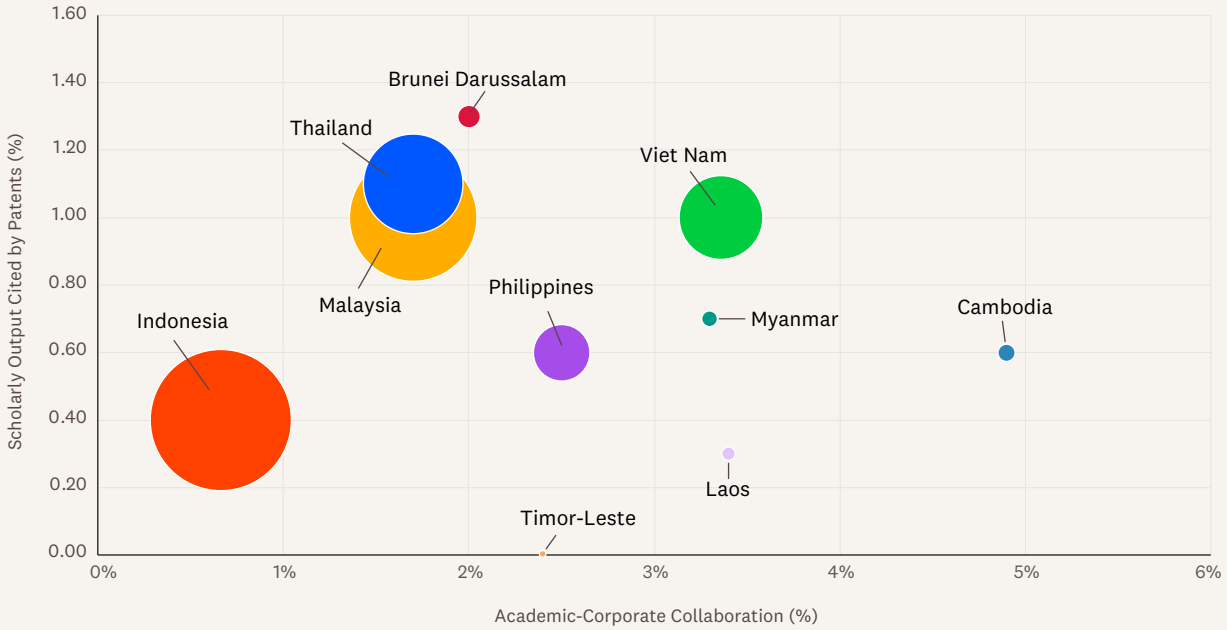
The two indicators do not need to move in proportion, which is important to note, as papers see a time-lag in being cited by patents which, if accompanied by a large growth in published output may result in output cited by patents making up a smaller proportion. Singapore leads the region on both, at 9.2% of output co-authored with industry and about 4% cited in patents, both well above world average. Strategically, the question is not on how to increase the collaboration, but who owns which results from collaboration and its economic and societal impacts in the region.

The association between international co-authorship and higher citation impact highlights the value of sustained research partnerships. For ASEAN, an important next question is how these partnerships can also support local research leadership, early-career development and the application of knowledge within the region.

Figure 7

Academic-corporate collaboration vs scholarly output cited by patents, bubble size representing total scholarly output

Source: SciVal



Policy influence and sustainability alignment

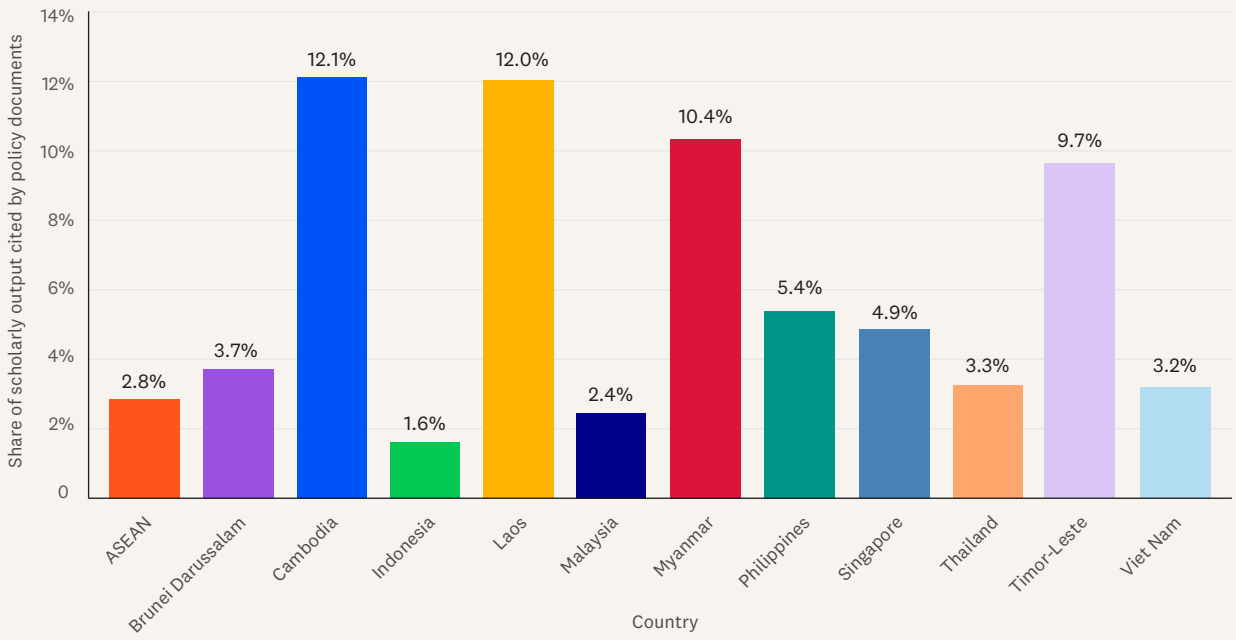
Policy impact and societal relevance

Beyond academic impact, research also influences society when it is cited in policy documents. Across ASEAN, approximately 3% of scholarly output is cited in policy documents. Notably, several smaller research systems record the highest policy-citation rates -- Cambodia and Laos (12%), Myanmar (10%) and Timor-Leste (10%). This however, is mainly due to their research output being overall small and with all of them with more than 80% of international co-authorship, many of these related notably to global health studies and protocols, naturally being highly cited by policy documents.

Figure 8

Share of scholarly output cited in policy documents, by member state, 2021–2025

Source: SciVal



This policy engagement reflects how ASEAN governments are implementing APASTI 2026–2035, which prioritises stronger STI governance, mission-oriented research, talent mobility, and technology transfer and commercialisation. Research also underpins broader regional agendas — including the ASEAN Community Vision and sectoral cooperation on health, energy, food security and the digital economy — providing an evidence base for regional decision-making.

Table 4 below summarises some key policy documents in which these citations have been seen:

Title	Policy body	Policy body country/region
AR6 Climate Change 2021: The Physical Science Basis	IPCC	Intergovernmental
Climate Change 2022: Impacts, Adaptation and Vulnerability	Government of South Africa	South Africa
Suspected cancer: recognition and referral	NICE	United Kingdom
Climate Change 2022: mitigation of climate change: Working Group III Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change	United Nations	Intergovernmental
ADHD Diagnosis and Treatment in Children and Adolescents	AHRQ	United States
AR6 Climate Change 2022: Impacts, Adaptation and Vulnerability	IPCC	Intergovernmental
Climate Change 2021: The Physical Science Basis	Government of South Africa	South Africa
Climate Change 2021: the physical science basis: Working Group I Technical Support Unit	United Nations	Intergovernmental
Overweight and obesity management	NICE	United Kingdom

Table 4: Source: Overton, 2021–2025. Note, these are the most cited, likely reflecting internationally collaborative papers most frequently being cited by global bodies, explaining why there are no ASEAN policy bodies listed

Sustainability and SDG alignment

ASEAN's founding Charter commits the region to sustainable development, protecting its environment, resources, culture, and quality of life (Article 1.9, ASEAN Charter, signed 2007, entered into force 2008). However, of the 68 SDG targets ASEAN officially tracks (2016–2023), only 15 are on track for 2030, while 21 show minimal progress, stagnation or outright regression, including, notably, Goal 9's R&D-expenditure-to-GDP ratio and researchers per million inhabitants, both of which declined over the period. Both ratios fell not because R&D effort declined but because ASEAN's GDP and population grew faster than research investment and researcher numbers in its lower-intensity, higher-weight member states, dragging the regional average down even as most countries' absolute R&D spending and researcher counts rose.

The ASEAN region spans countries at markedly different stages of economic development and is among the most disaster-prone regions in the world, highly exposed to both the consequences of climate change and seismic activity. The number of people killed, missing or affected by climate-related disasters per 100k population more than doubled, from 3k in 2016 to 6k in 2023 (ASEAN SDG Indicators Progress Report 2025, ASEAN Secretariat/ASEANstats).

Against that backdrop, ASEAN's research orientation towards sustainable development is unsurprising but shows some concern. Measured by Relative Activity Index (RAI), the region's share of publications in a topic relative to its world share, where 1.0 denotes activity in line with the global average. The focus is sharpest in Good Health and Well-being (SDG 3, RAI = 3.6), SDG 9 Industry, Innovation & Infrastructure and SDG 7, Affordable and Clean Energy.

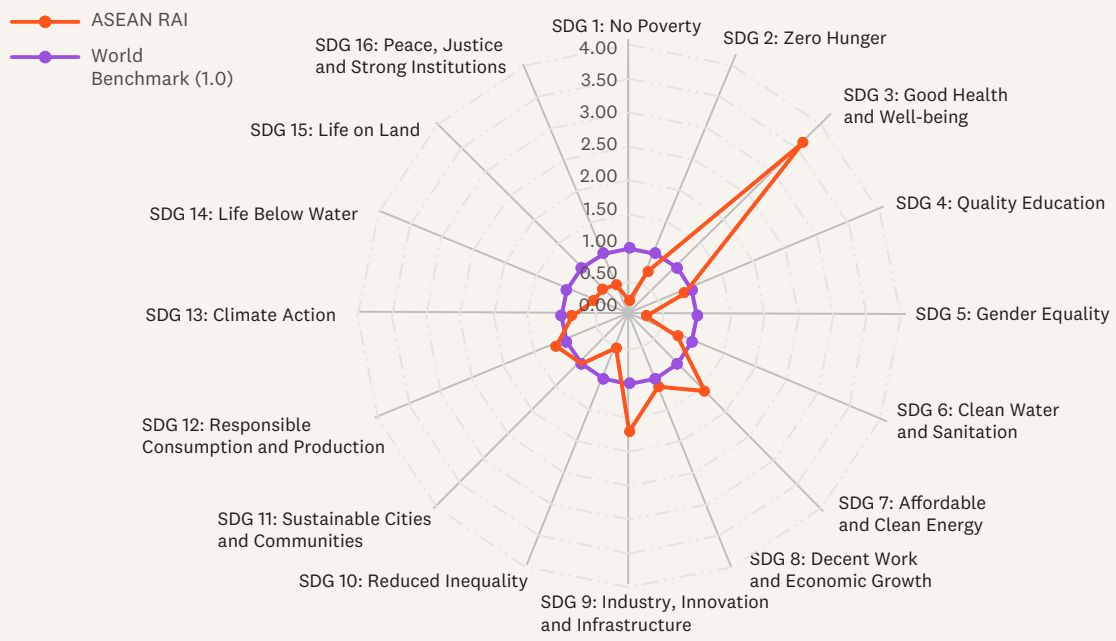
Relative to these strengths, ASEAN research is comparatively less concentrated in Gender Equality (SDG 5, ≈ 0.36), SDG 13 Climate Action, SDG 14 Life Below Water, and SDG 15 Life on Land.

This, as well as a low focus on SDG 10, Reduced Inequality, should raise some concern as the region is strongly affected by climate change, environmental pollution as well as being in different stages of economic development. Research to show increased understanding in how to strengthen societal development in these areas may be of increasing priority.

Figure 9

ASEAN research specialisation across the SDGs (RAI, world = 1.0, 2021–2025)

Source: SciVal



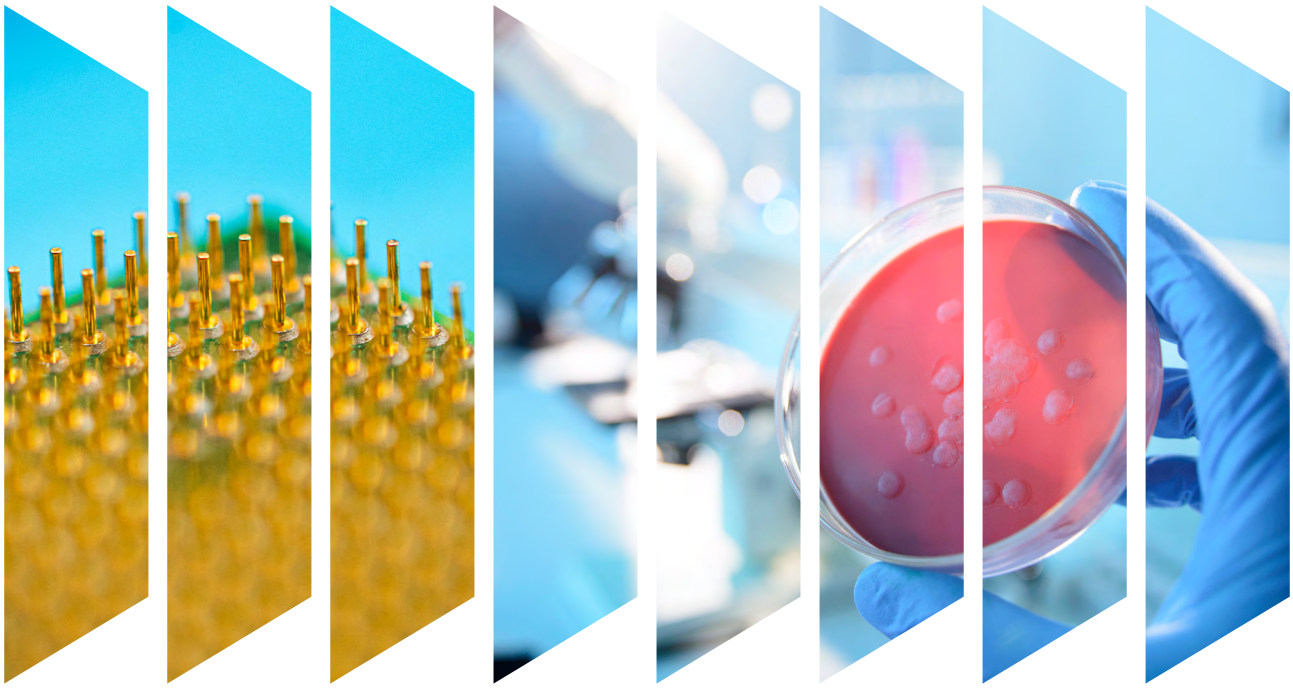
Emerging and frontier technologies

Countries worldwide are investing in frontier technologies seen as strategic for competitiveness and technological sovereignty. ASEAN's framework is APASTI 2026-2035, built on five cross-sectoral strategies (emerging and enabling technologies; space; STI ecosystems and entrepreneurship; STI in key industries; talent development and mobility) and two sector priorities covering new energy and the blue and circular economy, and agriculture, food, forestry and water. Strategy 1 names artificial intelligence, big data, high-performance computing, quantum technology and biotechnology explicitly, and COSTI operationalises these through sub-committees on biotechnology, microelectronics and information technology, space, and sustainable energy.

This chapter examines four areas: Artificial Intelligence; Biotechnology and Health; Clean Energy and Climate Technologies; and Semiconductors and Advanced Manufacturing. The first three correspond directly to APASTI priorities. APASTI does not name semiconductors specifically as a research priority; its own framing is dependence on foreign technology as a structural challenge. We include semiconductors here as our own analytical addition, because ASEAN holds a significant position in global semiconductor assembly, test and packaging, and the distance between that industrial footprint and the region's research base speaks directly to the import dependency APASTI identifies. Space technology, cross-sectoral strategy 2, falls outside this report's scope and is flagged for subsequent analysis. Note the data for this section refers to 2020-2024, as the key technology areas used follow the US OSTP Key Technology subject area definitions available in Scopus, last updated in 2024.

Technology area	Output	FWCI	Intl. collab.	Growth
Biotechnology & Health	113,565	1.21	45.6%	+37%
Artificial Intelligence	59,467	1.87	49.2%	~3×
Clean Energy & Climate	53,573	1.40	52.0%	+50%
Semiconductors & Adv. Mfg.	20,981	1.31	61.1%	~flat

Table 5: Source: SciVal, 2020–2024. FWCI world average = 1.0



Artificial intelligence

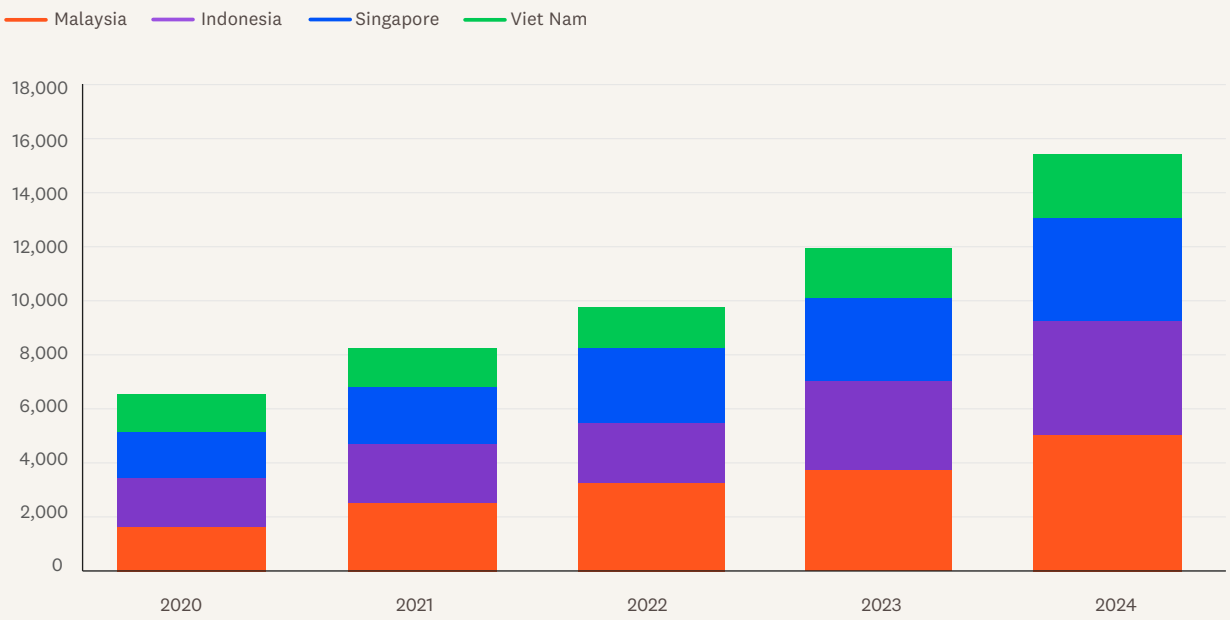
ASEAN's AI research output nearly triples over 2020–2024 to approximately 60k publications, led by Malaysia and Indonesia. With an FWCI of 1.87, the region's AI research is cited well above the world average, with Singapore hosting the top-producing institutions, Nanyang Technological University, the National University of Singapore and A*STAR.

Summary of research activity in artificial intelligence 2020–2024

Figure 10

ASEAN AI output nearly tripled over 2020–2024, led by Malaysia and Indonesia

FWCI of 1.87 is well above the world average, and Singapore hosts the region's top-producing institutions (NTU, NUS, A*STAR)



59,467
Scholarly output

49.2%
International collaboration

4.1%
Academic-corporate collaboration

155,832
Authors

22
Avg. citations per publication

Top 5 institutions	2020	2021	2022	2023	2024	Total
Nanyang Technological University	735	799	997	1,218	1,567	**5,316**
National University of Singapore	608	740	908	1,114	1,311	**4,681**
Agency for Science, Technology and Research, Singapore	232	286	379	448	511	**1,856**
Universiti Teknologi Malaysia	259	317	384	362	467	**1,789**
Bina Nusantara University	77	207	267	520	585	**1,656**

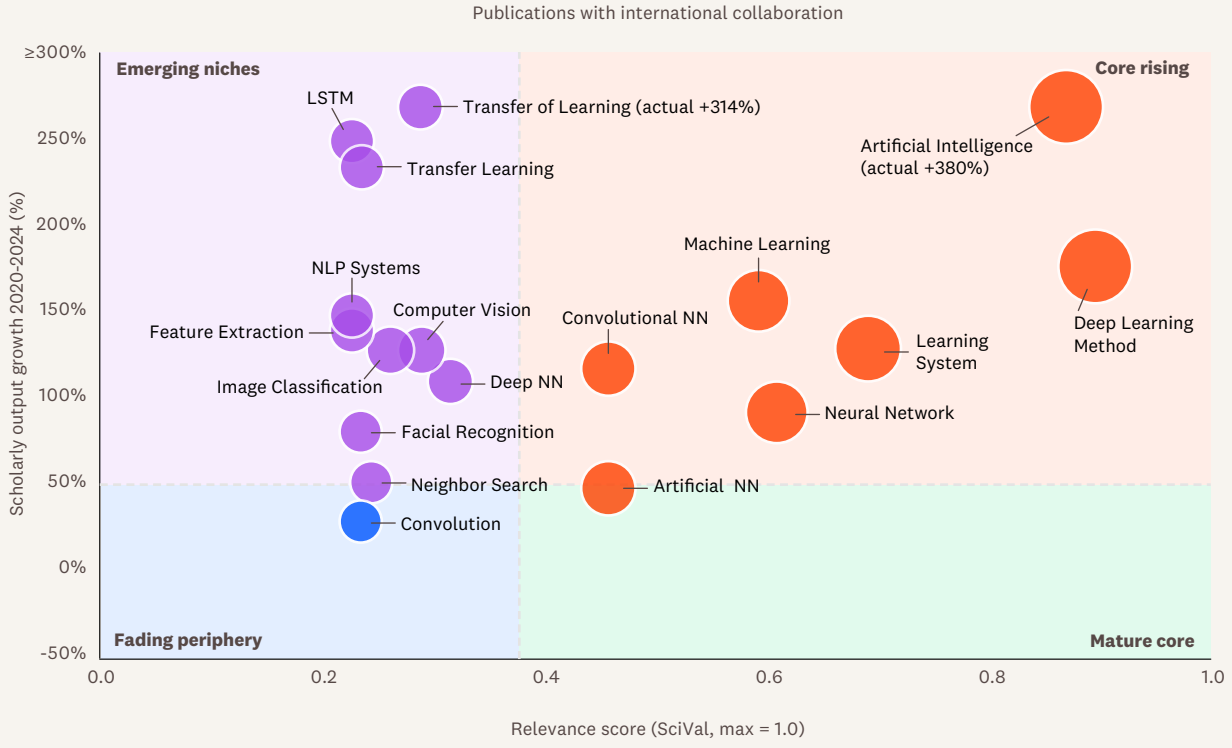
Stacked bar shows top ASEAN member countries. Institutions ranked by 2020-2024 total output.
Source: SciVal 2020-2024

The figure below allows us to map the sub-topics that have been emerging within broad topic (Artificial Intelligence), based on SciVal's "topic clusters" which identifies the relevance score for sub-topics in correlation with publication growth in that domain. Deep-learning and transfer-learning methods sit in the "core rising" quadrant of high relevance and rapid growth, signalling strong momentum in frontier AI methods.

Furthermore, the emerging niches quadrant visualises strategic sub-topics that could be of stronger relevance in the coming years. For a large association such as ASEAN, with significant global competitors, creating strengths in these niches could be a viable strategy in creating enhancing research capacity in a way that is future-proof.

Figure 11

Artificial intelligence



Biotechnology and health

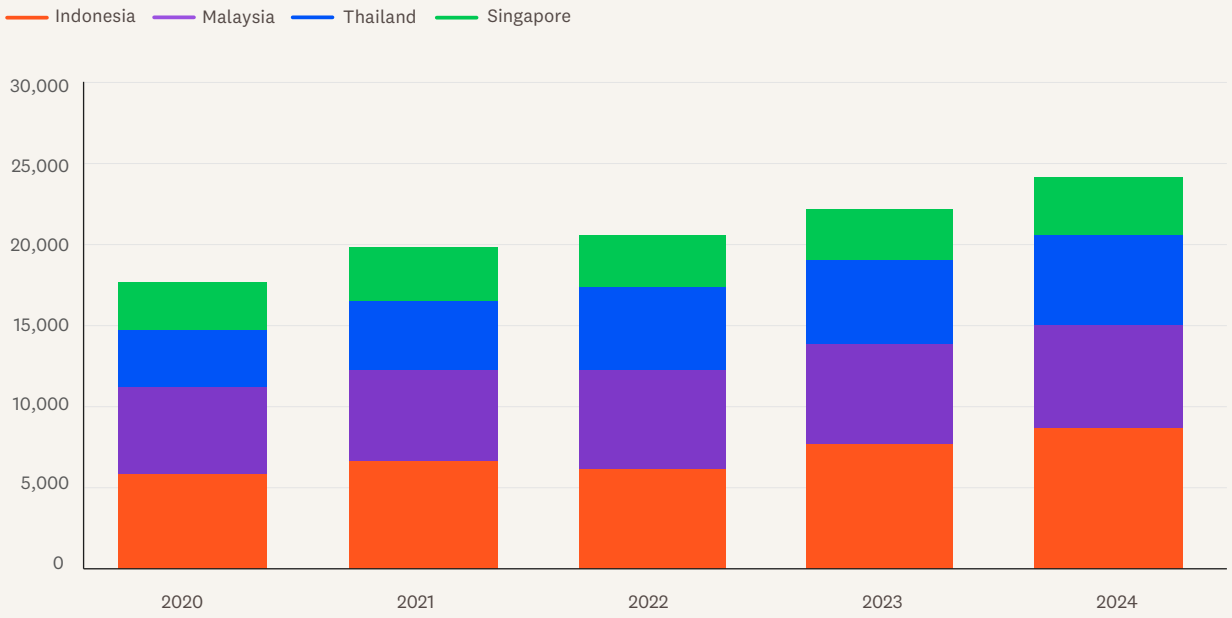
Biotechnology and health is ASEAN's largest strategic field by volume, with around 114k publications and an FWCI of 1.21. It has grown approximately 37% over the last five years, with Indonesia leading by volume and Thailand being the fastest-growing contributor. Medicine (FWCI 1.62) and materials science deliver the strongest citations, while high-volume fields such as biochemistry and agricultural and biological sciences anchor the region's broad life-sciences base.

Summary of research activity in biotechnology & health 2020–2024

Figure 12

ASEAN biotechnology and health output grew ~37% over 2020–2024

Indonesia leads by volume and Thailand is the fastest-growing contributor FWCI of 1.21 is above the world average, led by Medicine (1.62)



113,565
Scholarly output

45.6%
International collaboration

2.8%
Academic-corporate collaboration

372,795
Authors

18.8
Avg. citations per publication

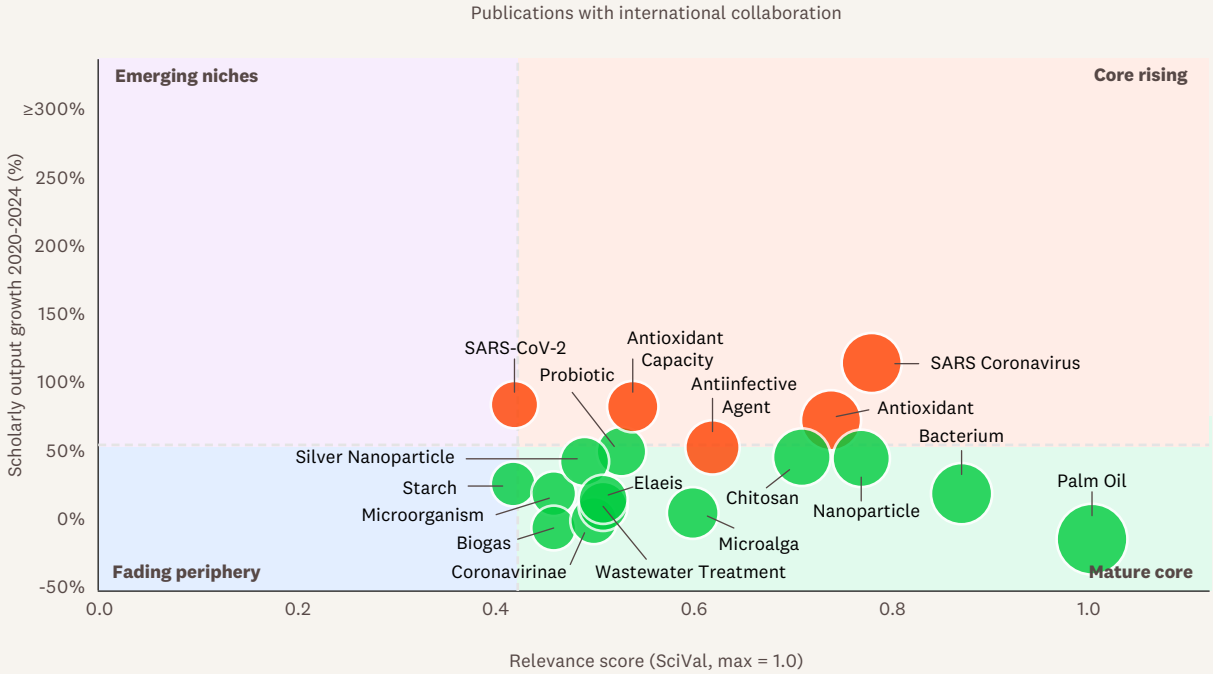
Top 5 institutions	2020	2021	2022	2023	2024	Total
National University of Singapore	1,724	1,901	2,019	1,828	1,984	**9,456**
Mahidol University	786	977	1,154	1,065	1,119	**5,101**
Nanyang Technological University	946	937	953	891	900	**4,627**
Chulalongkorn University	628	858	932	986	1,119	**4,523**
Universiti Putra Malaysia	896	963	840	868	872	**4,439**

Stacked bar shows top ASEAN member countries. Institutions ranked by 2020-2024 total output
Source: SciVal 2020-2024

Where ASEAN's AI research sits in fast-rising topic clusters, Biotechnology & Health concentrates in mature ones already well funded and still central to the field. In AI, ASEAN is building a position on a moving frontier; in biotechnology it is deciding how to deploy depth it already holds. Established clusters such as SARS-related coronavirus research are accumulated capability, not emerging opportunity, so the question is not whether to invest but where to concentrate.

Figure 13

Biotechnology and health



Clean energy and climate technologies

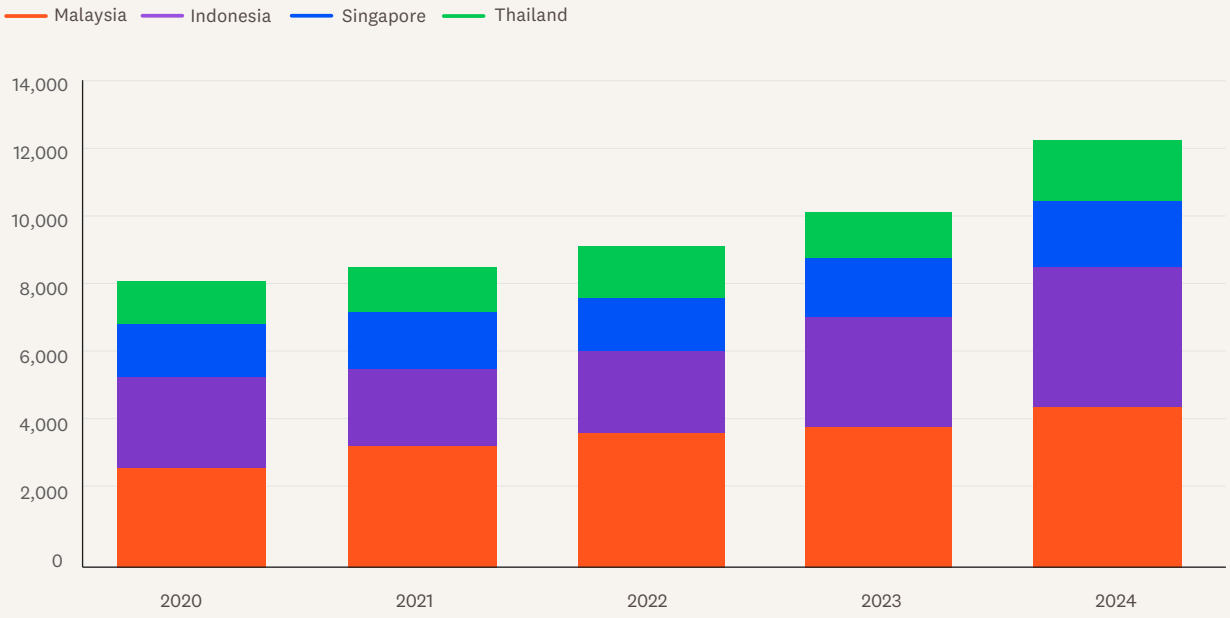
Being a particularly disaster-prone area, with tropical climates and adaptation a key issue for ASEAN member nations, Clean Energy & Climate Technologies is a particular area of focus, with definite social impact. Clean energy and climate research grew around 50% over 2020–2024 to approximately 54k publications, with an FWCI of 1.40, showing strong momentum and impact. Malaysia and Indonesia together account for over 60% of regional output.

Summary of research activity in clean energy & climate technologies 2020–2024

Figure 14

ASEAN clean energy output grew ~50% over 2020–2024

Malaysia and Indonesia together account for over 60% of regional research. FWCI of 1.40 is well above the world average, with Renewable Energy and next-generation solar surging



53,573
Scholarly output

52.0%
International collaboration

1.9%
Academic-corporate collaboration

134,595
Authors

23.3
Avg. citations per publication

Top 5 institutions	2020	2021	2022	2023	2024	Total
Nanyang Technological University	741	664	697	747	871	**3,720**
National University of Singapore	616	644	611	663	726	**3,260**
Universiti Teknologi Malaysia	403	491	486	545	526	**2,451**
Universiti Kebangsaan Malaysia	336	405	459	475	484	**2,159**
University of Malaya	368	397	458	404	429	**2,056**

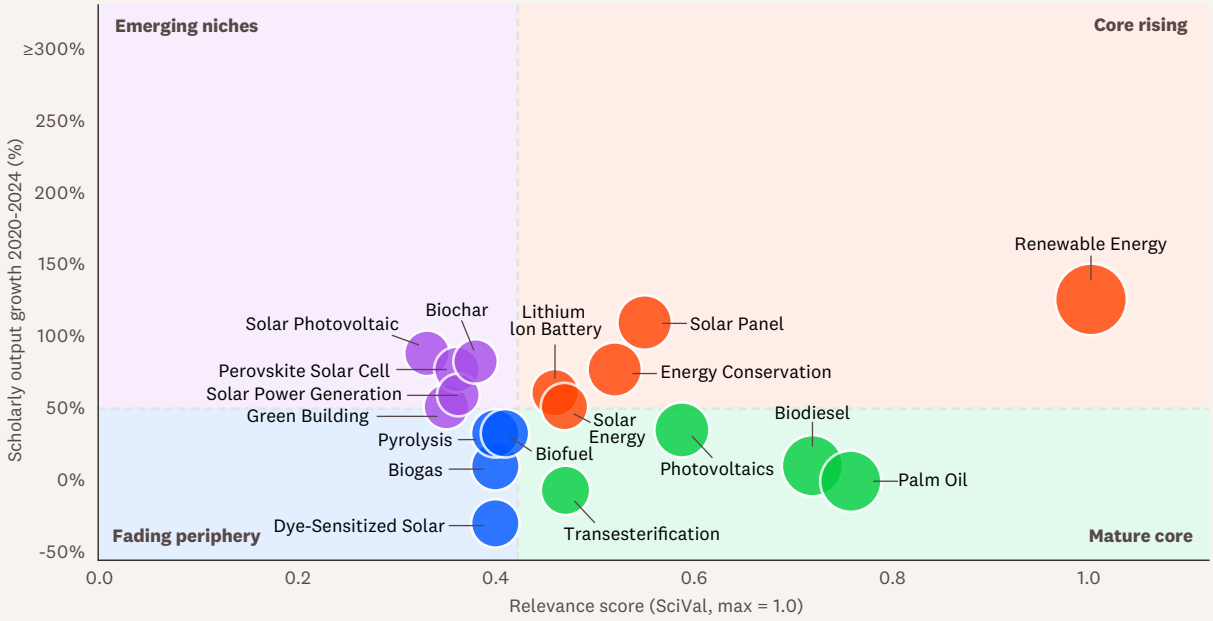
Stacked bar shows top ASEAN member countries. Institutions ranked by 2020-2024 total output
Source: SciVal 2020-2024

Renewable energy and next-generation solar technologies show the fastest momentum, and chemistry, environmental science and materials science achieve the highest citation impact.

The sub-topics within this technology area align directly with APASTI Sector Priority 1, covering the innovation and commercialisation of new energy technologies, decarbonisation, and a just and inclusive renewable energy transition, and with the priority areas of COSTI's Sub-Committee on Sustainable Energy Research, among them renewable and alternative energy, solar, and energy storage.

Figure 15

Clean energy and climate technologies



Semiconductors and advanced manufacturing

Semiconductor and advanced-manufacturing output is essentially flat over 2020–2024 at around 21k publications — a strategic gap as global demand for chips accelerates, and one that speaks to the dependence on foreign technology APASTI identifies as a structural challenge for the region. The field nonetheless records the highest international collaboration rate of the four areas (61.1%) and an FWCI of 1.31.

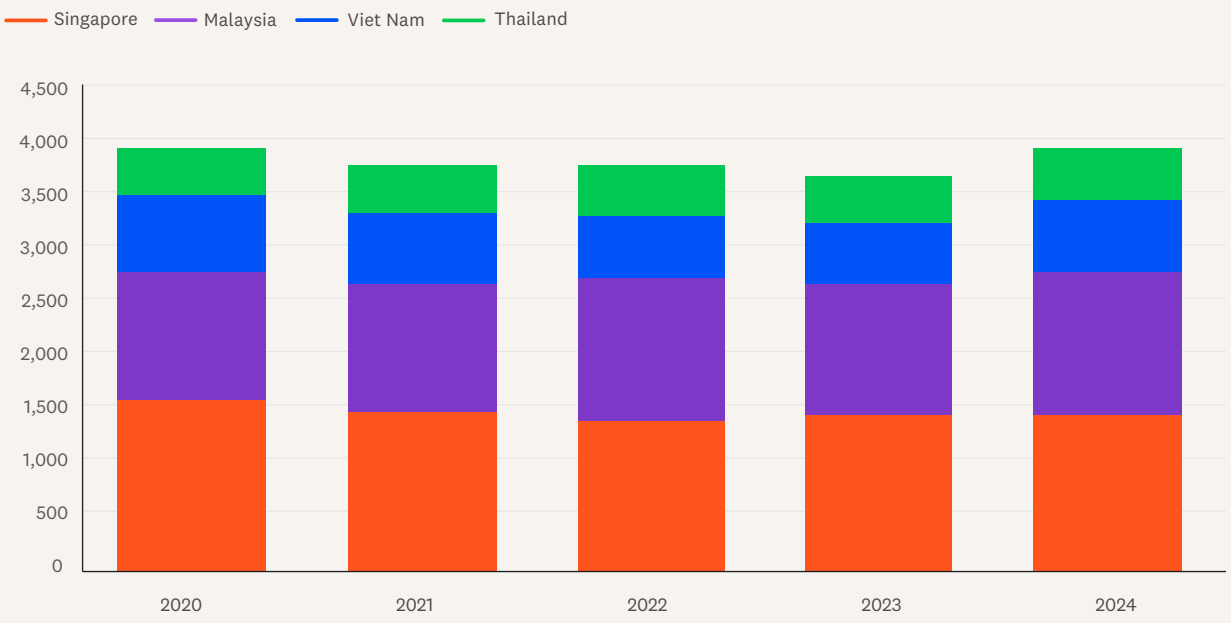
Singapore leads but its output is declining, while Malaysia is the only major member state increasing production, positioning itself as the emerging regional hub. Being a key technological strength required to combat import dependency, strengthening collaboration with ASEAN and third-party collaborators will be a necessary step to reinforce semiconductor and advanced manufacturing capabilities in ASEAN.

Summary of research activity in semiconductors and advanced manufacturing 2020–2024

Figure 16

ASEAN Semiconductor output is essentially flat over 2020–2024 — a strategic gap as global chip demand rises

It shows the highest international collaboration rate (61.1%) of the four technology areas; Singapore leads but is declining, while Malaysia is the only major grower



20,981 Scholarly output

61.1% International collaboration

3.5% Academic-corporate collaboration

61,579 Authors

23.1 Avg. citations per publication

Top 5 institutions	2020	2021	2022	2023	2024	Total
Nanyang Technological University	714	636	563	612	579	**3,104**
National University of Singapore	631	584	534	557	582	**2,888**
Agency for Science, Technology and Research, Singapore	324	291	356	389	362	**1,722**
Universiti Kebangsaan Malaysia	177	202	207	170	216	**972**
University of Malaya	201	189	192	185	198	**965**

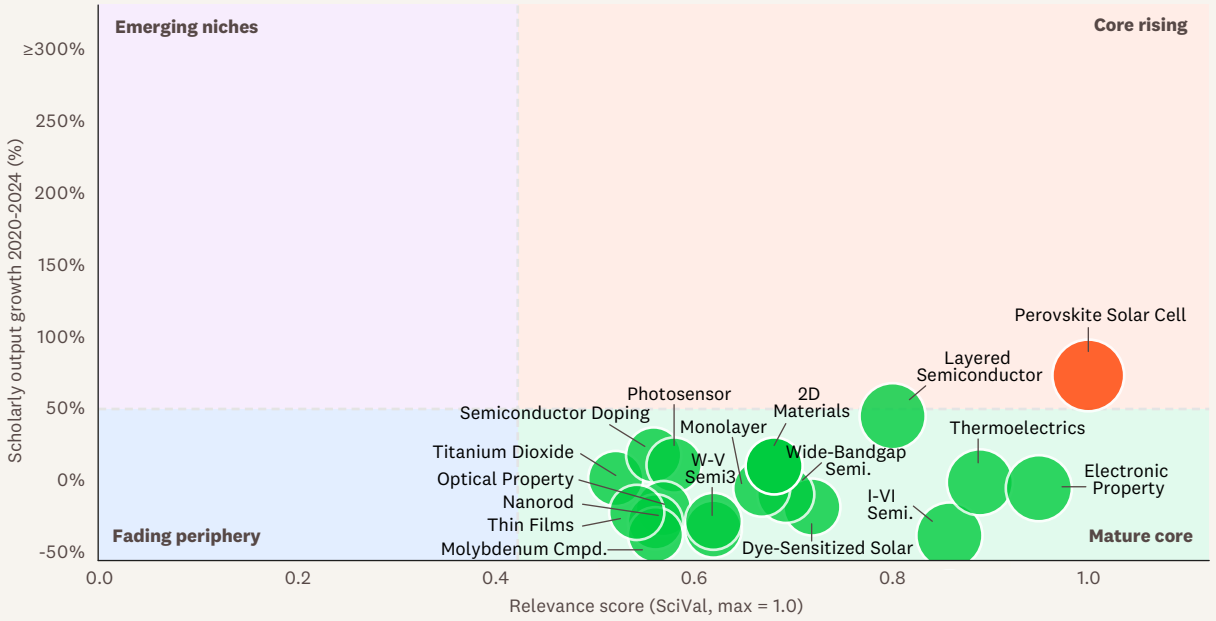
Stacked bar shows top ASEAN member countries. Institutions ranked by 2020-2024 total output
Source: SciVal 2020-2024

Notably, in the figure below, Semiconductors and Advanced Manufacturing see a large proportion of mature research sub-topics, as opposed to emerging or rising topics. Utilising ASEAN's existing strength and growth within clean energy research, creating a niche within semiconductors by focusing on core rising topics such as Perovskite Solar Cell, which also overlaps with clean energy research, may be a method of distinguishing ASEAN's semiconductor expertise against global competitors.

Figure 17

Research momentum (relevance vs. growth 2020–2024) for semiconductors; bubble size reflects field relevance

Source: SciVal Keyphrase Analysis



The ASEAN University Network as a catalyser of collaborations

The ASEAN University Network (AUN), with the secretariat in Bangkok, Thailand was established as an ASEAN coordination mechanism with the mission to promote collaborative study and research programmes on priority areas identified by ASEAN, strengthening academic mobility and joint research capacity across the region. This section will provide brief insights into the role of ASEAN University Network AUN in contribution to ASEAN overall research and innovation performance. Here we limit ourselves to the contributions from the 30 core university members of AUN only. It is to be noted that AUN also have a network of more than 300 associated members. AUN's mandate extends beyond research collaboration to student and faculty mobility and cross-border quality assurance through AUN-QA, creating thematic networks, academic exchange and institutional dialogue; this chapter examines only the research-output dimension of that broader role.

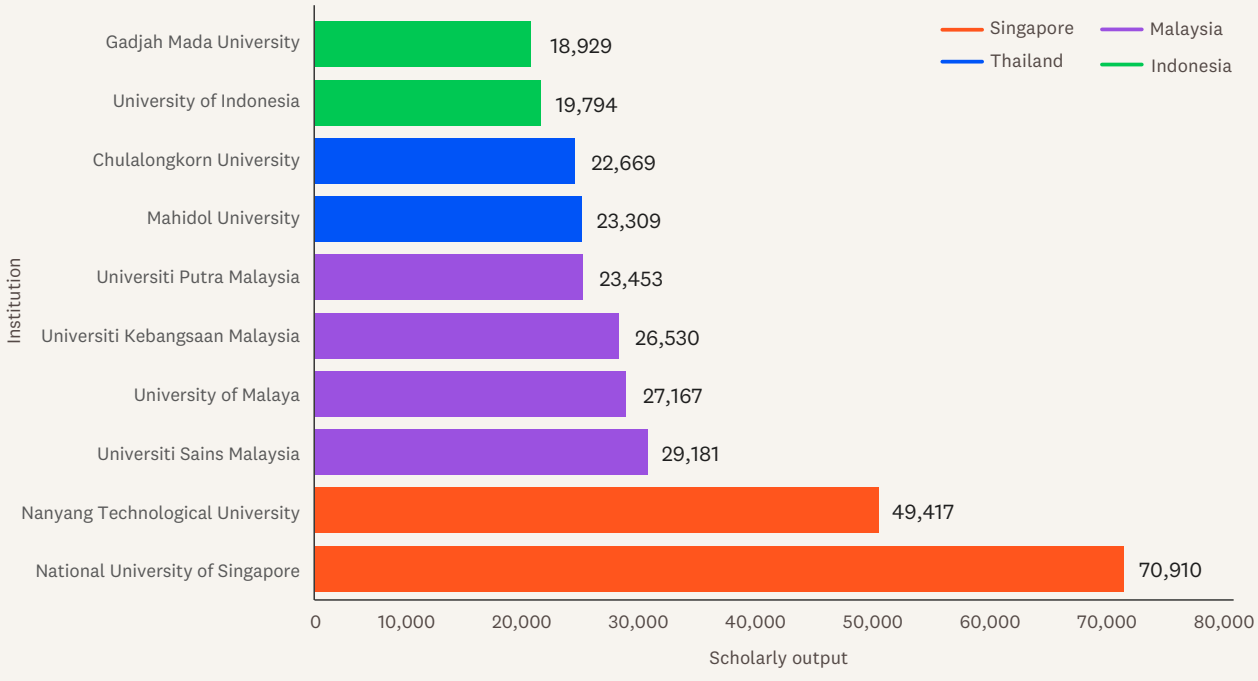
Across 2021–2025 the ASEAN University Network produced 389k publications, with annual output rising from 70k to 89k, a 27% increase, this supported by a growing author base of 239k unique researchers (annual counts up 26%, from 78k to 98k). In relation to ASEAN countries overall, 42% of ASEAN output is from AUN, and to emphasise again this only from the 30 core member institutions. In terms of academic impact, the FWCI of 1.41 of AUN places the network 41% above world average, and as expected above ASEAN FWCI of 1.11 and 54.3% of output is Open Access, well above global norms. It is to be noted, like ASEAN countries overall, most of the citation impact stems from internationally co-authored publications, both with partners from within the region, outside the region with China, United States and the United Kingdom as the three largest co-publication partners outside the ASEAN region.

ASEAN University Network: Research strengths, 2021–2025

Figure 18

Top 10 AUN institutions in terms of scholarly output

Singapore's NUS and NTU anchor a network spanning all ten ASEAN nations, with over half of output produced through international collaboration



389,652
Scholarly output

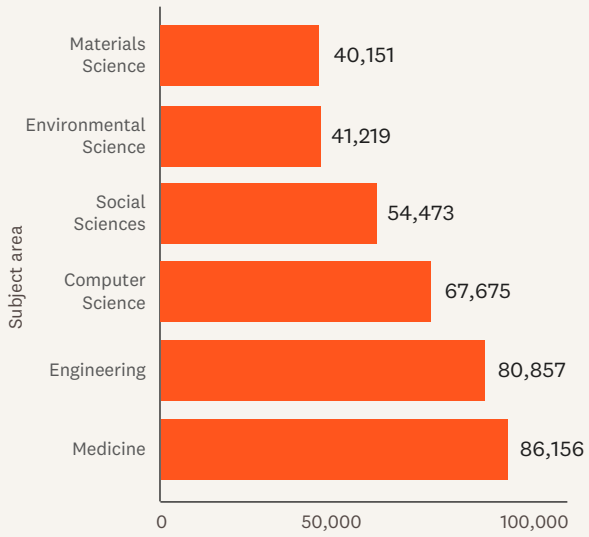
1.37
FWCI (world avg =1.0)

54.3%
Open access

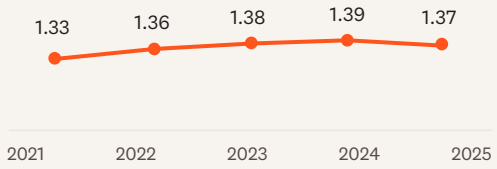
52.0%
International collaboration

5.79M
Citations

Leading subject areas by scholarly output



Research quality and momentum



Citation excellence

1 in 7

AUN papers rank among the world's top 10% most-cited (55,371 publications); of which 7,200 are also in the top 1%.

Fastest-growing fields (2021-25)

Arts and humanities	+113%
Psychology	+93%
Computer Science	+63%

Source: SciVal 2021-2025
Data: Scopus

Looking closer into the expansion of collaboration of the AUN, the network maps show the increasing growth of AUN collaboration over the years, creating a visualisation of the progress the network has made towards its goals. Over the past 20 years, AUN member nations with co-publications have grown from 22 institutions to 30. Further, not only has the network of international co-publications expanded, inter-AUN publications have remained central to the network.

Additionally, the variance of non-AUN universities have also grown, with a cross-border co-authorship, an important dimension of connectivity among AUN member universities. The observed relationship with prestigious institutions from China, Korea and Japan, this also a part of the ASEAN+3 University Network (ASEAN+3 UNet) formed in November 2012 as a sister network to the original ASEAN University Network (AUN).

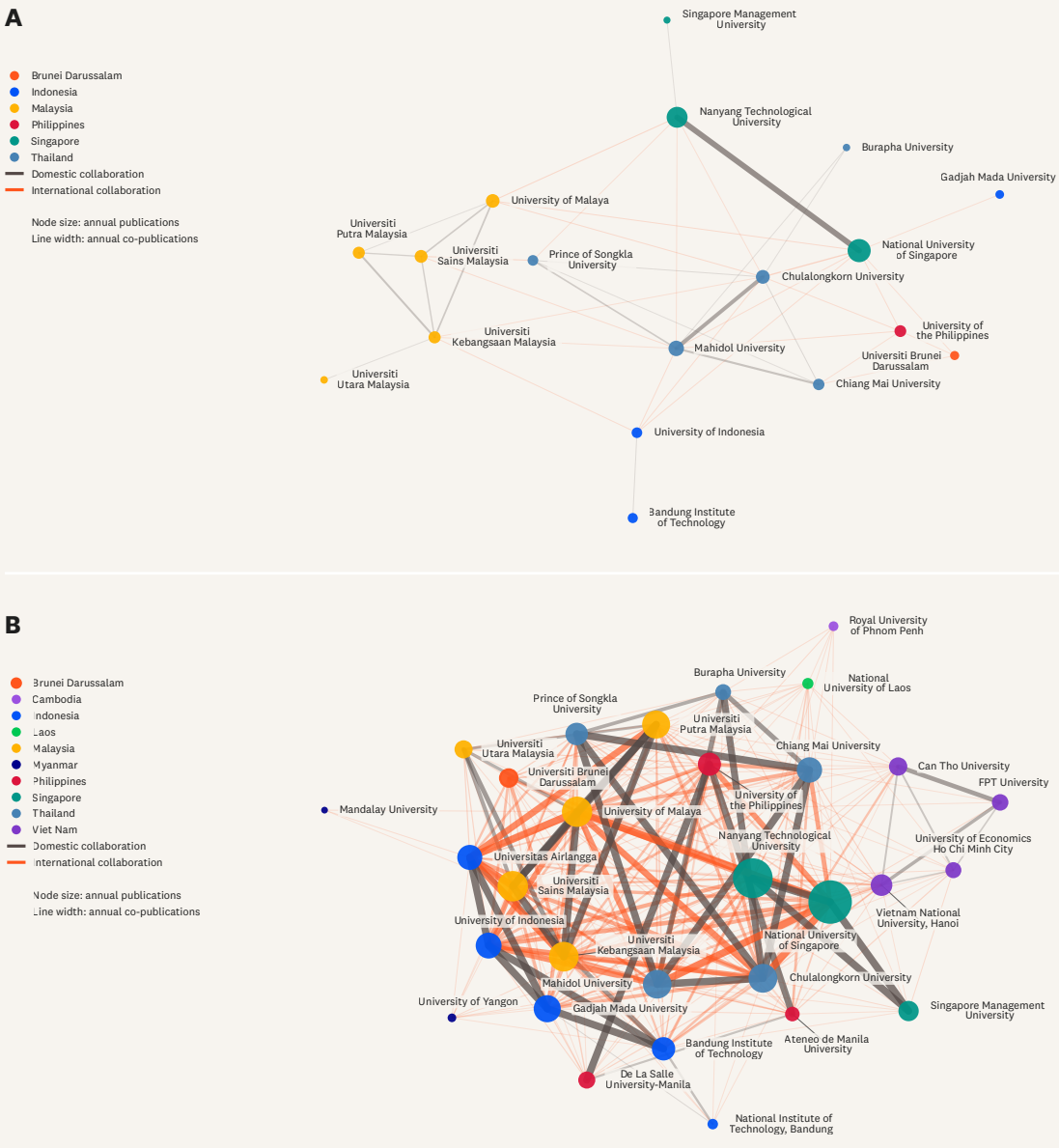
Whilst in 2000, there were a limited number of international co-publications with each university and a larger number domestically for larger ASEAN member nations, the picture has completely shifted in 2025. International co-publications outnumber those of domestic publications. This acts as a visual representation of the expertise, intelligence and research capabilities of AUN being compounded through collaboration.

Furthermore, there cannot be a clearer visualisation of the success that AUN has had in "strengthen[ing] the existing network of leading universities and institutions of higher learning in the ASEAN region" (Charter of the ASEAN University Network, proposal in 1993, funded 1995). With new member institutions being added to the core members as well as strong ties being maintained with China, Japan and Korea, AUN is a key catalyser for the ASEAN region and the APASTI objectives.

Figure 19

AUN network growth: a) 2000, b) 2025

Source: SciVal.



Looking deeper into inter-AUN collaboration, co-authorship among AUN core members over 2021–2025 describes a network broad in reach but concentrated in its strongest ties. Of 435 possible institutional pairs, 309 record some joint output, though only 49% reach twenty or more co-authored publications and 21% exceed one hundred. Of 40k co-publication links, 63.8% sit within the same country and 36.2% cross a national border — and it is that cross-border third, concentrated among mid-sized and smaller members, that represents AUN's emphasis on the importance of cross-border co-authorship as a dimension of connectivity among member universities (links are whole counted, with a multi-institution paper creates multiple pairs, not unique publications). The observed relationships provide a foundation for further regional cooperation, while programme-level evidence would help establish how specific AUN activities contribute to the initiation and continuity of these partnerships. Present domestic clusters and cross-border links as complementary as domestic domestic cooperation contributes expertise and capacity that supports regional partnerships: Nanyang Technological University with the National University of Singapore (5k) and Chulalongkorn with Mahidol (2k), alongside a dense Malaysian cluster. The cross-border picture is distinct. The strongest international axis runs between Malaysia and Indonesia (3k), ahead of Malaysia–Thailand (2k) and Malaysia–Singapore (2k).

The University of Malaya is the network's most connective institution, with 8k links, 46% of them cross-border, and nineteen partners at twenty publications or more. Regional orientation is strongest among mid-sized and smaller members rather than the largest producers: Universiti Brunei Darussalam (100% cross-border), Viet Nam National University Hanoi (92%), Can Tho University (84%) and the University of the Philippines (71%). Much of AUN's aggregate output therefore rests on strong national clusters, and the network's distinctive contribution, collaboration that would not otherwise occur, lies in its cross-border third. Members in Cambodia, Laos and Myanmar remain lightly connected, marking where coordinated regional programmes could add most value. It is a picture of some distinct regional ties, but with AUN core network and associated universities, with a strong potential to add value.

The research achievements of AUN member universities illustrate the substantial academic strengths represented within the network. AUN seeks to support connections through which these strengths can contribute to shared learning and continued cooperation across ASEAN and with international partners.





Conclusions

ASEAN has established itself as a high-growth, highly diverse research region. Regional scholarly output has expanded almost twenty-fold since 2000 and now approaches 230k publications a year, 4.2% of the world total, carrying the region past Japan in volume and slightly ahead of Latin America. That expansion has been accompanied by the scale of the higher-education base, some 22 million tertiary students within a population of 684 million, than by research intensity: gross domestic expenditure on R&D remains around 1.1% of GDP against an OECD average of 2.7%.

Academic impact reflects the same structure. ASEAN's Field-Weighted Citation Impact stands at approximately 1.11 and has stayed within a narrow band for a decade. Behind that average, the 43% of output that is internationally co-authored records an FWCI of 1.61, while nationally co-authored, institutional-only and single-authored work falls below the world baseline. Singapore is the exception, at 1.31 for national-only output. The region's citation premium is, in aggregate, an international impact multiplier, and collaboration within the region is rising.

The ASEAN University Network shows the same relationship at institutional level. Its thirty core members account for 42% of regional output, collaborate internationally at 51.7%, and record citation impact above the regional average. Two-thirds of co-authorship within the network is domestic; the cross-border third, strongest between Malaysia and Indonesia and most pronounced among mid-sized members, is where key aspects of AUN’s impact can be seen.

Translation into economic value is at an earlier stage. Academic-corporate co-authorship averages 2.5%, though joint output has grown from 4k to 5.5k publications with an FWCI of 2.70, and approximately 1% of output is cited in patents, rising to 4% in Singapore. The most frequent corporate partners are state-linked enterprises working with national research agencies. Across frontier technologies, artificial intelligence and clean energy expand rapidly with impact above the world average, biotechnology and health anchors volume, and semiconductors and advanced manufacturing remain flat. Research aligns only partly with sustainability priorities, with activity exceeding global averages in selected Sustainable Development Goals.

Five observations and potential actions suggested by the analysis:

- Collaboration is the region's strongest demonstrated impact multiplier, and the regional network has broadened markedly since 2000. As a future option, COSTI and AUN could jointly baseline and monitor intra-ASEAN co-authorship annually and use the eligibility criteria of ASTIF (ASEAN Science, Technology and Innovation Fund) calls to favour consortia spanning several member states. This is a direct available route to lifting the national-only output that currently sits below world average.
- Laos, Cambodia and Timor-Leste record the region's fastest growth yet remain lightly connected within AUN. An associate-to-core progression pathway, twinning with the network's most connective institutions, and the formalisation through approved AUN governance processes of Timor-Leste's participation would serve to connect and build regional capacity.
- The academic-corporate co-publication share is low but is impactful. Rather than seeking a broad private research market, COSTI's ecosystem strategy may scale the state-linked enterprise and national agency model already producing results, adopting the patent-citation rate as a tracked indicator against global benchmarks.
- Five of eleven member states have no current reading for R&D expenditure, and SDG indicators have declined regionally. Further work by COSTI with member state statistical agencies, would make APASTI's own theory of change measurable and strengthen the case for investment nationally.
- The semiconductor area records the highest international collaboration rate of the four technologies examined, and its research overlaps with the region's fast-growing clean energy base. A joint programme across COSTI's microelectronics and sustainable energy sub-committees, may be of interest.

Together these findings set a baseline against which the effects of APASTI 2026-2035 can be measured.

Appendix 1: Definitions

This report is primarily based on analysis made with Elsevier's SciVal, which draws on output and usage data from Scopus, a source-neutral abstract and citation database curated by independent subject-matter experts. The terminology used in the report is defined below.

Academic-corporate (academic-industry) collaboration

Academic-corporate collaboration in this report is indicated by papers with at least one author from an academic institution and one author from a corporate institution listed in the authorship byline.

Citation

A citation is a formal reference to earlier work made in document, frequently to other scholarly papers, but also to policy documents or patents. A citation is used to credit the originator of an idea or finding and is typically used to indicate that the earlier work supports the claims of the work citing it. The number of citations received by a paper from subsequently published papers and/or policy documents as well as patents, can be used as a proxy of the quality, importance, societal impact or economic translational value of the reported research.

FWCI (Field-Weighted Citation Impact)

Field-weighted citation impact (FWCI) is an indicator of mean citation impact and compares the actual number of citations received by a paper with the expected number of citations for papers of the same document type (article, review, or conference proceeding), publication year, and subject area. When the paper is classified in two or more subject areas, the harmonic mean of the actual and expected citation rates is used. The indicator is therefore always defined with reference to a global baseline of 1.0 and intrinsically accounts for differences in citation accrual over time, differences in citation rates for different document types (e.g., reviews typically attract more citations than research articles), as well as subject specific differences in citation frequencies overall and over time and document types. It is one of the most sophisticated indicators in the modern bibliometric toolkit.

International collaboration

International collaboration in this report is indicated by papers with at least two different regions listed in the authorship byline.

Patent Citations

This is the count of scholarly output published by an entity (e.g., a university) that have been cited by Patents. In the report we use the percentage of total output of an entity which is cited in patents. The SciVal tool used in the report collects Patent data from 107 Patent Offices worldwide.

RAI (Relative Activity Index)

Relative Activity Index is defined as the share of an entity's publications in a subject relative to the global share of publications in the same subject. A value of 1.0 indicates that an entity's research activity in a field corresponds exactly with the global activity in that field; higher than 1.0 implies a greater emphasis while lower than 1.0 suggests a lesser focus.

Scholarly output

Scholarly output describes the products of scholarly activity, such as journal articles, books, book chapters, conference papers, and other forms of research dissemination. Throughout the report, when looking at collaborations, we use whole counting, meaning that collaborating entities on a scholarly publication all get a full count in terms of contribution.

SDG output

The United Nations Sustainable Development Goals (SDGs) challenge the global community to build a world where no one is left behind.

Since 2018, Elsevier has generated SDG search queries to help researchers and institutions track and demonstrate progress toward the SDG targets. In the past 3 years, these queries, along with the university's own data and evidence supporting progress and contributions to the particular SDG outside of research-based metrics, are used for the THE Impact Rankings.

For 2025, the SDGs use the exact same search query and ML algorithm as the Elsevier 2023 SDG mappings, with only minor modifications coming from changes to the search engine handling the SDG queries. Because of this, while the vast majority of publications retain their original mapping, the number of publications in each SDG has slightly changed.

All these changes were implemented to streamline how SDG queries are handled. Users should note that running these in Scopus should be done for reference purposes only, as the Scopus search engine behaves slightly differently than the classifier used to formerly tag SDGs to publications.

Strategic technologies

The Office of Science and Technology Policy (OSTP) advises the President on the impacts of science and technology on domestic and international affairs. The OSTP Research Areas in SciVal represent 5 OSTP focus areas: Artificial Intelligence, Quantum Information Science, Nuclear Technology, Biotechnology, and Semiconductors.

Subject area classification

The subject area classification used in this report is based on the Quacquarelli Symonds codes. This classification is used in QS World University Rankings. It covers 5 subject areas and 51 subjects. Each QS subject area is mapped to one or more All Science Journal Classification (ASJC — the default subject area classification used in SciVal.



Appendix 2: Data sources

Scopus

Scopus is a comprehensive, source-neutral abstract and citation database curated by independent subject-matter experts. It indexes tens of millions of records from thousands of publishers and forms the underlying data source for the analyses in this report.

www.scopus.com

SciVal

SciVal is an advanced research-analytics tool built on Scopus data. It enables visualisation of research performance, benchmarking against peers, analysis of collaboration and emerging trends, and the creation of tailored reports. All bibliometric indicators in this report are derived from SciVal for the 2021–2025 period unless otherwise stated.

www.scival.com

LeapSpace

LeapSpace™ is the research-grade AI-assisted workspace that lets researchers work faster, think deeper, and achieve more in a secure environment.

Designed with the research community, it blends responsible AI and trust indicators with the most comprehensive collection of peer-reviewed, publisher-neutral full text and abstracts.

www.sciencedirect.com/leapspace

Overton

Overton is the world's largest searchable index of policy documents, guidelines, think-tank publications and working papers. Its database consists of more than 1.65 million policy documents, with data collected from 182 countries and over a thousand sources worldwide. These policy documents include white papers from international multilateral organisations, as well as guidelines from city councils, parliamentary transcripts and other classes of the so-called "grey literature." Around half of these documents make citations to academic or scholarly publications. More than 2 million distinct journal-based publications are cited by at least one policy document in the database.

www.overton.io

Scope and method

Analyses use whole counting and cover the eleven ASEAN member states. Strategic-technology datasets follow the relevant Elsevier methodologies (AI Report methodology for Artificial Intelligence; US OSTP definitions for Biotechnology and Semiconductors; SDG 7 for Clean Energy). Population and GDP context is drawn from ASEANstats, Statista and World Economics (2023–2024).

Appendix 3: ASEAN R&D investment, population and economic scale

All eleven ASEAN Member States. Sourcing restricted to the ASEAN Secretariat, the UNESCO Institute for Statistics (UIS) and the OECD. UIS R&D data as at the February 2026 release (extracted 26 February 2026); OECD data from Main Science and Technology Indicators, March 2026 release. Compiled 14 September 2026.

Table A3.1: Research investment, research workforce and economic scale, by member state

Member state	Population 2024 (million)	GDP per capita 2024 (US$)	GERD, % of GDP (reference year)	Researchers per million inhabitants, FTE (reference year)
Brunei Darussalam	0.46	33,619	0.28% (2018) a	506 (2022) a
Cambodia	17.53	2,656	0.09% (2015) b	30 (2015) b
Indonesia	282.35	4,820	0.28% (2020)	395 (2020)
Laos	7.72	1,970	0.04% (2002) c	16 (2002) c
Malaysia	35.34	12,333	1.01% (2022) b	1,218 (2022) b
Myanmar	54.32	1,404	0.02% (2023) d	28 (2023) d
Philippines	115.37	4,090	0.28% (2020)	320 (2020)
Singapore	5.81	90,689	1.81% (2022)	8,782 (2022)
Thailand	71.69	7,499	0.94% (2023)	1,592 (2023)
Timor-Leste	1.39	1,352	no data	no data
Viet Nam	100.68	4,710	0.41% (2023)	836 (2023)
ASEAN (11 states)	**684.1**	**5,759 (avg.)**	**1.03% (2023)**	**873 (2023)**

a Higher education sector only.
b Break in series with the previous year on record.
c Partial data, from a regional publication rather than a national R&D survey.
d Excludes business enterprise and private non-profit sectors; partial data; reported on a fiscal-year basis.

Population: World Population Prospects 2024 as disseminated by UIS — the same denominator UIS uses for researchers per million, so the two columns are consistent. GDP per capita: ASEAN Key Figures 2025 (2024). GERD and researchers: UIS, SDG 9.5.1 and 9.5.2, latest year per country. ASEAN row: population and GDP per capita from ASEAN Key Figures 2025; GERD and researchers are the UIS aggregate for South-Eastern Asia, which covers the same eleven countries.

Table A3.2: Regional and global benchmarks

	GERD, % of GDP	Researchers per million, FTE	Reference year
South-Eastern Asia (= ASEAN)	1.03%	873	2023
World	1.92%	1,486	2023
Eastern & South-Eastern Asia	2.42%	—	2023
Europe & Northern America	2.55%	4,358	2023
OECD total	2.72%	—	2024

Rows 1–4: UIS, SDG 9.5.1 and 9.5.2, February 2026 release. OECD total: OECD Main Science and Technology Indicators, March 2026 release (2.70% in 2023). The OECD figure is a GDP-weighted aggregate of OECD members only, Frascati-based and so comparable in concept with the UIS aggregates but not one of them. OECD reports its research workforce per thousand total employment, which is not comparable with researchers per million inhabitants.

Where the data is incomplete, and why

ASEAN does not yet measure its own research investment at regional level. The ASEAN Plan of Action on Science, Technology and Innovation (APASTI) adopts both indicators as outcome measures, but no ASEAN Secretariat publication currently carries a science and technology chapter, and the Secretariat runs no regional R&D survey. Comparable figures exist only where Member States report to the UIS annual survey. These gaps reflect the current state of national R&D survey infrastructure across the region, which APASTI's own STI governance objectives are designed to strengthen. The gaps below are structural, not a sourcing choice.

- **Currency** Only Thailand, Viet Nam and Myanmar report 2023. Malaysia and Singapore report 2022; Indonesia and the Philippines 2020; Brunei 2018; Cambodia 2015; Laos 2002. Timor-Leste has never reported either indicator.
- **Comparability** Brunei, Myanmar and Laos (notes a, c, d) are understated against full-coverage GERD. Laos's single observation is evidence that the indicator is not measured, not a current reading.
- **Population** Two official totals disagree: ASEAN Key Figures 2025 gives 684.1 million for 2024, while the WPP 2024 estimates in Table A3.1 sum to 692.7 million — 1.3% apart, mostly Thailand (registered 65.95 million against a WPP estimate of 71.69 million).

Sources

ASEAN Secretariat, ASEAN Key Figures 2025, Vol. 8 (December 2025; released April 2026) — population and GDP aggregates, GDP per capita, shares of world population and output; first edition to include Timor-Leste. · ASEAN Secretariat, APASTI 2016–2025. · UNESCO Institute for Statistics, SDG 9.5.1 and 9.5.2, February 2026 release, and Background Information on R&D Statistics in the UIS Database (February 2026). · OECD, Main Science and Technology Indicators, March 2026 release. · UN DESA Population Division, World Population Prospects 2024.

National figures, for completeness (not mutually comparable — censuses mixed with official projections): Brunei 456k (2024, DEPS) · Cambodia 17.3M (2024 census, prelim.) · Indonesia 281.6m (2024 projection, BPS) · Laos 7.55m (2023 est., 2015 census base) · Malaysia 34.1m (2024, DOSM) · Myanmar 51.3m (2024 census, prov.) · Philippines 112.7m (2024 census) · Singapore 6.04m total / 4.18m residents (2024, SingStat) · Thailand 65.95m (registered, Jan 2025) · Timor-Leste 1.3M (2022 census) · Viet Nam 101.1m (2024 mid-term census, GSO).



CS-3103
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