

End-Term Review of the ASEAN Plan of Action on Science, Technology and Innovation 2016- 2025

Final detailed report

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Aus4ASEAN
FUTURES



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Glossary

AEC	ASEAN Economic Community
AMMSTI	ASEAN Ministerial Meeting on Science, Technology and Innovation
AMS	ASEAN Member State
APASTI	ASEAN Plan of Action on Science, Technology and Innovation
ASCC	ASEAN Socio-Cultural Community
ASEAN	Association of Southeast Asian Nations
ASEC	ASEAN Secretariat
ASTNET	ASEAN Science and Technology Network
BAC	Board of Advisers to COSTI
COSTI	Committee on Science, Technology and Innovation
ETR	End-Term Review
GEDSI	Gender Equality, Disability and Social Inclusion
GERD	Gross Expenditure on Research and Development
GDP	Gross Domestic Product
GII	Global Innovation Index
IPR	Intellectual Property Rights
MSMEs	Micro, Small and Medium-Sized Enterprises
KPI	Key Performance Indicator
MTR	Mid-Term Review
R&D	Research and Development
SC	Sub-Committee (of COSTI)
S&T	Science and Technology
STEM	Science, Technology, Engineering and Mathematics
STI	Science, Technology and Innovation
WIPO	World Intellectual Property Organization

1. Introduction

1. Introduction

1.1. APASTI 2016-2025

The Association of Southeast Asian Nations (ASEAN) Plan of Action on Science, Technology and Innovation (APASTI) 2016–2025 is a 10-year strategic plan aimed at fostering a science, technology, and innovation-enabled ASEAN that is innovative, competitive, vibrant, sustainable, and economically integrated. The APASTI was designed to support broader ASEAN strategic plans including the ASEAN Community Vision 2025 and the ASEAN Economic Community (AEC) Blueprint.

The goals of the APASTI 2016-2025 are outlined in **Figure 1**.

Figure 1: APASTI 2016-2025 goals



The Committee on Science, Technology, and Innovation (COSTI) and its Sub-Committees (SCs) oversee the implementation of the APASTI, which play crucial roles in driving the Strategic Thrusts and Actions outlined in the plan. An Implementation Plan supplements the APASTI 2016-2025, outlining expected outputs and outcomes, Key Performance Indicators (KPIs), and work plans for each of the SCs.

1.2. Purpose of this review

This End-Term Review (ETR) is aimed at assessing the progress, achievements, and challenges encountered during the implementation of the APASTI 2016–2025. This review will provide valuable insights and lessons learned to inform the development of the subsequent APASTI 2026–2035.

The primary objectives of this review are to:

1. **Analyse each AMS within their existing STI landscape:** this analysis focuses on the outcome indicators of the APASTI and how each AMS has progressed.
2. **Evaluate the effectiveness of strategies and initiatives outlined in the APASTI:** highlighting achievements, challenges, and areas of improvement.
3. **Identify lessons learned and best practices to inform the future APASTI:** Use of rigorous analysis, desktop research and stakeholder consultations to inform lessons learned and examples of best practice for the future.
4. **Develop curated recommendations for AMS and COSTI to consider for adoption and incorporation into the APASTI 2026-2035 policy document:** provide a solid foundation for the formulation of APASTI 2026-2035.

By conducting this review, COSTI aims to ensure that the next phase of its STI agenda is well-informed, strategically aligned and capable of addressing both current and future challenges. The insights gained from this review will be instrumental in shaping a more innovative, competitive and sustainable ASEAN region through the development of the next APASTI.

This ETR complements and builds on the Mid-Term Review (MTR) of the APASTI 2016-2025 undertaken by the University of Cambridge, which was completed in August 2023 and covers the period 2016-2022. The content outlined throughout this report combines the MTR outputs and updated findings from the ETR.

This report should be read in conjunction with the Executive Summary and the key recommendations short form report.

1.3. Review methodology, structure and information sources

Key information sources used in development of this review included, but were not limited to:

- Background documents provided by COSTI, including:
 - The APASTI 2016-2025;
 - The Implementation Plan;
 - The MTR;
 - Reports on the ASEAN Science, Technology and Innovation Fund (ASTIF) and Board of Advisers to COSTI (BAC) prepared by the University of Cambridge concurrently with the MTR;
- SC reports and other materials provided by COSTI which document the activities and outputs of the SCs between 2016-2025;
- The outputs of an ETR Workshop; and
- Desktop research and quantitative and qualitative analysis utilising a range of sources as referenced in this document.

The methodologies used to undertake this review are further outlined in the subsequent chapters. In summary:

- Chapter 2 outlines recommendations for the development and implementation of the APASTI 2026-2035 based on the analysis and findings outlined in this ETR.
- Chapter 3 reviews the overall trends across AMS by analysing key indicators of STI development and outputs. The review considers a range of quantitative metrics using desktop research, which are generally aligned to the Outcome Indicators specified in the Implementation Plan;
- Chapter 4 reviews progress against each of the Strategic Thrusts defined in the APASTI 2016-2025. Progress has been assessed primarily with reference to reports prepared by each of the COSTI SCs, which outline the range of activities overseen by that SC and the status of these activities. This analysis is also supplemented by insights obtained from participant feedback at the ETR Workshop; and
- Chapter 5 reviews the effectiveness and efficiency of the implementation of the APASTI 2016-2025, based on insights from the ETR Workshop and the review team's observations from the review of the APASTI, Implementation Plan, SC reports, MTR and other relevant documents.

Key limitations of this report, such as data gaps are detailed in Section 5.

1.4. Review workshop and engagement with ASEC and AMS representatives

On 13 February 2025 an online workshop was facilitated to obtain input from key stakeholders on:

- Quantitative and qualitative achievements challenges under the APASTI 2016-2025;
- The contribution of the APASTI 2016-2025 to regional STI goals; and
- Key recommendations for APASTI's future direction and improvements.

This workshop is referred to throughout this document as the 'ETR Workshop.' The ETR Workshop was attended by representatives of the ASEAN Secretariat (ASEC) as well as each AMS. A full list of attendees is provided in Appendix 1. Workshop pre-submissions, polling results and qualitative responses from within the Workshop have been analysed and, where applicable, have been reproduced in this review along with relevant insights. The identities of individual workshop participants, insofar as specific feedback and responses is concerned, have been kept anonymous.

2. 2016-2025 Trends across ASEAN Member States

2. Outcome Indicator Trends across ASEAN Member States

This chapter reviews the growth of AMS between 2016-2025 by analysing the progress made against the Outcome Indicators specified in section F.2 Key Performance Indicators (KPIs) of the APASTI 2016-2025 Implementation Plan.

To assess AMS against these Outcome Indicators, a desktop research exercise was undertaken to identify the progress across ASEAN between 2016-2025. Where data allows, AMS outcomes are compared to those of Dialogue Partners to get an understanding of the extent of progress. This chapter considers broad trends against Outcome Indicators across the ASEAN region, as well as differential impacts and variability across individual AMS.

Where relevant, data sources have been referenced, such as:

- The Global Innovation Index (GII), which ranks the innovation performance of approximately 130 economies;
- Feedback received from participants at the ETR Workshop; and
- Additional desktop research undertaken to gain insights into progress against Outcome Indicators where quantitative data was limited.

It is noted that while several of the Outcome Indicators provide useful insight into STI trends and progress across the ASEAN region, it is not possible to directly attribute these outcomes to the APASTI 2016-2025. Nevertheless, this chapter demonstrates some clear areas of progress across ASEAN, in line with APASTI goals and intended outcomes and identifies areas requiring continued focus in the next APASTI.

2.1. Research and development (R&D) expenditure is growing, but consistent data collection is needed to track progress

Key Finding:

AMS appear to be increasing their gross expenditure on R&D (GERD), in line with APASTI 2016-2025 goals. Several AMS have also achieved, or are actively targeting, a greater proportion of private investment in R&D. However, to the extent that data is available, GERD as a percentage of GDP for most AMS remains significantly lower than global averages, with the notable exception of Singapore.

The APASTI 2016-2025 Implementation Plan includes the following Outcome Indicators:

R&D Expenditure (referenced in the APASTI as F.2.1)

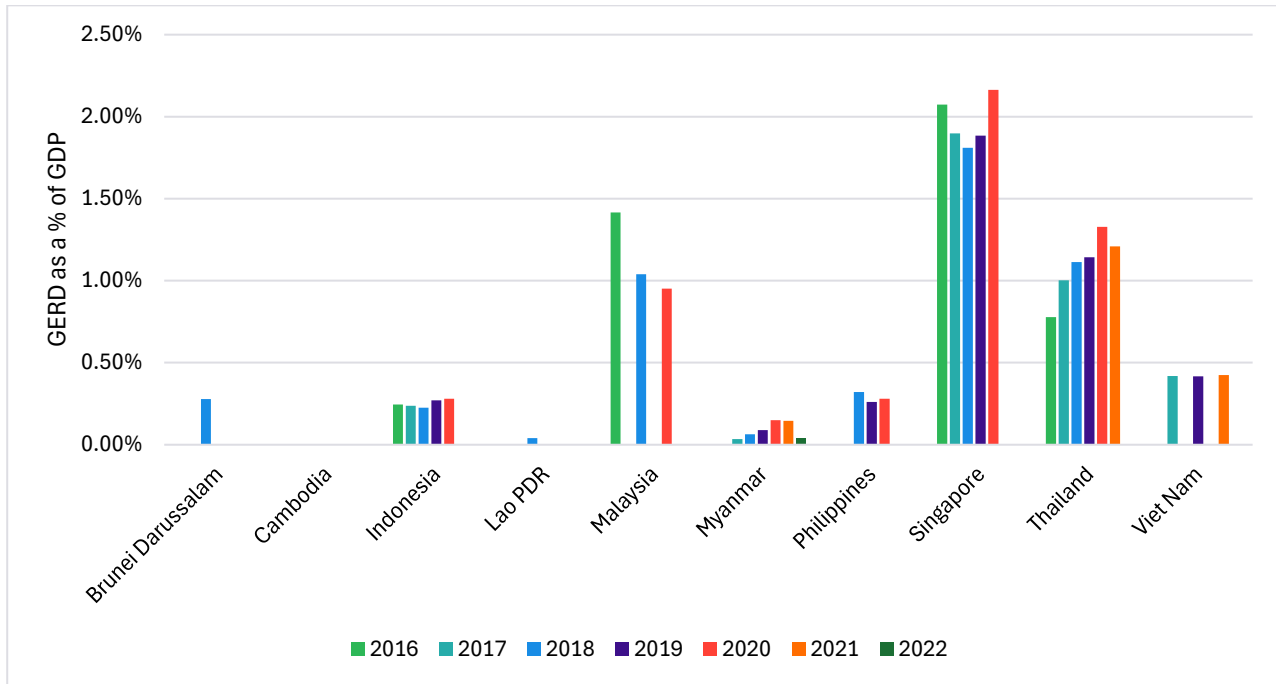
- Gross Expenditure on R&D (GERD)¹
- Percentage of GERD financed by industry

¹ GERD captures domestic expenditure on R&D, in order to compare GERD across economies, it is captured as a proportion of gross domestic product (GDP). An increase in GERD as a percentage of GDP indicates that an economy is increasingly allocating public and private resources to innovation and development of knowledge, services and products across all sectors.

- Percentage of GERD financed by government Gross expenditure on R&D (GERD)

Figure 2 shows a time series of GERD as a percentage of GDP for ASEAN Member States for the period of the APASTI 2016-2022, to the extent data is available.

Figure 2: R&D expenditure in AMS (GERD as a percentage of GDP), 2016-2022 (or latest year available)



Source: UNESCO Institute of Statistics (UIS), GERD as a percentage of GDP (as at February 2025); UNESCO Global Observatory of Science, Technology and Innovation Policy Instruments (GOSPIN), Mapping Research and Innovation in Lao PDR (2018); Survey Results of the 2019-2020 R&D Expenditures and Human Resources, Department of Science and Technology, Republic of the Philippines.

Singapore has maintained the highest GERD as a percentage of GDP by a considerable distance, at an average of 2.00%. At a regional level, AMS expended between 0.59% (during COVID-19) and 1.1% of GDP on R&D on average between 2016 and 2021. When excluding Singapore, AMS expended between 0.42% and 0.81% on average over the same period. By comparison, as at 2023, the proportion of global GDP invested in R&D was 1.98%.²

2.1.1. Percentage of GERD financed by industry and government

The APASTI 2016-2025 Outcome Indicators also consider the relative level of investment in R&D by government and industry (i.e. the private sector). By encouraging private sector investment in R&D, the APASTI aims to leverage the agility and resourcefulness of businesses to drive technological advancements and commercialisation of research outcomes. This not only enhances the overall capacity for innovation, but it also supports the alignment of R&D efforts with market needs and industry priorities.

AMS statistics found in the desktop research exercise demonstrate that governments are committed to allocating more R&D expenditure in their

² World Intellectual Property Organization (WIPO), Global Innovation Index. *End of Year Edition – Against All Odds, Global R&D Has Grown Close to USD 3 Trillion in 2023.*

budgets, whilst also targeting greater proportions of GERD from the private sector:

- **Brunei Darussalam:** The Brunei Government Research Department expended BND\$21.9 million in 2016. By 2023 this had increased to BND\$24.6 million in 2023;³
- **Cambodia:** The Cambodian National Budget includes ‘fees for experimental research,’ which increased by an average of 8% per year between 2017 and 2022;⁴
- **Lao PDR:** Lao PDR’s government targeted an increase in the proportion of public investment in STI R&D in its budget from 1% in 2020 to 8.5% in 2025 as part of its 9th Five-Year National Socio-economic Development Plan (2021-2025).⁵ The plan also focuses on increasing the proportion of private investment in R&D from 30% in 2020 to 35% in 2025;⁶
- **Malaysia:** The National Policy on Science, Technology and Innovation 2021-2030 outlines ten programmes designed to achieve Malaysia’s GERD goal of 3.5% by 2030.⁷ It highlights that public-private R&D spending ratio sat at 35:65 in 2020, with an aim to increase private sector contribution to 70% to achieve its R&D targets;⁸
- **Philippines:** The latest Department of Science and Technology (DOST) data on R&D Expenditures and Human Resources showed that private R&D expenditure from 2015 to 2020 made up 52% of total spend;⁹
- **Singapore:** The private sector proportion of GERD steadily increased from 58% to 63% between 2016 to 2021 with a transition away from contributions from institutes of higher learning (a decrease from 18% to 13%).¹⁰ The government’s contribution to total GERD also increased from 11% to 13% whilst public research institutes’ proportion of GERD fell from 13% to 11% over the same period;¹¹ and
- **Thailand:** The Office of Higher Education, Science, Research and Innovation Policy Council’s 2021 survey revealed that the public-private ratio of GERD sat at 26:74.¹² Thailand is targeting a ratio of 30:70 by 2027.¹³

The remaining AMS are not commented on here as current data was not available.

³ Ministry of Finance and Economy – Brunei Darussalam, Department of Economic Planning and Statistics, Brunei Darussalam Statistical Yearbook. RPT.pdf.

⁴ Cambodian National Budget, National Expenditures (2017-2022, English). *Cambodia National Budget*.

⁵ Government of Lao PDR, *9th Five-year National Socio-economic Development Plan (2021-2025)*.
_eng_9th_nsedp_final_print_12.1.22.pdf.

⁶ Government of Lao PDR, *9th Five-year National Socio-economic Development Plan (2021-2025)*.

⁷ Malaysian Investment Development Authority, *Nearly RM86 bln in R&D investment needed to achieve NSTIP targets.*:
Nearly RM86 bln in R&D investment needed to achieve NSTIP targets — Mosti - MIDA | Malaysian Investment
Development Authority.

⁸ Malaysian Investment Development Authority, *Nearly RM86 bln in R&D investment needed to achieve NSTIP targets*.

⁹ Survey Results of the 2019-2020 R&D Expenditures and Human Resources, Department of Science and Technology, Republic of the Philippines.

¹⁰ Singapore Government Department of Statistics, *Research and development expenditure by sector.: (DOS) | SingStat Table Builder – Research And Development Expenditure By Sector*.

¹¹ Singapore Government Department of Statistics, *Research and development expenditure by sector*.

¹² Office of Higher Education, Science, Research and Innovation Policy Council (NXPO), NXPO puts forward recommendations aiming at promoting R&D investment to escape the middle-income trap. Accessed 25 February 2025: NXPO puts forward recommendations aiming at promoting R&D investment to escape the middle-income trap – Office of National Higher Education Science Research and Innovation Policy Council.

¹³ NXPO, NXPO puts forward recommendations aiming at promoting R&D investment to escape the middle-income trap.

2.2. Human resources involved in R&D are growing across AMS and closely linked to expenditure

Key Finding:

While individual AMS showed variability in growth in the number of researchers, the number of researchers in Southeast Asia as a whole (i.e. ASEAN plus Timor Leste) grew consistently between 2016-2022, with Singapore exceeding key Dialogue Partners with respect to number of researchers per million inhabitants.

The APASTI 2016-2025 Implementation Plan includes the following Outcome Indicators:

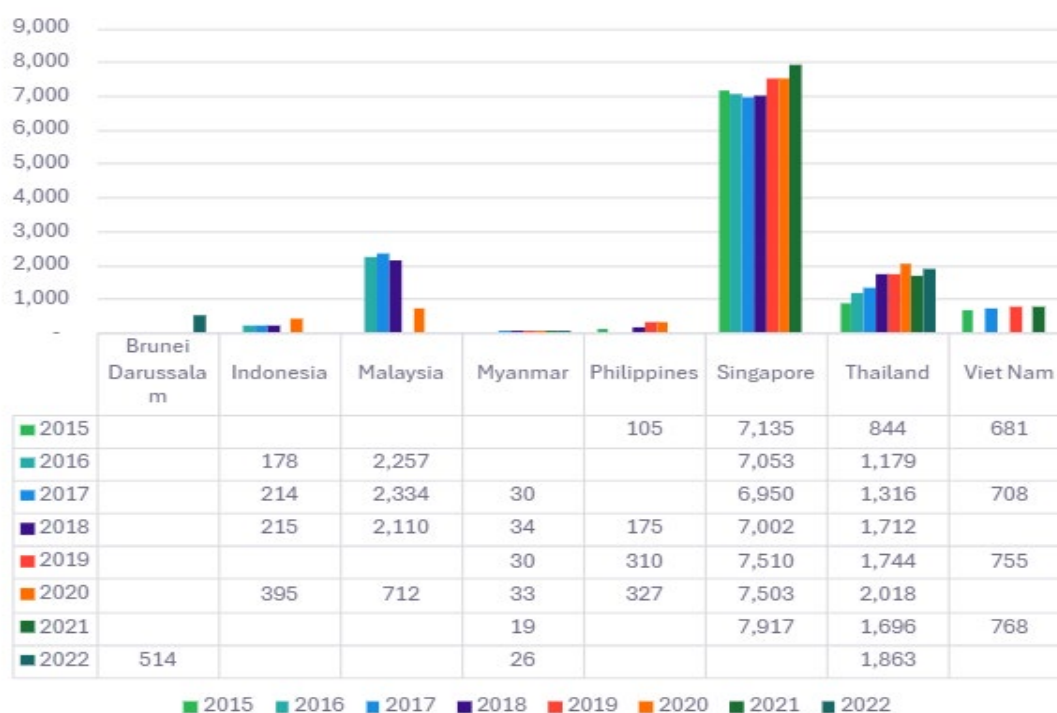
Human Resources Involved in R&D (F.2.2)

- Number of R&D Personnel (Head count per million inhabitants)
- Number of Researchers (Head count per million inhabitants)

2.2.1. Number of researchers

Noting that no data was available on R&D personnel other than researchers, Figure 3 illustrates that the number of researchers varies significantly across AMS, with Singapore having by far the highest density of researchers in 2021.¹⁴ The number of researchers was typically growing over the 2016-2022 period in Indonesia, the Philippines, Thailand and Viet Nam, especially before the COVID-19 pandemic.

Figure 3: Researchers per million inhabitants (FTE), AMS*, 2016-2022 (or latest year)



Source: UIS, Researchers per million inhabitants (FTE) (as at February 2025); Survey Results of the 2019-2020 R&D Expenditures and Human Resources, Department of Science and Technology, Republic of the Philippines. *Note no data was available for Lao PDR or Cambodia for the 2016-2022 period.

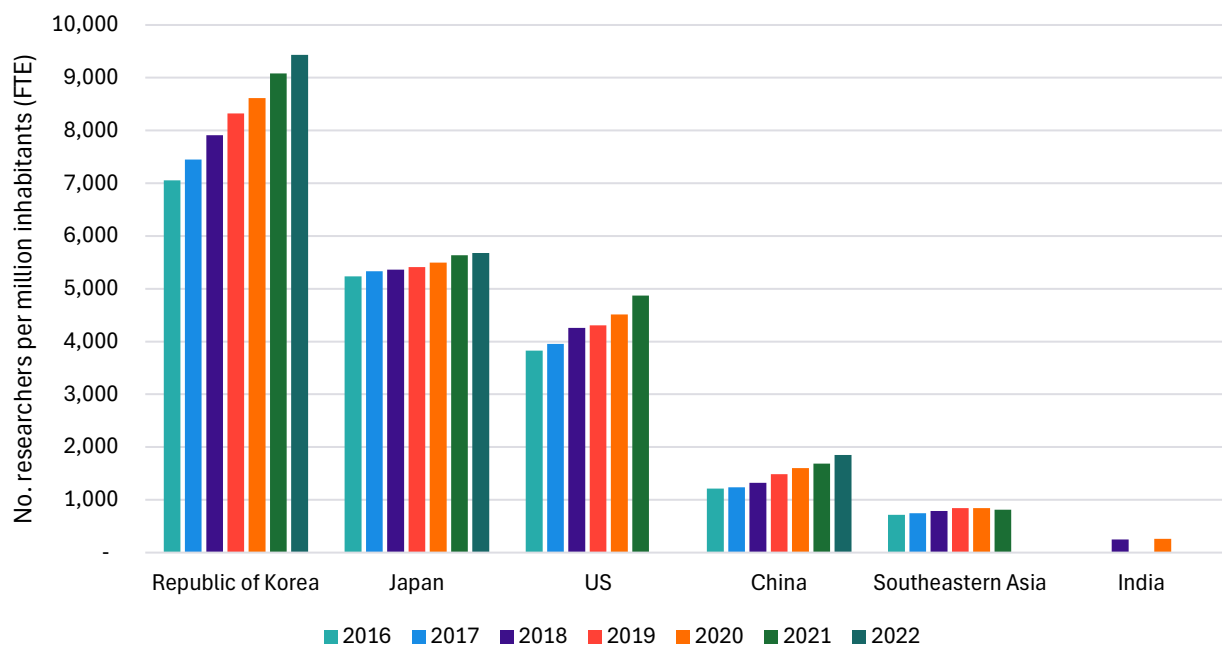
¹⁴ UIS, Researchers per million inhabitants (FTE). UIS Data Browser.

When comparing across AMS, there appears to be a strong correlation between AMS R&D expenditure and the density of researchers in the population. Moreover, when comparing the ranking of AMS across the percentage of GERD of GDP and the number of researchers per million inhabitants, the ranking of AMS is near identical.

While individual AMS may have had variability in growth of researchers across the period, Southeast Asia as a region (AMS plus Timor-Leste) grew consistently across the period, except in 2021, in alignment with AMS Dialogue Partners and at a faster rate (3.4% p.a.), on average, than Japan (1.3% p.a.).

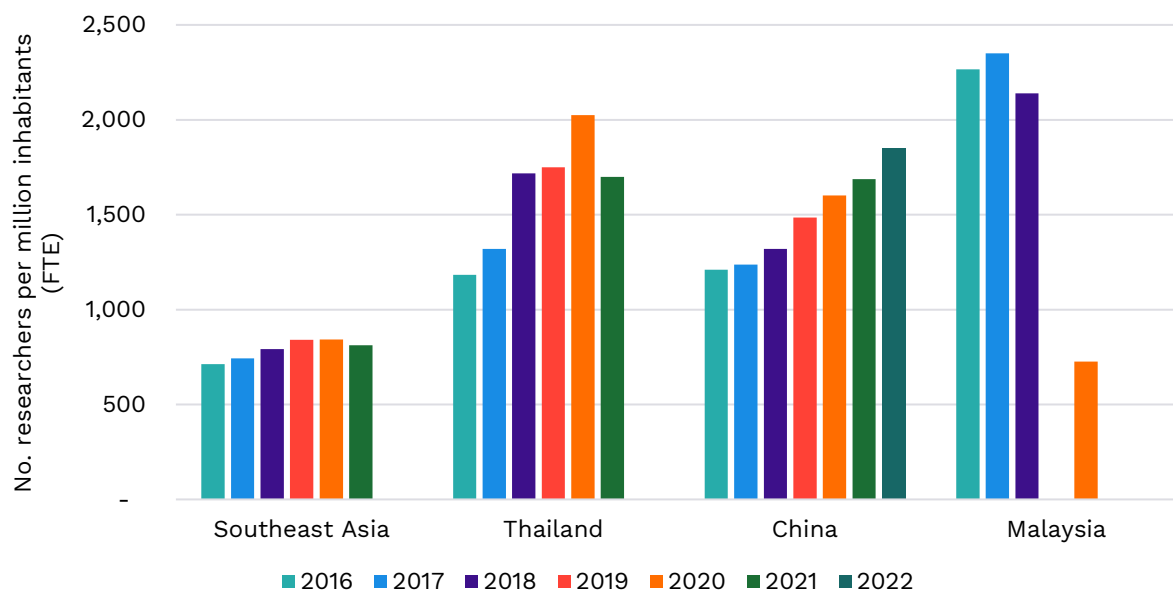
When comparing Southeast Asia to selected AMS Dialogue Partners (as shown in Figure 4), Southeast Asia typically has a lower proportion of researchers per million inhabitants. However, it is notable that Singapore has a higher density of researchers than China, Japan and the US, and is closely approaching equal to the Republic of Korea. As highlighted in Figure 5, Thailand and Malaysia also have a higher researcher density than Southeast Asia as a whole and sit on par or above China.

Figure 4: Researchers per million inhabitants (FTE), Southeastern Asia* and selected AMS Dialogue Partners, 2016-2022 (or latest year)



Source: UIS, Researchers per million inhabitants (FTE) (as at February 2025).
 *Southeast Asia data includes 10 AMS and Timor-Leste.

Figure 5: Researchers per million inhabitants (FTE), Southeastern Asia*, Thailand, Malaysia and China, 2022 (or latest year)



Source: UIS, Researchers per million inhabitants (FTE) (as at February 2025).

*Southeast Asia data includes 10 AMS and Timor-Leste.

2.3. COVID-19 pandemic has caused disruptions to STI outputs

Key Findings:

- On average between 2016-2023, patent applications across AMS increased by 3% per year.
- The COVID-19 pandemic had a significant impact on STI output across ASEAN, with all AMS except Viet Nam seeing a decrease in patent applications in 2020. At an ASEAN-wide level, the number of patent applications has returned to a level similar to pre-pandemic (i.e. 2019) levels.
- The number of patents granted generally grew across all technology areas between 2016-2023.
- Brunei Darussalam, Cambodia and Lao PDR, which had the lowest number of patents granted among AMS (for which data is available), nevertheless each saw significant increases in the number of patents granted between 2016-2023, indicating an upward trend.
- The greatest number of patents granted in AMS related to digital communication and computer technology.
- AMS-authored citable documents increased by 137% from 2016 to 2023 – a greater relative increase than seen by several selected Dialogue Partners.

In line with the APAST 2016-2025 Implementation Plan, this section focusses on how STI output in terms of patents and publications has progressed over the period.

The Implementation Plan includes the following Outcome Indicators:

Science and Technology (S&T) Output (F.2.3) ¹⁵

- Number of Patent Applications in one year
- Number of Patents Granted in one year
- Number of Scientific and Technical Publications

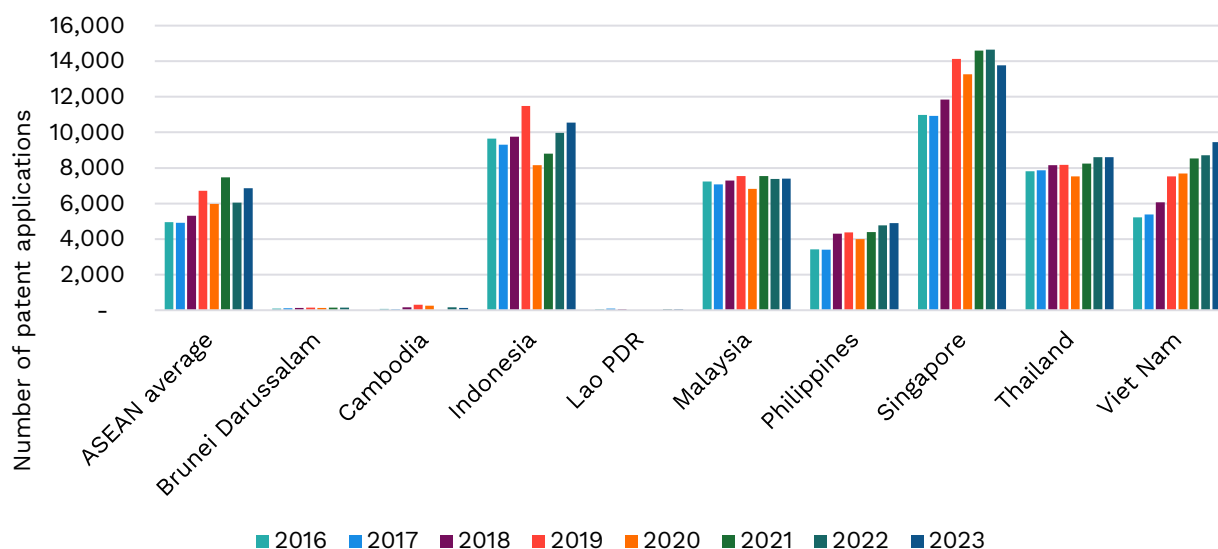
2.3.1. Number of patent applications

A growing number of patent applications in an economy signifies a strengthening culture of innovation, ideas and commercialisation of technological output.

- On average across the 2016-2023 period, patent applications across AMS increased by 3% per year, peaking at over 54,800 applications in 2023 (the last available year of data).¹⁶
- While almost all AMS had more patent applications in 2023 than they did in 2016 (except Malaysia), Figure 6 shows that Viet Nam experienced the most sustained level of growth across the period.
- Singapore had the highest number of patent applications in every year across the period, making up 26% of total AMS applications, followed by Indonesia (24% of the total).
- Lao PDR had the lowest number of patent applications, however had higher average annual growth in patent applications than Indonesia and Thailand, which may indicate further capacity to grow post-2023.

The COVID-19 pandemic had a significant impact on science and technology output across all AMS. As shown in Figure 6, patent applications typically saw annual growth prior to the COVID-19 pandemic; however, all AMS (except Viet Nam) saw decreases in patent applications in 2020.

Figure 6: Number of patent applications in national patent offices of AMS*, 2016-2023 (or latest year)



Source: WIPO Statistics Data Center, Total patent applications (direct and PCT national phase entries) (as of February 2025). *Note no data was available for Myanmar.

¹⁵ For consistency, the term STI is used in preference to S&T throughout this document, except when directly referencing documents where S&T is used.

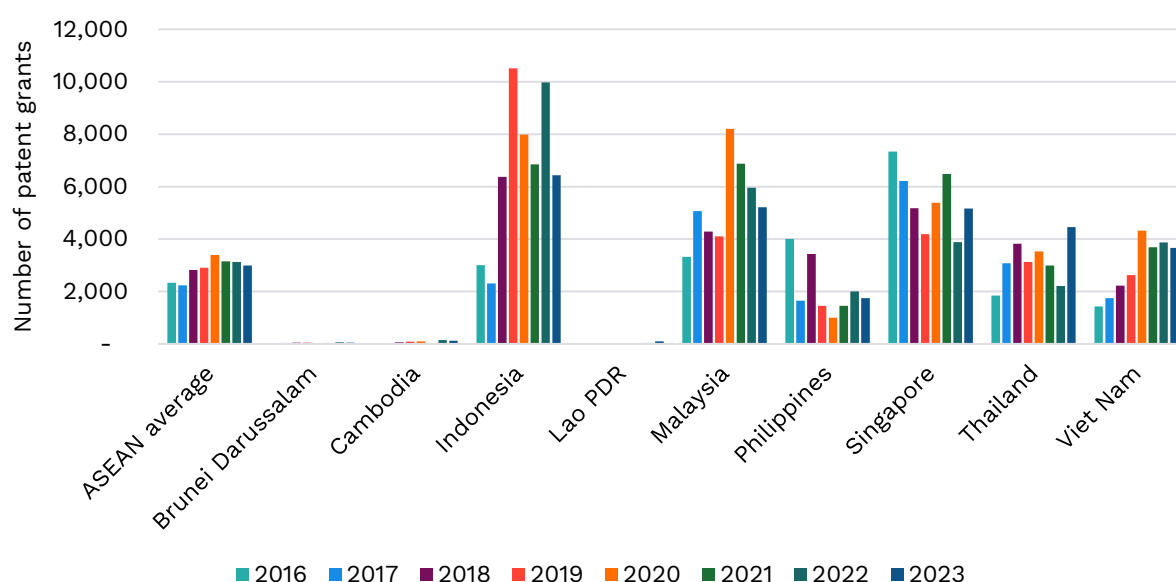
¹⁶ WIPO IP Statistics Data Center, Total patent applications (direct and PCT national phase entries).

2.3.2. Number of patents granted

The number of patents granted varies significantly across AMS.

- While Singapore had the highest average number of patent applications per year, Indonesia had the highest average number of patents granted per year over the 2016–2023 period, making up 24% of total AMS grants, on average, across the period (Figure 7).¹⁷
- Viet Nam had the most sustained levels of annual growth in patent grants, in line with trends for patent applications.
- Overall, AMS generally saw annual growth in patent publications across all technology types, but with decreases in 2022 and 2023, likely reflecting a lag in applications during the COVID-19 pandemic.
- Brunei Darussalam, Cambodia and Lao PDR each had significant increases in patents granted between 2016 and 2023. Lao PDR saw the most significant increase from just two patents granted in 2016 to 97 in 2023.¹⁸

Figure 7: Number of patent grants in national patent offices of AMS*, 2016–2023 (or latest year)



Source: WIPO Statistics Data Center, Total patent grants (direct and PCT national phase entries) (as at February 2025).
 *Note no data was available for Myanmar.

2.3.3. Scientific and technical publications and citations

The number of scientific and technical publications¹⁹ and citations serves as an important indicator of progress in research and innovation. The number of scientific and technical publications can be demonstrative of the productivity of the research community and the commitment of AMS to advancing STI.

Conversely, the number of citations serves as a measure of the impact and relevance of these publications within the scientific community. High citation counts suggest that the research is being recognised and utilised by other scholars, reflecting its influence on subsequent studies and advancements in the field.

¹⁷ WIPO IP Statistics Data Center, Total patent grants (direct and PCT national phase entries).

¹⁸ WIPO IP Statistics Data Center, Total patent grants (direct and PCT national phase entries).

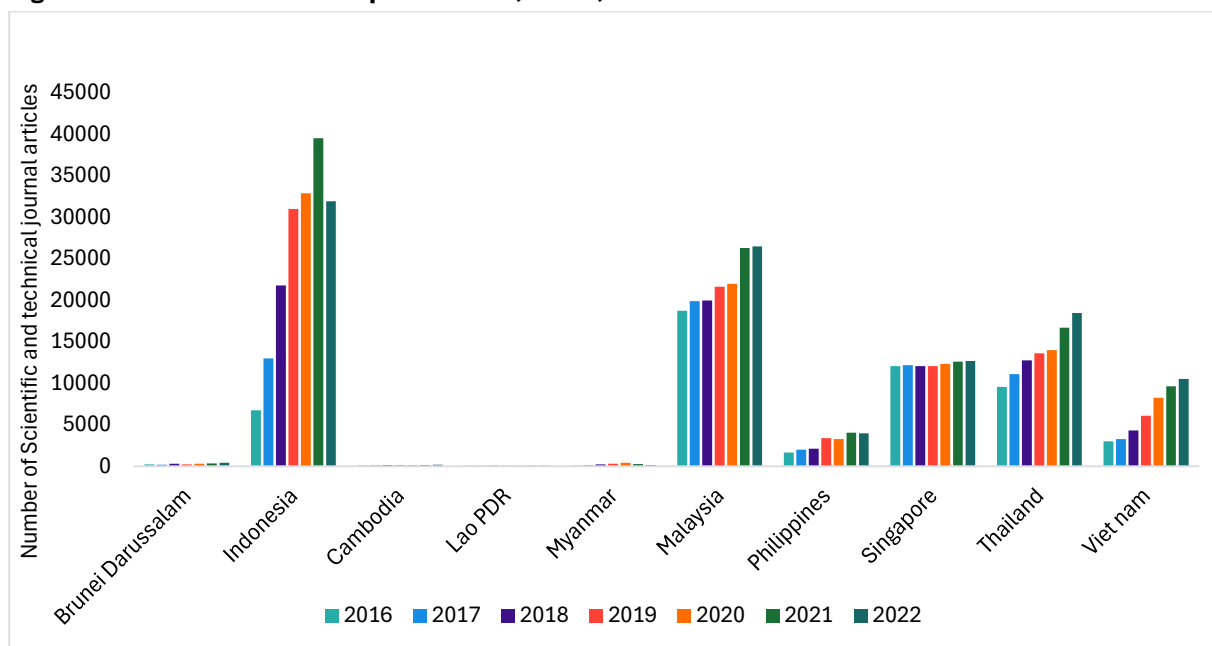
¹⁹ Scientific and technical publications refer to journal articles by authors from different countries.

Together, these metrics help to form a picture of R&D effectiveness, illustrating both the output of research activities and the significance of these contributions to the broader scientific discourse.

In the 2016-2022 period, authors from Indonesia and Malaysia published more scientific and technical articles than all other AMS, with Indonesia seeing 37% average annual growth in scientific publications per year.²⁰ Both produced over 21,000 publications per year, as shown in Figure 8.²¹

In contrast, and despite strong performance in other APASTI outcome measures in this section, Singapore produced an average of 12,200 publications per year and had the lowest average growth rate in publications at 1%.²² Cambodia and Lao PDR authors produced the lowest number of publications across the period.

Figure 8: Number of scientific publications, AMS*, 2016-2022



Source: World Bank Group DataBank, Scientific and technical journals (as at February 2025)

Similarly, as shown in Figure 9, Indonesia and Malaysia outperformed all other AMS in terms of the number of citable documents. Citations from Indonesia-authored documents more than tripled over the 2016-2022 period while Viet Nam-authored documents more than doubled.

Singapore, followed by Malaysia, had the highest aggregate H-Index²³ in 2023. Indonesia, Viet Nam and the Philippines all had similar H-Index scores while Myanmar, Cambodia and Lao PDR had the smallest. When considering the number of citations and H-Index together, Malaysia performs the strongest, indicating its strength in both STI output as well as impact at an ASEAN level.

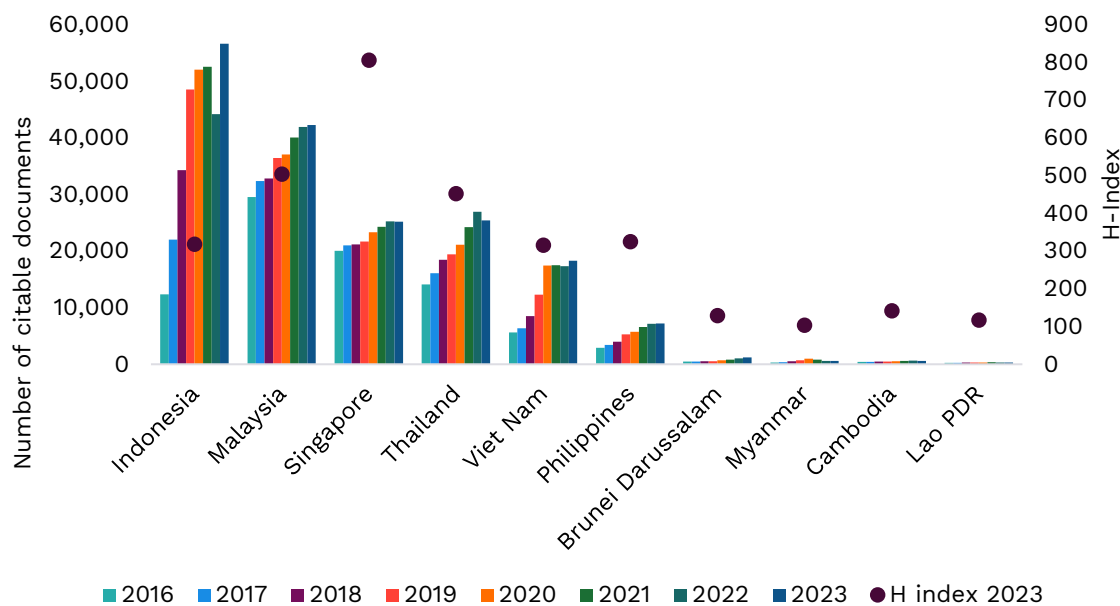
Figure 9: Number of citable documents and H-Index, AMS, 2016-2023

²⁰ World Bank Group, DataBank – Scientific and technical journal articles. *Scientific and technical journal articles | Data*.

²¹ World Bank Group, DataBank – Scientific and technical journal articles.

²² World Bank Group, DataBank – Scientific and technical journal articles.

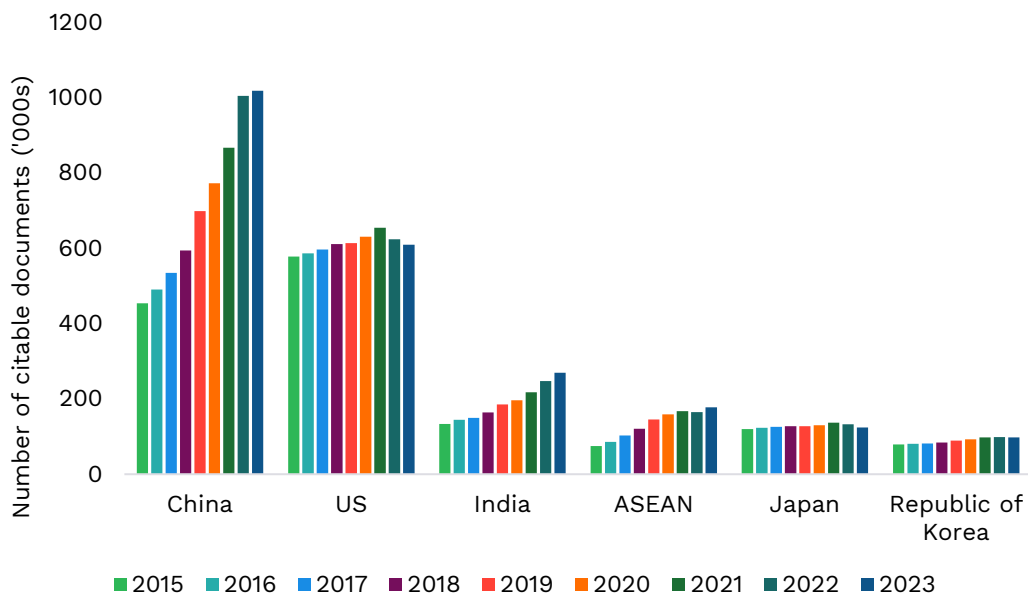
²³ The H-Index, or Hirsch index, is an author-level metric that expresses the number of publications (h) that have had at least h citations (i.e. the number of citations equal to the number of that author's publications). For example, an author who has published six articles, each of which have six or more citations, has an H-Index of 6. However, an author who has published six articles, of which only three have had three or more citations, has an H-index of 3. The H-Index is used as a measurement of research impact.



Source: SCImago Journal & Country Rank, Country rankings (as at March 2025)

Across ASEAN, AMS-authored citable documents increased by 137% from 2016 to 2023 – a greater relative increase than seen by several selected Dialogue Partners. AMS-authored documents are consistently more cited than those authored in the Republic of Korea and Japan (post-2019) as shown in Figure 10.²⁴

Figure 10: Number of citable documents (thousand), ASEAN and selected Dialogue Partners, 2016-2023



Source: SCImago Journal & Country Rank, Country rankings (as at March 2025)

²⁴ SCImago Journal & Country Rank, Country Rankings. *SJR - International Science Ranking*. 2025.

2.4. Talent mobility

Key Findings:

- In general, it appears that AMS are promoting talent mobility through programs and the encouragement of inward and outward research opportunities.
- Memoranda of Understanding and similar agreements exist in Indonesia, Malaysia, the Philippines, Thailand and Viet Nam to facilitate the exchange of students internationally.

By promoting talent mobility²⁵, the APASTI 2016-2025 seeks to foster greater connectivity among researchers and institutions, facilitate knowledge sharing, and build a more integrated workforce capable of addressing regional challenges in science and technology.

Talent mobility is central to the APASTI 2016-2025 goals and to Thrust 2, making the measurement of outcomes related to talent mobility important to monitor. The APASTI 2016-2025 Implementation Plan includes the following Outcome Indicators:

Talent Mobility (F.2.4)

- Exchange programs, scholarships, internships established
- Number of foreign researchers (inward mobility)
- Number of local researchers leaving (outward mobility)

As no data was available on the number of inbound foreign researchers or outbound local researchers among AMS, the below provides an assessment of progress regarding the number of exchange programs, scholarships and internships established.

2.4.1. Exchange programs, scholarships, internships established

Exchange programs, scholarships and internships established are difficult to track on an AMS basis, with evidence of performance against this metric examined in this section from a qualitative perspective only.

Memoranda of Understanding and similar agreements exist in Indonesia, Malaysia, the Philippines, Thailand and Viet Nam to facilitate the exchange of students internationally. Additional qualitative evidence across select AMS has been collected to further understand how mobility outcomes like exchange programs, scholarships and internships are progressing across AMS.

In general, it appears that AMS are promoting talent mobility through programs and the encouragement of inward and outward research opportunities.

²⁵ Talent mobility refers to the movement and exchange of skilled individuals, including scientists, researchers, and students, across AMS. Ultimately, talent mobility is intended to strengthen the overall capacity for innovation and collaboration within ASEAN, contributing to the development of a skilled workforce that can drive economic growth and sustainable development.

- **Cambodia, Lao PDR, Myanmar and Viet Nam:** The German Academic Exchange Service offers a range of scholarship and study abroad programs for STEM doctoral candidates from ASEAN countries;²⁶
- **Indonesia:** The Ministry of Education, Culture, Research and Technology has established a Global Internship Program to fund internships for Indonesian students at top companies and organisations overseas;²⁷
- **Philippines:** The DOST has programs supporting international talent mobility such as scholarships and training programs for certain ASEAN researchers.²⁸ The DOST also collaborates with other national organisations like the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD) to offer scholarships for Filipino researchers and graduate students. Additionally, the Philippine Austrian Cultural and Educational Society is a joint initiative between the Philippines and Austria that aims to provide students in STEM degrees with scholarship and study abroad opportunities in both the Philippines and Austria;²⁹
- **Singapore:** The Ministry of Education has introduced a new engineering and technology program to provide 200 pre-university students with scholarship and training opportunities as part of their STEM talent pipeline;³⁰ and
- **Australia:** Australia and ASEAN established a Comprehensive Strategic Partnership (CSP) to enhance cooperation on pressing regional challenges. The Aus4ASEAN Scholarships program offers 100 scholarships for ASEAN leaders to pursue master's degrees in key areas related to the ASEAN Outlook on the Indo-Pacific. The Aus4ASEAN Digital Transformation and Future Skills Initiative supports vocational training for 350 scholars. Additionally, under the Aus4ASEAN Futures Initiative, jointly agreed projects are underway to support ASEAN priorities.³¹

²⁶ German Academic Exchange Service. *DAAD Scholarships for Cambodia, Laos, Myanmar and Vietnam*. 2025.

<https://www.daad-vietnam.vn/en/find-funding/daad-scholarships-for-cambodia-laos-myanmar-and-vietnam/>

²⁷ Indonesian Ministry of Education, Culture, Research and technology. *Indonesian Global Internship Program*. 2025.

<https://partnership.kemdikbud.go.id/scholarship/read/indonesian-global-internship-program>

²⁸ Republic of the Philippines, Department of Science and Technology. <https://dost.gov.ph>

²⁹ Philippine Austrian Cultural and Educational Society. *The PACES STEM Scholarships*. 2025. <https://www.paces-stem.org/stems70-scholarship-program/>

³⁰ Philippines Ministry of Education. *New Engineering and Tech Programme Scholarship to prepare Pre-University Students for Careers in STEM*. 2022. <https://www.moe.gov.sg/news/press-releases/20220511-new-engineering-and-tech-programme-scholarship-to-prepare-pre-university-students-for-careers-in-stem>

³¹ The ASEAN-Australia Comprehensive Strategic Partnership - a year of progress. https://asean.mission.gov.au/aesn/CSP_02.html

2.5. Knowledge impact and diffusion

Key Findings:

- Over the 2016-2022 period, an average of 35% of manufacturing value-add across ASEAN was from medium and high-technology value add; however, there was significant variation between AMS, with AMS essentially falling into three distinct ‘tiers’ of 0-5% (3 AMS), 25-45% (5 AMS) and 70-90% (2 AMS) medium to high-technology value add.
- Between 2016-2022 most AMS saw consistent growth in the share of medium and high-technology manufacturing exports, which contrasts with Japan, the Republic of Korea and the US, which each saw consistent and overall declines across the period. This may reflect that AMS are experiencing technological growth experienced by these selected Dialogue Partners previously.

Knowledge impact (or deployment) and diffusion, in the context of the APASTI 2016-2025 Implementation Plan refers to technological and commercial outputs of STI activities in AMS.

The APASTI 2016-2025 Implementation Plan includes the following Outcome Indicators:

Knowledge Impact (F.2.5)

- High-tech and medium-tech output (% service exports)
- Number of commercial spin-offs

Knowledge Diffusion (F.2.6)

- Total royalties and licence fees receipts (% service exports)
- High-tech exports (in USD)
- Communications, computer and information services exports (in USD)

While not clearly linked in the Implementation Plan, these Outcome Indicators are aligned to aspects of Thrust 1 (technology transfer and commercialisation) and Thrust 3 (STI applications to raise competitiveness).

The following section reviews the progress of knowledge impact and diffusion among AMS in terms of value and relative magnitude of technological output and exports. Other Outcome Indicators from the APASTI 2016-2025 Implementation Plan, like the number of commercial spin-offs and total royalties and license fees, have not been included due to lack of data sets available and data gaps for the 2016-2025 period.³²

2.5.1. Medium and high-tech output

The share of medium and high-technology manufacturing in total manufacturing value added is a measure of the technological sophistication of the manufacturing in a country. Over the 2016-2022 period, an average of 35% of

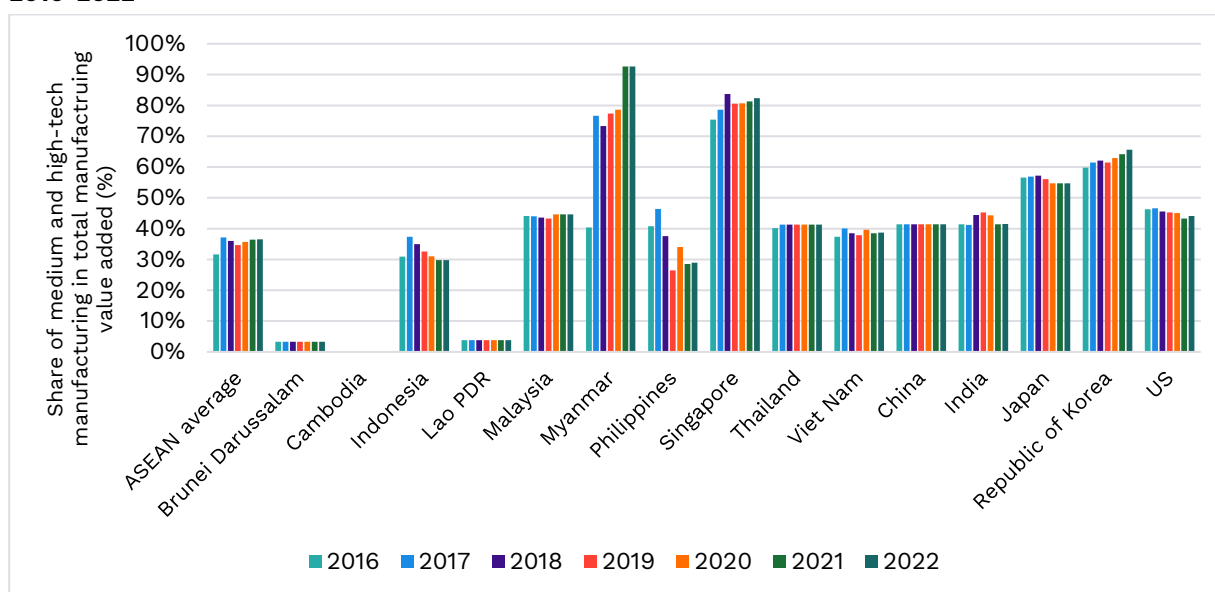
³² Commercial spin-offs through partnership with the private sector featured in the thrusts of the 2001-2004 and 2007-2011 APASTI but are not specifically defined or highlighted in the 2016-2025 APASTI. There are not data sets available to assess this outcome indicator. Data for royalties and license fees receipts only exists for 2015 therefore does not allow for review.

AMS manufacturing value-add was from medium and high-technology value add; however, there is significant variation between AMS.³³

- Myanmar and Singapore had averages of 69% and 80%, respectively, of manufacturing value add from medium and high-technology manufacturing, which was significantly higher than all other AMS and higher than selected Dialogue Partners, as shown in Figure 11.³⁴
- Malaysia also had a higher share on average over the period than China and India.
- Brunei Darussalam, Cambodia, Lao PDR all had shares less than 4% of total manufacturing made up of medium and high-technology manufacturing.³⁵
- The Philippines also saw a significant decrease of 29% between 2016 and 2022 in the medium and high-technology manufacturing share of total manufacturing value add.³⁶

This variation reflects different levels of economic and industrial development between AMS. It may be more meaningful to measure technological/ manufacturing output between AMS at similar levels of industrial development, or to compare AMS relative to the annual changes in medium to high-technology manufacturing value add instead.

Figure 11: Medium and high-tech manufacturing value-added shares, AMS and selected Dialogue Partners, 2016-2022



Source: World Bank Group, DataBank – Medium and high-tech manufacturing value add (% of manufacturing value added) (as at March 2025)

In the above data, AMS fall into three distinct ‘tiers’:

- 0-5% medium to high-technology value add: Brunei Darussalam, Cambodia, Lao PDR;

³³ World Bank Group, DataBank – Medium and high-tech manufacturing value add (% of manufacturing value added): [World Development Indicators | DataBank](#). Medium and high-tech manufacturing industries include chemicals (excl. pharmaceuticals, machinery and equipment, electrical machinery and apparatus, radio, TV, and communications equipment, motor vehicles and other vehicles).

³⁴ World Bank Group, DataBank – Medium and high-tech manufacturing value add (% of manufacturing value added).

³⁵ World Bank Group, DataBank – Medium and high-tech manufacturing value add (% of manufacturing value added).

³⁶ World Bank Group, DataBank – Medium and high-tech manufacturing value add (% of manufacturing value added).

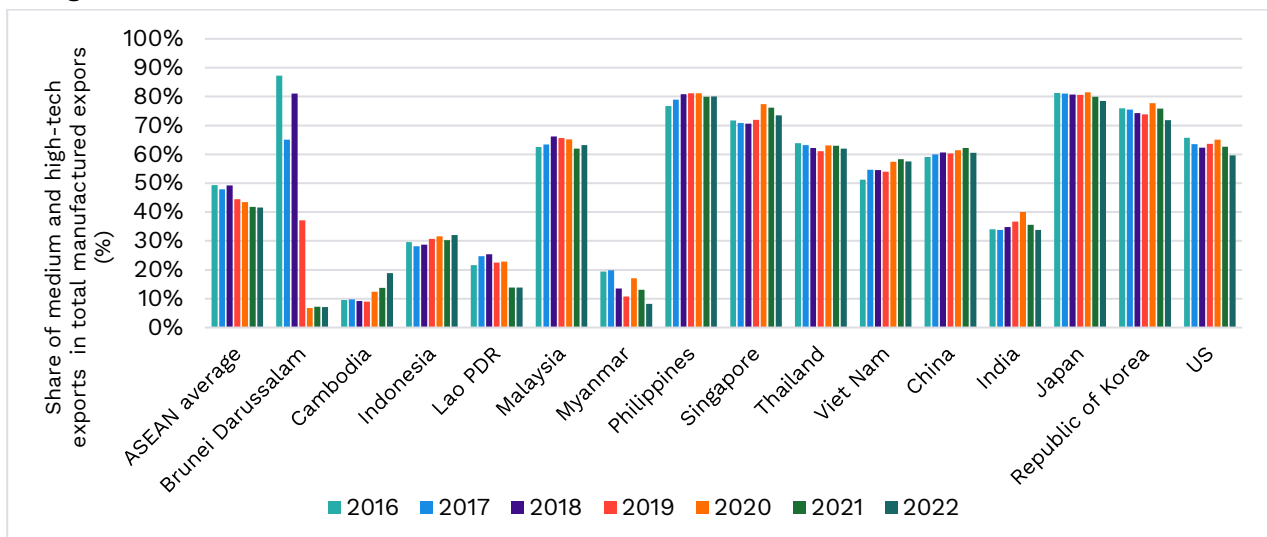
- 25-45% medium to high-technology value add: Indonesia, Malaysia, Philippines, Thailand, Viet Nam; and
- 70-90% medium to high-technology value add: Myanmar, Singapore.

Measures of goods and services exports can also provide insight as to the relative impact and diffusion of knowledge outputs of different AMS and the ASEAN region as a whole.

Figure 12 shows how AMS compare with select Dialogue Partners in the share of medium and high-technology exports of total manufactured exports.

- On average across the 2016-2022 period, 46% of AMS manufacturing exports were medium and high-technology manufacturing exports. This was higher than in India but lower than other selected Dialogue Partners.³⁷
- Across the period, most AMS saw consistent growth in the share of medium and high-technology manufacturing exports, which contrasts with Japan, the Republic of Korea and the US, which each saw consistent and overall declines across the period. This may reflect the lag between economies in terms of industrialisation and globalisation processes, where economies such as the US and Japan have previously seen higher rates of growth in these exports and AMS economies (outside of Singapore) are experiencing this growth now.
- When considering individual AMS, the Philippines had the highest average share of its manufacturing exports as medium and high-technology exports at 79%, which was higher than all Dialogue Partners except Japan.³⁸ Cambodia had the lowest average share at 11%, however, saw the highest average annual change per year at 12% when compared with all other AMS and Dialogue Partners.³⁹

Figure 12: Medium and high-technology exports (percentage of manufactured exports), AMS and selected Dialogue Partners, 2016-2022



³⁷ World Bank Group, *DataBank – Medium and high-tech manufacturing exports (% of manufactured exports)*: [World Development Indicators | DataBank](#). Medium and high-tech manufacturing industries include chemicals (excl. pharmaceuticals, machinery and equipment, electrical machinery and apparatus, radio, TV, and communications equipment, motor vehicles and other vehicles).

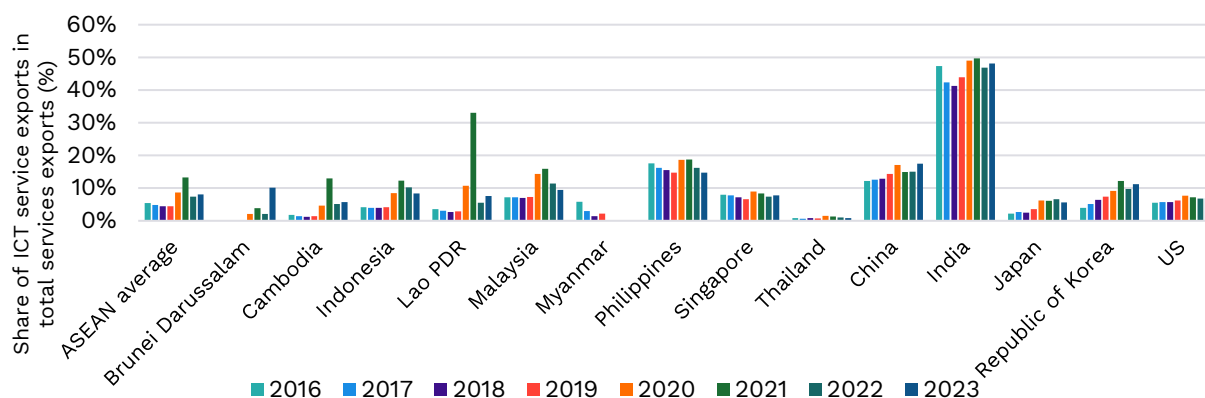
³⁸ World Bank Group, *DataBank – Medium and high-tech manufacturing exports (% of manufactured exports)*.

³⁹ World Bank Group, *DataBank – Medium and high-tech manufacturing exports (% of manufactured exports)*.

Knowledge diffusion by AMS may also be reflected in the export of services related, namely communications, computer and information services exports.

- On average across the 2016-2023 period, 7% of total service exports from AMS were information and communications technology (ICT) exports.⁴⁰
- The Philippines had the highest share of ICT services exports of total exports across AMS at an average of 16% during the 2016-2023 period.⁴¹ As shown in Figure 13, this was higher than selected Dialogue Partners except India.
- Most AMS saw a large spike in ICT service exports as a share of total service exports during the COVID-19 pandemic years (2020 and 2021). Dialogue Partners did not see a comparable increase during these years. However, this is likely due to the negative impact of COVID-19 on other sectors in AMS, such as tourism, resulting in a temporary increase in the share of ICT services as a share of total service exports.

Figure 13: ICT services exports (percentage of services exports), AMS* and selected Dialogue Partners, 2016-2023



Source: World Bank Group, DataBank – ICT service exports (% of service exports, Balance of Payments) (as at March 2025). *Viet Nam does not have data for this metric and Myanmar has data to 2019 only.

2.6. STI culture

Key Findings:

- While there is no central or comprehensive data on STI fairs, evidence from AMS show that both the government and private sector are actively promoting STI culture.
- On average, 28% of tertiary graduates in the ASEAN region were in STEM disciplines, with less variability across AMS than seen in other measures, indicating a relatively stable pipeline of STEM talent.

The goals of the APASTI 2016-2025 included promoting a deep awareness of STI and an innovation-driven economy with deep STI enculturation. Key Outcome Indicators regarding STI Culture are:

⁴⁰ World Bank Group, DataBank – ICT service exports (% of service exports, Balance of Payments): World Development Indicators | DataBank.

⁴¹ World Bank Group, DataBank – ICT service exports (% of service exports, Balance of Payments), 2025.

STI Culture (F.2.7)

- Number of STI fairs
- Rate of technology diffusion
- Percentage of individuals interested in S&T careers in population
- Percentage of scientists, engineers and researchers in population

2.6.1. Number of STI fairs

The presence and volume of STI fairs (e.g. conferences, festivals, showcases etc.) provides an indication of how STI is being promoted in the professional culture of an economy. While no central data or information repository exists for STI fairs, various evidence from AMS show that both the government and private sector are actively promoting STI culture.

- **Brunei Darussalam:** In 2025, Brunei Darussalam will be hosting an international conference on Science, Technology and Management;⁴²
- **Cambodia:** Hosted by the STEM Organisation for Education, the annual Cambodian STEM Festival showcases the largest student exhibition in STEM, offering a platform for students to display their innovations;⁴³
- **Indonesia:** STEMCON Indonesia is an annual science and technology conference that brings together policymakers, corporate leaders and universities to develop innovative approaches to build the STEM space across ASEAN partners;⁴⁴
- **Malaysia:** The Malaysia Technology Expo is an annual event that brings together industry experts to showcase the latest technological advancements in the country;⁴⁵
- **Philippines:** The National Science and Technology Week highlights the essential role of science and technology in national development. It promotes science and technology advocacy through various fields such as applied research and technology transfer, and is complemented by Regional Science and Technology Week events nationwide;⁴⁶ and
- **Singapore:** The Singapore Science and Engineering Fair is a national fair organised by the Ministry of Education in tandem with various Singaporean science-based organisations.⁴⁷

Relevant information could not be found for remaining AMS.

2.6.2. Percentage of individual interested in STI careers in population

Individual interest in STI careers in a population is not a readily measurable indicator. A related metric to understand this aspect of STI culture in AMS is the share of tertiary graduates from science, technology, engineering and mathematics (STEM) programmes. It should be noted, however, that this metric

⁴² International Academy of Science, Technology, engineering and management, *Conference in Bandar Seri Begawan, Brunei Darussalam Apr 2025: IASTEM » IASTEM International Conference 2025 - 2026*.

⁴³ STEM Organisation for Cambodia, *Events: Events – STEM Education Organisation for Cambodia*

⁴⁴ STEM Indonesia, *STEMCON Indonesia 2024. STEMCON Indonesia 2024 Official Website*

⁴⁵ Malaysia Technology Expo. *Malaysia Technology Expo*.

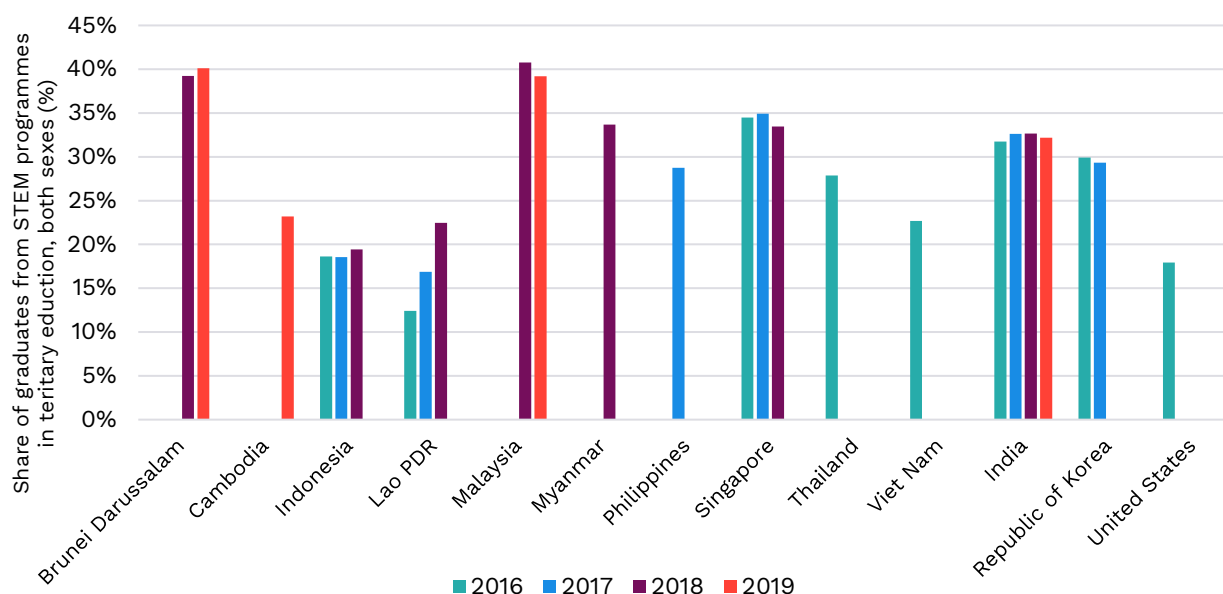
⁴⁶ Department of Science and Technology: National Science and Technology Week. *National Science, Technology, and Innovation Week*.

⁴⁷ Science Centre Singapore, *Singapore Science and Engineering Fair. Singapore Science Competition | Singapore Science and Engineering Fair | Science Centre Singapore*.

has significant data gaps that reduce its effectiveness as a measure over changing interest in STI careers over time.

As shown in Figure 14, there is less variability in the proportion of STEM graduates across AMS when compared with other STI outcome indicators discussed. On average across AMS, 28% of tertiary graduates were from the STEM disciplines.⁴⁸ This is higher than the United States’ average of 18%.⁴⁹ Brunei Darussalam and Malaysia both had the largest proportion of STEM graduates, on average, at 37% and 40%, respectively.⁵⁰

Figure 14: Share of STEM graduates in tertiary education, 2016-2019 (or latest year)



Source: World Bank Group, DataBank – Education Statistics (as at February 2025)

The percentage of scientists, engineers and researchers in the population is also an indicator of STI culture embedded in the labour markets of AMS. While there are data gaps for this outcome indicator specifically, the number of researchers in the population in section 2.2.1 provides the closest understanding for this indicator. There is no available data to measure the diffusion of technology in AMS.

2.7. Most AMS have improved their rankings in the Global Innovation Index

Key Finding:

Most AMS have improved their rankings in the GII in the period 2016-2024, indicating general progress in STI across ASEAN.

While the GII⁵¹ is not explicitly referenced as an Outcome Indicator in the APASTI 2016-2025, it provides a useful indicator of the general progress of AMS

⁴⁸ World Bank Group, DataBank – Education Statistics. *Education Statistics – All Indicators | Data Bank, 2025*

⁴⁹ World Bank Group, DataBank – Education Statistics. *Education Statistics – All Indicators | Data Bank, 2025*.

⁵⁰ World Bank Group, DataBank – Education Statistics. *Education Statistics – All Indicators | Data Bank, 2025*.

⁵¹ The GII is an annual index published by the World Intellectual Property Organization (WIPO), which ranks the innovation performance of approximately 130 economies around the world. The GII comprises approximately 80 indicators of innovation, including metrics relating to policy, education, infrastructure and knowledge creation.

in relation to innovation (as shown in .Table 1 below). The GII rankings of selected Dialogue Partners are also shown for comparison purposes.

Table 1: Global Innovation Index ranking of AMS and selected Dialogue Partners

AMS / Dialogue Partners	2016	2018	2020	2022	2024	Change 2016-2024
Brunei Darussalam	71	67	71	92	88	-17
Cambodia	95	98	110	98	103	-8
Indonesia	88	85	85	75	54	34
Lao PDR	N/A	N/A	113	112	111	N/A
Malaysia	35	35	33	36	33	2
Myanmar	N/A	N/A	129	116	125	N/A
Philippines	74	73	50	59	53	21
Singapore	6	5	8	7	4	2
Thailand	52	44	44	43	41	11
Viet Nam	59	45	42	48	44	15
AMS average change						8
Australia	19	20	23	25	23	-4
Canada	15	18	17	15	14	1
China	25	17	14	11	11	14
India	66	57	48	40	39	27
Japan	16	13	16	13	13	3
New Zealand	17	22	26	24	25	-8
Republic of Korea	11	12	10	6	6	5
Russian Federation	43	46	47	47	59	-16
United States	4	6	3	2	3	1
Selected Dialogue Partner average change						3

Legend

Top	10%
Top	11-50%
Bottom	10-49%
Bottom	10%

Source: WIP Global Innovation Index, 2016-2024

- In the period 2016-2024⁵², the rankings of AMS have increased on average by eight places.
- The most significant increases occurred in Indonesia, which increased by 34, and the Philippines, which increased by 21 places.
- The rankings of two AMS decreased over the period: Brunei Darussalam, which decreased by 17 places, and Cambodia, which decreased by eight.

⁵² 2024 being the most recent data available

- Singapore remains the top-ranked AMS at number 4 and is the only AMS in the top 10% of economies included in the GII.
- In 2016, five AMS were in the bottom 50%. However, Indonesia was the only AMS to move out of the bottom 50% across the 2016-2024 period – illustrating improvement over time.

3. Progress Against Strategic Thrusts

3. Progress Against Strategic Thrusts

In the APASTI 2016-2025 four Strategic Thrusts were defined as the key focus areas to achieve the plan's overarching vision and goals. These Strategic Thrusts are outlined in Figure 15.

Figure 15: Strategic Thrusts

1	Public-private Collaboration	Strengthen strategic collaboration among academia, research institutions, networks of centres of excellence, and the private sector to create an effective ecosystem for capability development, technology transfer and commercialisation.
2	Talent Mobility, People-to-People Connectivity, and Inclusiveness	Enhance mobility of scientists and researchers, people-to-people connectivity and strengthen engagement of women and youth in STI.
3	Enterprises Support	Establish innovative system and smart partnership with dialogue and other partners to nurture STI enterprises to support MSMEs, nurture knowledge creation and STI applications to raise competitiveness.
4	Public Awareness and STI Enculturation	Raise public awareness and strengthen STI enculturation to enhance ASEAN science and technology cooperation.

Each Strategic Thrust has a list of associated actions, outputs and key performance indicators (KPIs) – specifically the Output Indicators. These Output Indicators are outlined in section F.1. of the APASTI 2016-2025 Implementation Plan.

The approach to measuring progress within each Strategic Thrust entailed:

- Analysing approximately 90 Sub-Committee (SC) reports to review the status of activities mapped to APASTI 2016-2025 Strategic Thrusts. In particular, by analysing how many activities were reported by SCs, and of those activities, how many were indicated as completed, in progress, pending or withdrawn.
- Feedback ascertained from the MTR and ETR workshop on key achievements and challenges in relation to the Strategic Thrusts between 2016-2025 were then layered onto this analysis to provide a more holistic view of progress and areas for improvement.
- Within the SC reports, SC activities are not directly mapped to APASTI Actions and Strategic Thrusts. An analysis was undertaken to map the activity to the most relevant Action based on their description. It is noted that, in the absence of a clear framework linking SC activities to APASTI Actions and Thrusts, this analysis is inherently subjective.

It would be desirable to assess the progress of each Strategic Thrust through the assessment of associated Output Indicators. However, there were several challenges which prevented this, and which altered our approach including:

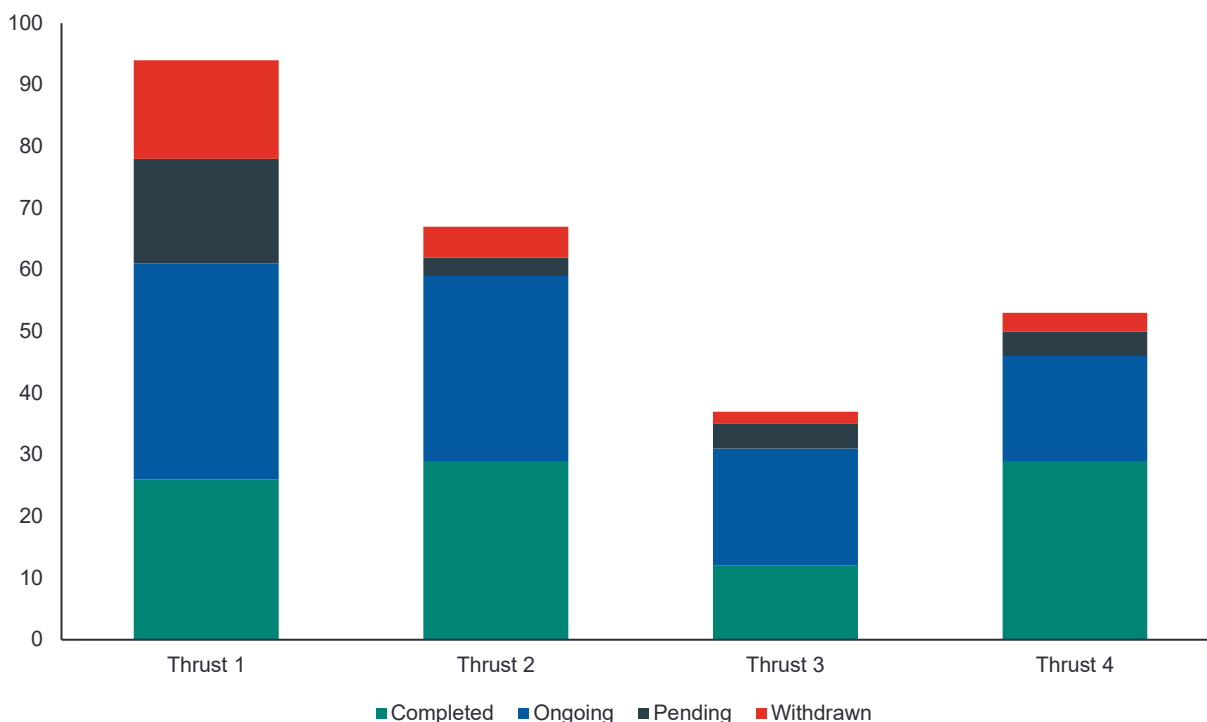
- Many Output Indicators are not supported by available data in many instances and have not been consistently tracked;

- Output Indicators lack measurable targets to be achieved; and
- Output Indicators defined in the Implementation Plan do not map directly to the range of activities undertaken by AMS and SCs.

3.1. Introduction

Based on analysis of SC activity between 2016-2025, the greatest activity level occurred in relation to Thrust 1 – Public-Private Collaboration, and Thrust 2 – Talent Mobility, People-to-People Connectivity, and Inclusiveness, as shown in Figure 16.

Figure 16: Overview of SC activities by Thrust



Feedback received in the ETR Workshop also indicated that Thrusts 1 and 2 were the most effective in advancing STI capabilities. Thrust 2 received a significantly stronger response, as shown in Appendix 2.

This largely implies that, the level of activity associated with each Strategic Thrust, has correlated with a level of impact across ASEAN. Further, there seems to be the greatest opportunity to increase the impact in relation to Thrust 3 (Enterprises Support) and Thrust 4 (Public Awareness / STI Enculturation) in future.

3.2. Thrust 1: Public-Private Collaboration

Key Findings:

- 94 activities were identified as relating to Thrust 1, of which 28% (26) have been completed and 37% (35) are in progress as of 2024. This was the highest number of activities among the four Thrusts.
- Engagement and collaboration with the private sector, academia, research institutions and networks of centers of excellence remains a key opportunity area to drive continued growth and impact.
- Enhanced visibility and use of ASTNET could improve data and information collection and management to enable a more cohesive and effective approach to monitoring and evaluation of the APASTI.

Thrust 1 of the APASTI 2016-2025 relates to strengthening strategic collaboration among academia, research institutions, networks of centres of excellence, and the private sector to create an effective ecosystem for capability development, technology transfer and commercialisation.

It has four related Actions as set out in Table 2.

Table 2: Thrust 1 Actions

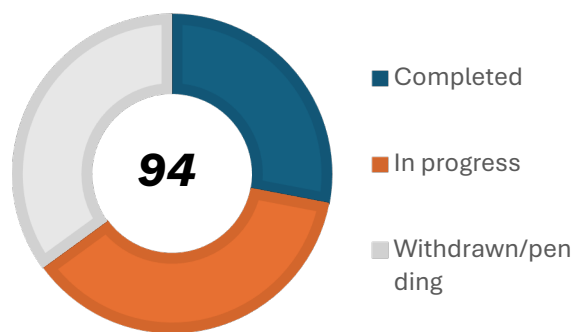
Action 1.1	Intensify the engagement of academe, private sector and relevant partners in the planning, implementation and assessment of joint undertakings in human resource development, and research and development.
Action 1.2	Enhance and sustain the utilisation of the ASEAN Science and Technology Network (ASTNET) and strengthen other Science and Technology (S&T) networks to facilitate information sharing.
Action 1.3	Establish policy frameworks including Intellectual Property Rights (IPR) protection, risk and benefit sharing mechanisms for joint collaboration and technology transfer among centers of excellence.
Action 1.4	Strengthen existing regional STI initiatives in priority areas including Sustainable Development Goals.

As noted above, three key findings were made in the assessment of these actions. However, in line with the focus on Sustainable Development Goals (SDGs) in Action 1.4, a review of the APASTI 2016-2025 was also completed. This review reveals strong alignment with the United Nations (UN) Sustainable Development Goals and Agenda 2030.

A relatively high number of activities are supporting Thrust 1, with the majority completed or in progress

Based on analysis of SC reports, 94 activities reported on by SCs were identified as relating to Thrust 1. This was the second-highest level of activity among the four Thrusts. As at 2024 28% (26) of these activities were recorded as completed (as seen in Figure 17).

Figure 17: Status of activities under Strategic Thrust 1



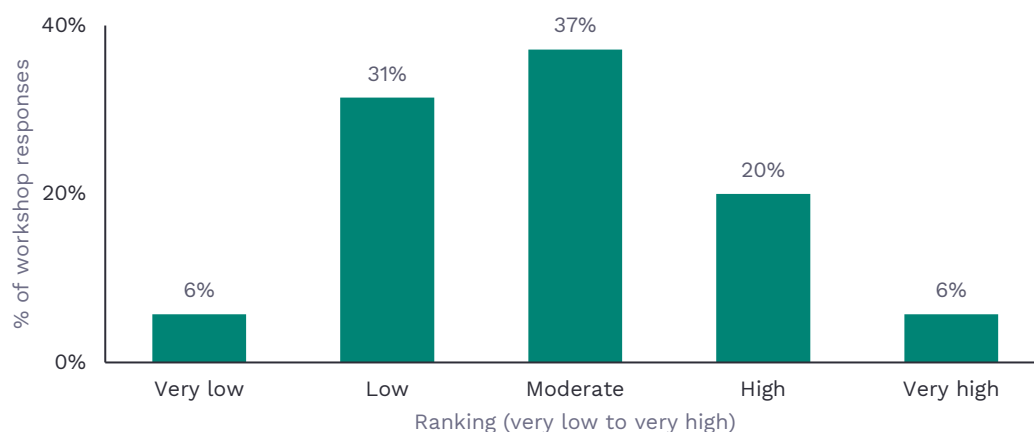
The highest number of progressed activities relate to Action 1.1 (intensify the engagement of academe, private sector and relevant partners), followed by Action 1.4 (strengthen existing regional STI initiatives in priority areas including Sustainable Development Goals) – these differences are illustrated in Appendix 3.

3.2.1. The APASTI is supporting regional collaboration between AMS, but engagement and collaboration with the private sector can be further strengthened

One of the key achievements of the APASTI 2016-2025 as highlighted by participants in the ETR Workshop was progress in using collaboration to uplift capacity and knowledge transfer between AMS, as illustrated in Appendix 2. Similarly, Action 1.1 (intensify the engagement of academe, private sector and relevant partners) saw the highest level of demonstrated activity among Thrust 1 Actions.

However, feedback received at the ETR Workshop suggested there remains room for improvement on collaboration with the private sector specifically, as seen in Figure 20.

Figure 20: Responses to ETR Workshop question – To what extent has the APASTI uplifted capacity building and knowledge transfer through collaboration with the private sector?



This indicates that further engagement and collaboration with the private sector remains a key opportunity area for the next APASTI. For example:

- Engagement and collaboration with the private sector could be further strengthened by fostering more structured partnerships and creating targeted initiatives that align with the needs of both industry and academia;

- Clear communication channels and frameworks that facilitate ongoing dialogue between stakeholders can ensure that private sector insights and expertise are integrated into the planning and implementation of APASTI initiatives;
- Developing mentorship and incentive programs specifically designed for private sector involvement can enhance collaboration, encouraging businesses to invest in research and development activities.

By promoting joint projects and initiatives that address real-world challenges, the new APASTI can leverage the agility and resources of the private sector to drive innovation and technology transfer, ultimately contributing to the region's economic growth and competitiveness.

3.2.2. Enhanced visibility and use of ASTNET can improve data and information collection and management

The ASEAN Science and Technology Network (ASTNET) is a platform designed to facilitate information sharing and collaboration in science and technology among AMS. It serves as a centralised repository for data related to scientific and technological activities, enabling researchers, institutions, and policymakers to access relevant information and resources.

Between 2016-2025 there were minimal recorded advancements in Action 1.2 (enhance and sustain the utilisation of ASTNET), suggesting that the utilisation of ASTNET and other STI networks within the ASEAN region was not prioritised. Efforts to drive greater visibility and awareness of ASTNET to increase its utilisation should be a continued focus. Moreover, the inputs into ASTNET should be outcome, rather than output focused. This will support better monitoring of activities undertaken by SCs and other ASEAN STI-related bodies such as COSTI, BAC and ASEC, and the impact that they make towards STI goals.

3.3. Thrust 2: Talent Mobility, People-to-People Connectivity and Inclusiveness

Key Findings:

- 67 activities were identified as relating to Thrust 2, of which 43% (29) have been completed and 45% (30) are in progress as at 2024. This was the second-highest number of activities among the four Thrusts, but on par with Thrust 1 in relation to activities completed or ongoing.
- If talent mobility remains a priority area for the next APASTI, the development of policy frameworks to facilitate the mobility of scientists, researchers and students in STI fields may require additional attention, to ensure effective implementation.
- A more robust and coordinated approach is necessary to ensure that gender equality, disability and social inclusion are prioritised as fundamental components of the APASTI and barriers to participation are reduced by using a dedicated and cross-cutting response within the APASTI.
- Greater socialisation and opportunities for youth within STI will support the development of an ongoing productive workforce and knowledgeable consumer base.

Thrust 2 relates to enhancing the mobility of scientists and researchers, people-to-people connectivity and strengthening the engagement of women and youth in STI. It has four related Actions as set out in *Table 3*.

Table 3: Thrust 2 Actions

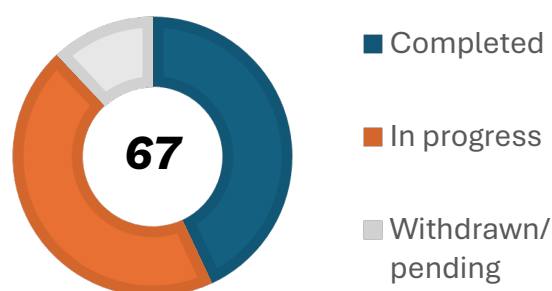
Action 2.1	Establish a policy framework for exchange of scientists, researchers and students including women and youth.
Action 2.2	Establish scholarship, fellowship and/or attachment programs for students, researchers and other STI personnel.
Action 2.3	Intensify efforts towards standardization of certification and accreditation in education and technical competency.
Action 2.4	Expand opportunities for women, youth and the disadvantaged group to contribute in STI through incentives and support mechanisms.

3.3.1. A relatively high number of activities are supporting Thrust 2, with the majority completed or in progress

Based on analysis of SC reports, 67 activities were identified as relating to Thrust 2. This was the second-highest level of activity among the four Thrusts, but on par with Thrust 1 in relation to the number of activities completed or in progress – 43% and 45% respectively, as seen in Figure 18.

Activities with the most progress relate to Action 2.2 – establish scholarship, fellowship and/or attachment

Figure 18: Status of activities under Strategic Thrust 2 (as at 2024)



programs. Programs such as the ASEAN–India Workshop Emerging Technologies for Young Biotech and Professionals from ASEAN Countries and the ASEAN–India Research Training Fellowship (AIRTF) Scheme continue to be delivered alongside new projects like the Japan-ASEAN STI for SDGs Bridging Initiative: Sakura Science Plan - Exchange Programme for Young ASEAN Officials Working in Science, Technology and Innovation (STI) for SDGs.

There is also continued activity progress in activities related to Action 2.4 - expand opportunities for women, young people and the disadvantaged. GEDSI efforts are being advanced through programs such as the ASEAN Women in Science, Technology, Engineering and Mathematics (STEM) Webinar Series and the 2024 ASEAN-India Women Scientists Conclave. Activity progress more recently indicates a greater focus on mobilising young people; for example, the 2023 ASEAN–ROK Students and Young Adults Competition and the Exchange Programme for Young ASEAN Officials Working in STI.

3.3.2. Policy frameworks supporting talent mobility may require additional focus

The relatively low number of activities identified as supporting Action 2.1 suggests policy frameworks facilitating mobility of scientists, researchers and students in STI fields may require additional attention. If talent mobility remains a priority area for the next APASTI, it is essential to strengthen these frameworks to ensure effective implementation.

Underdeveloped policy frameworks can lead to a more ad hoc approach to mobility programmes, as they lack the systematic structure necessary for consistent and impactful outcomes. This may hinder the ability of AMS to fully leverage the benefits of talent mobility, resulting in missed opportunities for collaboration and knowledge exchange. Ensuring that programme delivery aligns with the development of robust policy frameworks can support the institutional anchoring of exchange priority areas across AMS, fostering a more integrated and cohesive approach to talent mobility in the region.

3.3.3. Greater commitment to embedding approaches that improve GEDSI is required

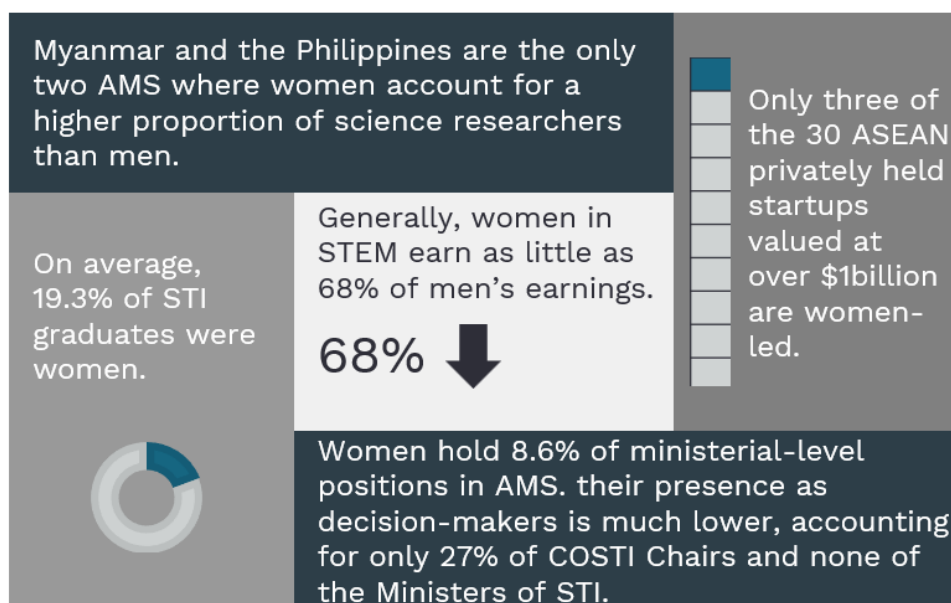
Between 2016-2025 there has been notable progress across Thrust 2 in the context of improving GEDSI, women, young people and other groups that remain under-represented in STI.⁵³ Despite progress, there remains persistent structural and systemic barriers to closing GEDSI gaps across AMS. Improving the participation of diverse and underrepresented groups in STI requires comprehensive and integrated programming, with clear targets that address root causes of exclusion.

Women remain under-represented in STI

Key insights found in a desktop research exercise regarding the representation and participation of women within STI in ASEAN are summarised in Figure 19.

⁵³ ASEAN-USAID IGNITE, *Policy Brief: Strengthening ASEAN Women's Participation in STEM*, December 2022.

Figure 19: Key insights into women in STI across ASEAN



Barriers to GEDSI are pervasive and creating change requires a dedicated and cross-cutting response

The APASTI 2016-2025 has a relatively narrow focus on GEDSI that is largely contained within Thrust 2.

To achieve greater impact, GEDSI should be embedded across all components of the APASTI, including its vision, key action areas, monitoring and evaluation framework and governance structure – as a cross-cutting principle. This is discussed further in Chapter 4.

3.3.4. Greater opportunities for youth are required to continue progress in STI

To develop a highly digitally-literate youth population in upcoming generations, young people need to have access to key opportunities within STI. Key barriers to creating opportunities for the next generation (some similar to those discussed above in 3.2.1) include the below, and specifically ‘education quality issues’⁵⁴:

- Lack of experience
- Limited access to financial services
- Job insecurity
- Insufficient skills or opportunities for skill development

⁵⁴ Mid-term review pg.49

3.4. Thrust 3: Enterprise Support

Key Findings:

- 37 activities were identified as relating to Thrust 3, of which 32% (12) have been completed and 51% (19) are in progress as at 2024. This was the lowest number of activities among the four Thrusts.
- Collaboration with Dialogue Partners and other strategic partners has been impactful for AMS but could be better leveraged to support and nurture STI enterprises.

Thrust 3 relates to establishing innovative systems and smart partnerships with dialogue and other partners to nurture STI enterprises to support micro, small and medium-sized enterprises (MSMEs), nurture knowledge creation and STI applications to raise competitiveness. It has two related Actions as set out in Table 4.

Table 4: Thrust 3 Actions

Action 3.1	Establish support mechanism such as mentorship and incentive program to support and nurture STI enterprises from start-up to the next competitive level of development.
Action 3.2	Engage dialogue and other strategic partners in joint undertakings on appropriate and commercially viable STI initiatives.

3.4.1. Thrust 3 has the lowest number of associated activities of the four Thrusts

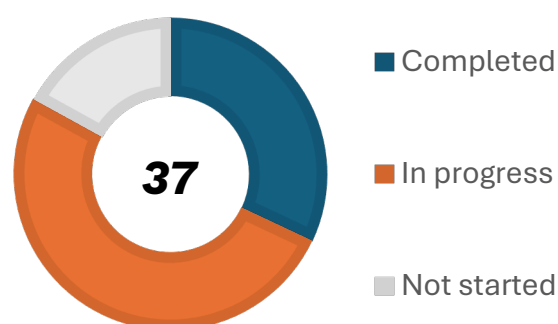
Based on analysis of SC reports, 37 activities reported on by SCs were identified as relating to Thrust 3, the lowest number among the four Thrusts. Of these activities, 32% were recorded as complete and 51% in progress as seen in Figure 20.

Activities with the most progress relate to Action 3.2 (engage dialogue and other strategic partners in joint undertakings on appropriate and commercially viable STI initiatives).

While these activities continue to address capacity building in information sharing and innovation, more recent activities show an increased focus on the development of technology and business innovation.

While activity progress against Action 3.1 - establish support mechanism such as mentorship and incentive program to support and nurture STI enterprises from start-up to the next competitive level of development, remains relatively low. While the ongoing delivery of initiatives such as the China-ASEAN Innovation and Entrepreneurship Competition, the Korea-ASEAN AI Development & Startup Competition and the ASEAN-India Start Up Festival are facilitating enterprise support.

Figure 20: Status of activities under Strategic Thrust 3 (as at 2024)

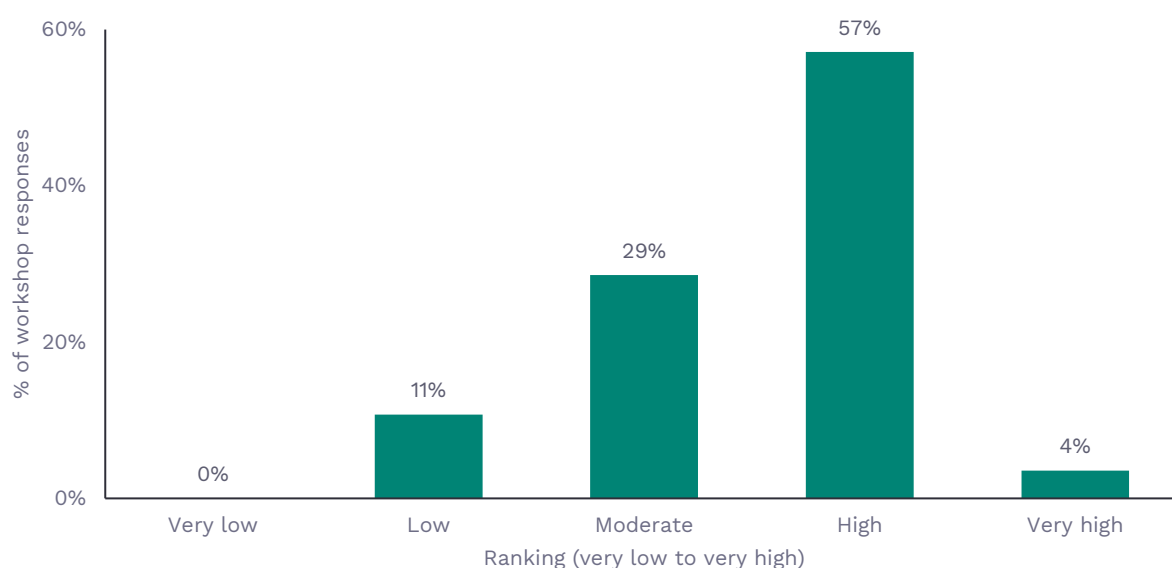


3.4.2. Collaboration with Dialogue Partners and other strategic partners has been impactful for AMS but could be better leveraged to support commercially viable STI initiatives

The greatest amount of activity progress on Thrust 3 has occurred in relation to Action 3.2. Regional collaboration with Dialogue Partners, including the 2nd India ASEAN InnoTech Summit and the ASEAN-India Grassroots Innovation Forum held in 2019, 2022 and 2023, reflects progress in collaborations to support start-up ecosystems.

The impact of Dialogue Partner collaborations was reflected in key insights from the ETR Workshop, where most participants rated the extent to which APASTI had uplifted capacity building and knowledge transfer through collaboration with Dialogue partners as ‘high’ (as illustrated below in Figure 24).

Figure 24: ETR Workshop responses- To what extent has the APASTI uplifted capacity building and knowledge transfer through collaboration with Dialogue Partners?



Participants also noted that this collaboration has been particularly successful when collaborating in areas of mutual interest, co-funding projects, and capability building and knowledge transfer.

However, given that Action 3.1 has the lowest demonstrated level of activity progress across the Thrusts, there is an opportunity to better leverage relationships with Dialogue Partners and others to further support and nurture STI enterprises. By actively engaging with these partners, AMS can:

- tap into additional resources, expertise, and networks;
- facilitate the development of effective mentorship and incentive programs tailored to the unique needs of start-ups and MSMEs;
- access best practices and successful models from other regions;
- create platforms for knowledge exchange, where entrepreneurs can connect with mentors, investors, and industry experts, thereby strengthening the overall entrepreneurial ecosystem; and
- realise co-funding opportunities aimed at nurturing STI enterprises.

3.5. Thrust 4: Public Awareness and STI Enculturation

Key Findings:

- 53 activities were identified as relating to Thrust 4, of which 55% have been completed and 32% are in progress as at 2024.
- Public awareness and enculturation could be improved through developing a communication and enculturation strategy, initiatives such as implementing a standardised onboarding process for AMS personnel involved in the implementation of the APASTI, improving web content and deploying a range of tools including social media platforms.
- Greater alignment of national STI policies with APASTI would improve awareness of the strategy and coordination between AMS. This could also increase the contributions to APASTI by different AMS.

Thrust 4 relates to raising public awareness and strengthening STI enculturation to enhance ASEAN science and technology cooperation. It has five related Actions as set out in Table 5.

Table 5: Thrust 4 Actions

Action 4.1	Encourage the participation of scientists, researchers and industries in the ASEAN S&T events such as ASEAN Food Conference (AFC) and ASEAN Science, Technology and Innovation Week (ASTIW).
Action 4.2	Enhance the contents of the articles published in the ASEAN Journal of S&T for Development and other journals.
Action 4.3	Leverage on the ASTNET in publicising ASEAN initiatives in STI.
Action 4.4	Develop a resource database and network to facilitate information sharing and technical cooperation among agencies in the public and private sector.
Action 4.5	Engage relevant stakeholders in developing and implementing an effective communication and STI enculturation plan.

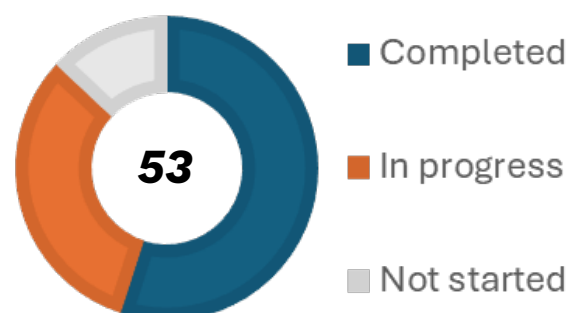
3.5.1. A moderate number of activities have been progressed, a majority of which have been completed

Based on analysis of SC reports, 53 activities reported on by SCs were identified as relating to Thrust 4.

The activities with the most demonstrated progress relate to Action 4.1 - encourage the participation of scientists, researchers and industries in the ASEAN S&T events such as ASEAN Food Conference and ASEAN Science, Technology and Innovation Week, followed by Action 4.4 - develop a resource database and network to facilitate information sharing and technical cooperation among agencies in the public and private sector.

Food science research dissemination remains a key activity area, however activities undertaken since the MTR have also addressed disaster resilience, AI implementation, geospatial and nanotechnology development.

Figure 21: Status of activities under Strategic Thrust 4 (as at 2024)



3.5.2. Public awareness, engagement and socialisation campaigns must be well-designed to improve enculturation

Opportunities for creating greater awareness and enculturation were highlighted multiple times during the ETR Workshop, with participants identifying dissemination as one of the significant challenges for the implementation of the APASTI 2016-2025. Suggestions from ETR Workshop participants included:

- Creating a standardised onboarding process for new personnel from various AMS involved in the implementation of the APASTI, to enhance their understanding and awareness of APASTI's goals and increasing the promotion of APASTI at a national level;
- Developing a dedicated website to build awareness and advertise STI events; and
- Utilisation of a range of tools including social media platforms to effectively connect with different audiences.

This has also been reflected in the limited progress on Action 4.5. Such a strategy would not only facilitate clearer messaging and outreach efforts but also enable a more robust evaluation of the impact of existing partnerships on awareness and enculturation efforts. Moreover, concentrating efforts on AMS policymakers, Dialogue Partners, and the private sector is more likely to maximise impact, as broad campaigns can be costly.

3.5.3. Better integration of the APASTI in national STI-related policies would improve awareness of the APASTI and alignment between AMS

The MTR completed analysis on the extent to which the APASTI thrusts and associated goals are embedded in national policies between 2016-2022. This analysis was completed across 10 AMS and found that the “APASTI thrusts and action lines are generally identified as priority themes in national strategies”. This was particularly evident with Thrust 1 – public-private collaboration. However, despite this alignment, national STI policies typically do not explicitly mention the APASTI, which may result in a lack of awareness of the APASTI amongst key stakeholders.

This too was reflected in the insights from the ETR Workshop where attendees suggested that a “policy coordination mechanism” should be developed to better embed APASTI into national policies. This would not only increase the socialisation of the APASTI but will likely support greater commitment, contribution, and coordination of all AMS towards the desired STI outputs.

4. Implementation

4. Implementation

This chapter reviews the effectiveness of strategies, coordination efforts and resources allocated for the implementation of the APASTI 2016-2025. This review assesses the structure and content within the APASTI 2016-2025, its associated Implementation Plan, and SC reports provided by ASEC.

Four key levels of implementation mechanisms were assessed, as described below.

- **Implementation framework:** the overall structure articulating the APASTI's vision, goals and actions, the anticipated outputs and outcomes and how these are measured;
- **Monitoring and evaluation:** mechanisms measuring the success of the APASTI in achieving specific goals and targets, and the efficiency and effectiveness of the plan's implementation;
- **Governance:** the mechanisms by which the implementation of the APASTI and the realisation of its goals and targets are overseen, managed and controlled; and
- **Funding and resource allocation:** the mechanisms by which funding and other resources are obtained for the implementation of the APASTI, including allocation to specific initiatives.

Key Findings:

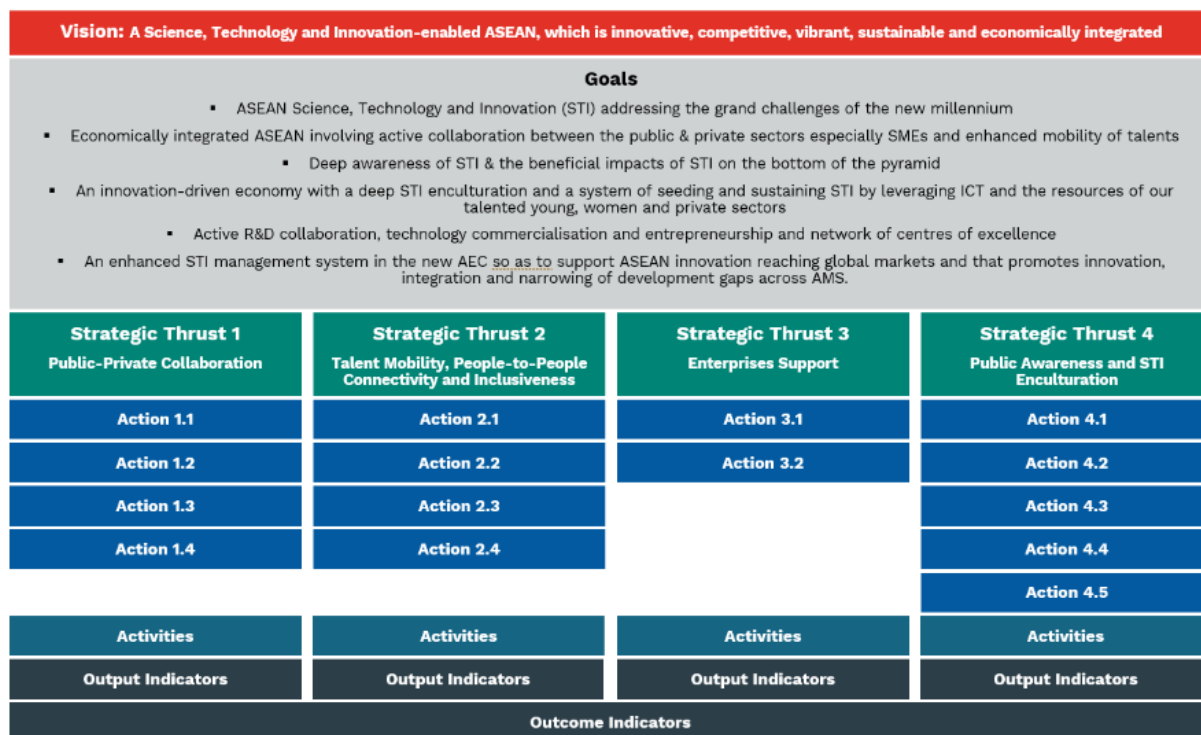
- The implementation framework for the APASTI 2016-2025 lacks a clear and cohesive logic linking together all components including the vision, goals, strategic thrusts, outputs/outcomes and key performance indicators, making it difficult to monitor and assess progress.
- The APASTI 2016-2025 is generally aligned to broader ASEAN strategies such as the AEC Blueprint, but this could be more explicit.
- The APASTI 2016-2025 and the Implementation Plan are long and difficult to navigate, making them difficult to understand by readers from different linguistic backgrounds.
- The APASTI could increase its relevance and be more effective in advancing AMS STI capacity by further recognising the different strengths, challenges, opportunities and priorities relevant to each AMS.
- Limited APASTI resources are spread across a large number of projects, activities and initiatives, which potentially dilutes the impact achieved.

4.1. Implementation framework

4.1.1. Articulation of the APASTI's vision, goals, actions, outputs and outcomes could be clearer and more cohesive

The overall implementation framework of the APASTI 2016-2025 is summarised in Figure 22 below.

Figure 22: Overall structure of the APASTI 2016-2025 implementation framework



While the individual components of the APASTI 2016-2025, are relatively clear, the relationships between these components are not always apparent. There is a lack of a clear and cohesive logic tying together all components of the APASTI implementation framework, which makes it difficult to monitor, assess and demonstrate progress towards the achievement of APASTI’s vision and goals.⁵⁵

Without clarity on how individual activities relate to broader APASTI objectives, including specificity on key indicators of success, it is difficult to determine the extent to which activities, projects and initiatives are contributing to the defined outputs, outcomes and KPIs of the APASTI or its Vision and Goals. Although there is evidence of a significant volume of activities, projects and initiatives at a SC level, these do not necessarily connect to the achievement of outcomes, goals or the APASTI 2016-2025’s vision. Moreover, while progress in STI has been made in a general sense across ASEAN, it is difficult to provide a clear picture of this progress using the structure provided by the APASTI 2016-2025.

To address these issues, the subsequent APASTI should be more explicit in linking together all components of the plan, creating a robust Theory of Change so that the plan can be clearly understood. Establishing a clear linear logic will assist in providing clarity of purpose for the implementation of the APASTI and support more effective monitoring and evaluation.

⁵⁵ For example:

- ▶ The Goals and Objectives of SCs, as outlined in section V of the APASTI 2016-2025 (Programme Areas and Implementation Strategy), do not explicitly link to the broader Goals of the APASTI or to the more detailed Work Plans in the Implementation Plan (although in some instances a connection may be identified);
- ▶ The more detailed metrics and work plans outlined in the Implementation Plan cannot always be reconciled with one another, or with higher-order components in the APASTI 2016-2025. For example, the Outcome Indicators listed in section F of the Implementation Plan (Key Performance Indicators) are not linked to specific Thrusts;
- ▶ It is not clear how (or if) similarly titled components from different sections of the Implementation Plan are connected to one another e.g. ‘Output Indicators’ and ‘Outcome Indicators’ in section F (Key Performance Indicators); and
- ▶ The inconsistent use of the terms ‘output’, ‘outcome’ and ‘indicators’ across the APASTI 2016-2025 and the Implementation Plan makes it difficult to understand the proposed relationships between the different mechanisms.

4.1.2. Lack of clarity and focus on its vision, goals and how to achieve them

Implementation challenges arising from a lack of clarity regarding its key components are heightened by the length and complexity of the APASTI 2016-2025. The APASTI spans 102 pages, with the first 40 pages focused on historical and contextual information. This extensive background makes it difficult to locate and understand the vision, goals, and objectives of the APASTI. In addition, the separate APASTI 2016-2025 Implementation Plan is 152 pages long, which adds another layer of complexity.

This was reiterated in feedback collected from the ETR Workshop where attendees articulated that the APASTI is not clear and overly complicates its subject matter. Moreover, when discussing the key challenges of the APASTI and of incorporating the APASTI into national policies, attendees at the ETR Workshop reported that communication and translation can be an inhibitor to progress, which creates further barriers to fully understand and realise APASTI goals.

As such, the next APASTI would benefit from:

- Reducing the overall length by placing contextual information in appendices except where critical for comprehension; and
- Ensuring each section is clear and concise.

4.1.3. The APASTI is generally aligned to broader ASEAN strategies, but this could be more explicit

The APASTI 2016-2025 references broader regional strategies including the ASEAN Economic Community (AEC) Blueprint 2025 and the ASEAN Socio-Cultural Community (ASCC) Blueprints 2025.

Extent of alignment to the AEC Blueprint

There is significant alignment between APASTI action lines and the strategic measures set out in the AEC Blueprint.⁵⁶ The MTR further found that 36 expected APASTI outputs were aligned with AEC Blueprint strategic measures, of which (as at 2022) 42% had been completed, 36% were ongoing and 22% did not have evidence of progress.⁵⁷

Additional analysis is shown in 0, which shows the number and status of activities identified as relating to each AEC Blueprint strategic measure, based on review of SC reports. Out of the 13 additional strategic measures outlined, they are 29% completed, 45% are ongoing, and the remaining 18% either pending or withdrawn, on average. As outlined in Chapter 3, the mapping of SC activities to Actions is inherently subjective.

While this indicates strong alignment between APASTI 2016-2025 and broader ASEAN strategies, there are limited explicit references which link these strategies to specific activities, projects and initiatives under the APASTI. There may be an opportunity to make these links more explicit in the next APASTI, which will further assist with providing clarity of purpose and promoting alignment with ASEAN-wide priorities.

⁵⁶ Mid-Term Review, p. 8.

⁵⁷ Mid-Term Review, p. 8.

Moreover, APASTI's contribution to the AEC Blueprint strategic measures are not currently being monitored or reported against. Given the APASTI is intended to further elaborate and implement the Blueprint, this should occur in order to track progress.

Alignment to evolving ASEAN strategic policy

Since 2016, the ASEAN policy environment has continued to evolve. Higher-order strategic policy documents currently in place or in development include:

- *ASEAN Community Vision 2045*, which outlines ASEAN's vision for a resilient, innovative, dynamic and people-centred ASEAN post-2025; and
- *AEC Strategic Plan 2026-2030*, including a vision for 2045, which builds on the previous AEC Blueprint and is expected to be finalised in mid-2025.

The subsequent APASTI should continue to be strongly aligned to overarching ASEAN strategic policies, by explicitly referencing relevant components and, where applicable, expressly linking APASTI initiatives with ASEAN's objectives under these broader strategies. This will support APASTI initiatives to be integrated with and aligned to ASEAN's strategic priorities and vision for the next 10 years and beyond.

Moreover, the APASTI is developed for 10-year periods while other AEC-level strategic plans cover only 5-year periods. As such, the APASTI must be flexible to remain aligned to changes in strategic direction over its 10-year timeframe.

Balancing ASEAN regional goals with those of AMS

While the APASTI should rightfully focus on the common goals of AMS, there may also be an opportunity to leverage the different strengths, challenges, opportunities and priorities relevant to each AMS.

In the ETR Workshop, participants provided feedback on making the APASTI relevant for each AMS. This could be achieved by embedding flexibility for each AMS to tailor the plan to reflect the varying levels of STI development across Member States. This approach will help in addressing disparities and fostering collaboration among AMS and make it easier for APASTI to align with national and regional needs and goals.

4.1.4. The APASTI covers a significant breadth of activities and could benefit from focussing on a smaller number of high-impact projects

Based on a review of SC reports provided by ASEC, there are around 250 activities, projects and initiatives currently being undertaken and/or monitored (a combination of those is pending, ongoing, completed and withdrawn).

Participants in the ETR Workshop emphasised challenges associated with the APASTI, or any 10-year plan, trying to capture and respond to every single regional or local AMS challenge or opportunity area. This is due to the scale of work required to achieve that, which is constrained by finite resources (both capital and human resources).

This approach has led to mixed progress of AMS and SCs on a wide range of activities and KPIs. This is, at least partially, a result of the scope of the APASTI and a lack of a prioritisation framework that helps to determine what activities, projects and initiatives will be the most impactful.

The absence of a cohesive and nuanced strategy for tackling the breadth of activities, projects, and initiatives results in inefficient resource utilisation, which in turn creates additional barriers to progress. Further, in a resource-constrained environment, spreading efforts too thinly across a large number of initiatives risks diluting the potential impact of the program as a whole.

4.2. Monitoring and evaluation

Key Findings:

- The monitoring and evaluation framework established for the APASTI 2016-2025 is high-level and provides limited guidance on the objectives, scope and processes for formal reviews and other monitoring and evaluation activities.
- Formal reviews of the APASTI 2016-2025 were only undertaken in the final two years of the APASTI's operation, limiting opportunities for adjustment and refinement of the APASTI in response to changing global, regional and AMS priorities.
- Many of the key performance indicators specified for the APASTI 2016-2025 are not clear, specific and/or measurable, limiting their usefulness.
- Key performance indicators and other performance metrics established for the APASTI 2016-2025 focus heavily on quantitative throughput measures and lack nuance in assessing the true value and impact delivered by the APASTI.
- While some of the Key Performance Indicators specified in the APASTI 2016-2025 Implementation Plan are supported by reasonable data sets, many are not measurable or have significant data gaps.
- A lack of data disaggregated by demographic attributes including gender makes it challenging to measure the impact of the APASTI on different groups.
- Current data collection methods vary significantly across SCs and projects, which complicates the comparison and aggregation of project impacts.

4.2.1. Monitoring and evaluation approach the APASTI could benefit from more detailed planning

The APASTI 2016-2025 and the Implementation Plan are high-level on the approach to monitoring and evaluation

Information on the approach to monitoring and evaluation of the APASTI 2016-2025 is spread across the APASTI and the separate Implementation Plan. In both documents, details to the approach of monitoring and evaluation are high-level.

The scope, objectives and process for formal reviews is not well-defined

The APASTI was intended to be reviewed at two points. An implementation review of the APASTI was intended to occur after five years (i.e. the MTR), with a final review to occur at the end of ten-year period (i.e. the ETR).

The MTR provides valuable insights into the implementation of the APASTI 2016-2025 and key achievements and challenges. However, due to delays in its completion – likely caused by the COVID-19 pandemic – there was not time for

any of the recommended improvements to be made. As a result, it has made it difficult for the ETR to demonstrate how progress has been made or how outcomes have changed since 2023.

Monitoring and evaluation could be improved by COSTI providing additional guidance on the objectives, structure and outputs of formal reviews, at the outset. This could include:

- A formal review of the implementation of the APASTI at around the two-year mark, to evaluate the establishment of relevant governance structures and implementation mechanisms (as applicable), review progress of key initiatives and identify any early barriers to the success of the APASTI;
- Opportunities to refine and amend the APASTI to incorporate relevant findings of the MTR at the five-year mark;
- A further implementation review, if necessary, to evaluate the implementation of any changes to the APASTI resulting from the MTR; and
- A Final Review at the conclusion of the 10-year period.

Effective formal reviews should also be supported by a well-structured and cohesive implementation framework as discussed in section 4.1.1.

SCs should regularly assess the efficiency and effectiveness of their work programme implementation

Based on the available information, it is not clear to what extent SCs have taken reviewed the efficiency and effectiveness of how their work programme supports the implementation of the APASTI, beyond status tracking of initiatives and associated meetings.

To embed ongoing monitoring and evaluation functions within SCs, consideration should be given to how SCs can regularly review their own work programme to ensure it remains aligned to achieving the vision, goals and objectives of APASTI 2026-2035. For example, regular reviews by SCs could consider:

- Effectiveness of project delivery, including any barriers such as external interdependencies or resourcing requirements;
- Impact of projects delivered on AMS;
- Effectiveness and efficiency of governance including opportunities to streamline processes; and
- Effectiveness of collaboration with other SCs and other bodies and organisations.

4.2.2. KPIs should be clear, specific, and measurable

To facilitate effective monitoring and evaluation, it is important that KPIs, and associated targets, are specific and measurable.⁵⁸

Several of the KPIs listed in section F of the Implementation Plan do not have a clearly defined meaning and / or are not practically measurable, for example:

- Amount of quality information provided (Actions 1.2 and 4.3); and

⁵⁸ Mid-Term Review, p. 14.

- Amount of resource mobilised (Action 3.2); and

The above KPIs are difficult to measure because they use terms with subjective or non-specific meanings (e.g. what is 'quality information?'). A corresponding measurable data point has not been identified to measure progress, nor has a target been defined, meaning that it is not clear what success looks like. This was also reflected by ETR Workshop where many participants selected monitoring and evaluation related improvements as priority areas of focus in the development of APASTI 2026-2035.

4.2.3. Current APASTI KPIs measure volume of outputs rather than value delivered or outcomes achieved

The monitoring and evaluation framework established for the APASTI 2016-2025 focusses heavily on quantitative output measures, many of which attempt to quantify the throughput generated by COSTI SCs and AMS.

While these measures may be indicative of underlying trends (notwithstanding that many of them are difficult to quantify), the focus on quantity over quality means they lack nuance in assessing the true value and impact delivered by the APASTI.

Similarly, the information captured in SC reports is focussed on the number of projects, activities and initiatives completed. Such throughput information was heavily relied on to assess progress in the MTR and within this report. However, not all projects/activities/initiatives are equal. Metrics on the quantity of initiatives undertaken may not adequately distinguish between initiatives of different scale, cost and impact.

For the subsequent APASTI, the monitoring and evaluation framework should place a greater emphasis on outcomes achieved, as opposed to outputs like the number of deliverables. This could incorporate additional qualitative methods such as surveys as well as quantitative methods, and could consider metrics such as:

- Level of awareness of STI initiatives and their perceived impact on community wellbeing among AMS;
- Level of STI awareness, knowledge and capability among AMS government officials;
- Economic impact of STI initiatives (e.g. economic growth or job creation);
- Number of collaborative research projects resulting in publications, patents or commercial products; and
- Employment rates of STI graduates in STI-related fields.

4.2.4. A more agile approach to implementation and evaluation will support the APASTI to remain relevant

An agile approach to implementation and evaluation is essential for ensuring that the APASTI remains relevant in a rapidly changing global landscape.

When asked about the impact of APASTI on key challenges between 2016-2025, participants in the ETR Workshop identified that global uncertainties and unforeseen challenges such as the COVID-19 pandemic can alter priorities across ASEAN. While the APASTI 2016-2025 did align to global trends and innovations such as climate change, changes in priorities and key challenges (for instance,

the emergence of COVID-19) impeded the ability of AMS to achieve the desired APASTI outcomes.

Participants from the ETR Workshop suggested that the APASTI should adopt a more agile approach to STI implementation to remain flexible and keep the strategy relevant over its 10-year tenure. Using foresight activities to inform the APASTI goals and plan was identified as a possible way to mitigate this challenge.

The implementation and monitoring and evaluation of the next APASTI could better allow for timely adjustments to strategies and actions based on emerging trends, stakeholder needs, and unforeseen challenges. This could be achieved by:

- Introducing additional review points, including both formal reviews and ongoing review by SCs, to facilitate more timely and regular assessment of progress, challenges and opportunities for improvement; and
- Enabling and planning for amendments to be made to the APASTI during the 10-year period, particularly following the MTR at the five-year mark, in response to review findings, changing priorities at a global, regional or AMS level and/or changes in ASEAN strategic direction such as changes to the AEC Strategic Plan, which is updated every five years.

This flexibility will enable the APASTI to respond effectively to the dynamic nature of STI and ensure that initiatives align with the evolving priorities of ASEAN, individual AMS, Dialogue Partners and the broader international community.

4.2.5. Improvements in data and information collection and management will support more effective monitoring and evaluation

Addressing data gaps

There is generally a lack of available data to support effective monitoring and evaluation. For example, the below data gaps make it difficult to track progress towards achievement of APASTI goals, outcomes and KPIs.

Figure 23: Data gap examples

Data gap	Example	Impact
Lack of disaggregated data	In particular by gender, age and other key social demographics	Difficult to track outcomes relating to GEDSI
Differences in AMS reporting	For most outcome indicators at least one AMS does not have available data	May result in data being skewed towards AMS with greater data collection capacities, causing bias in results.
Missing data over time	Missing years of data across outcome indicators	Challenging to identify trends or draw robust links to APASTI activities or across outcome indicators

See Appendix 5, for suggestions for improving data quality and consistency.

4.3. Governance

Key Findings:

- Current governance structures are impacting strategic decision-making through a lack of alignment with the APASTI vision.
- Roles and responsibilities of different governance bodies are not defined with sufficient clarity to prevent duplication of effort and delays in decision-making.
- For ASEAN's commitment to GEDSI to have greater impact, governance mechanisms for the APASTI must identify and address gaps that inhibit inclusivity, such as lack of awareness, inconsistent implementation, data deficiencies, cultural barriers, and resource limitations.
- Relationships with Dialogue Partners are critical to the success of APASTI and would benefit from structure to ensure collaboration can advanced shared specific goals and outcomes.

4.3.1. The governance structure should be reviewed to ensure it is fit-for-purpose

The key governance bodies relevant to APASTI 2016–2025 are summarised in Appendix 6.

The APASTI governance structure is currently not aligned to the goals and outcomes of the APASTI.

Although the APASTI governance structure sets out roles and responsibilities that should enable effective oversight and governance, this structure and the relationships between these bodies may no longer be fit-for-purpose for APASTI 2026–2035. Key challenges with this structure and its operation include:⁵⁹

- There is no framework or way that enables identification of common goals or prioritisation of activities based on ASEAN and AMS goals and outcomes;
- The participation and contribution of AMS can be inconsistent;
- The decision-making authority is too widely distributed and de-centralised, resulting in duplication especially in monitoring and implementation
- The current SC structure, which is organised around knowledge area rather than cross-cutting functions, results in similar activities and projects being undertaken, which results in duplication of efforts but also makes it difficult to track progress;
- Some Sub-Committees are considered redundant.

⁵⁹ Mid-Term Review, p. 89, 99.

Based on ETR Workshop participant insights and MTR consultations the following is suggested for the future APASTI.

- Re-organising how SCs deliver projects to reduce duplication of efforts and enhance monitoring and evaluation; and
- Considering how governance mechanisms can better support capacity building, networking and dissemination of research by improving coordination and communication across SCs;
- “re-aligning scope [of SCs] to APASTI objectives / functions rather than thematic field” supporting a ‘mission-orientated’ implementation approach; and
- “[removing] any redundancies amongst Sub-Committees (particularly in reducing the number of SCs and BAC)”;

Role and responsibilities of APASTI governance bodies may not be sufficiently defined to enable effective decision-making

There is opportunity for APASTI to play a more strategic role in strengthening collaboration in research, development and innovation in the region to address societal grand challenges and to navigate the increasingly complex international landscape.⁶⁰

Achieving this requires clarity on who is responsible for making strategic versus operational decisions and how that translates into the roles and responsibilities of the different APASTI governance bodies (e.g. BAC, COSTI, SCs, AMS, COSTI, ASTIF, etc.).

Terms of Reference included in the APASTI 2016-2025 for the National COSTI Chair and the COSTI SC Chair include language that creates ambiguity, especially in terms of how the monitoring and implementation of programmes and activities occurs:

- The National Chair is ‘To assist the S&T Minister in initiating, directing and overseeing the development, monitoring and implementation of the COST and the Sub-Committee programmes and activities, at the national level’;
- The SC Chair is ‘To initiate, direct and oversee the development, monitoring and implementation of Sub-Committee programmes and activities’.

This ambiguity reduces the ability of SCs to make effective decisions and can result in duplication of work and reduced collaboration. Ultimately, an improvement in clarity of roles and responsibilities will provide the structure for AMS and SC to work collaboratively to achieve the APASTI goals.

4.3.2. Governance mechanisms should be used to improve GEDSI

For ASEAN’s commitment towards GEDSI to have further impact, the governance mechanisms for APASTI and all activities it supports should be oriented towards identifying and addressing gaps which inhibit inclusivity in STI.

These gaps may manifest in various forms, such as:⁶¹

⁶⁰ Mid-Term Review, p. 91.

⁶¹ ASEAN-USAID IGNITE, *Policy Brief: Strengthening ASEAN Women’s Participation in STEM*, December 2022.

- Lack of awareness: stakeholders may not fully understand the importance of GEDSI, leading to insufficient prioritisation of these issues in decision-making processes;
- Inconsistent implementation: different AMS may have varying levels of commitment and resources dedicated to promoting GEDSI, resulting in uneven progress across the region;
- Data gaps: there is a lack of gender-disaggregated data, which makes it difficult to assess progress and identify areas needing improvement;
- Cultural and structural barriers: societal norms and institutional structures may inadvertently hinder efforts to promote inclusivity, creating obstacles for women and under-represented groups in accessing opportunities; and
- Resource limitations: limited financial and human resources can restrict the ability of AMS to implement comprehensive policies that support GEDSI.

Recognising and addressing these gaps is essential to ensure that GEDSI goals are met, allowing for a more equitable and effective approach to STI across the ASEAN region.

Practical mechanisms by which GEDSI could be more effectively incorporated into the APASTI governance structure could include:⁶²

- **Establishing inclusive policies:** developing clear policies that explicitly prioritise GEDSI within all governance frameworks. This could involve setting targets for female representation in decision-making roles and ensuring that policies are designed to address the specific needs of under-represented groups;
- **Inclusion of representatives from under-represented groups in decision-making bodies and roles:** Improve the representation of women and other under-represented groups in high-level STI policy decision-making roles, such as the National COSTI Chairs and Ministers of STI, by introducing targets for gender equality and representation of other under-represented groups and establishing standardised criteria for appointment of representatives to high-level ASEAN bodies (e.g. COSTI chairs), to mitigate risk of unconscious bias. By incorporating a wide range of perspectives, the APASTI can better reflect and address the unique challenges faced by different demographics, particularly women, youth and other under-represented groups;
- **Implementing training programs:** offering training and capacity-building programs for stakeholders on gender sensitivity and social inclusion. This can help raise awareness about the importance of these issues and equip individuals with the skills needed to promote inclusivity in their work;
- **Conducting regular assessments:** establishing mechanisms for regular assessments and evaluations of policies and programs to measure their impact on GEDSI. This can help identify gaps and areas for improvement, ensuring that initiatives remain relevant and effective;

⁶² Ibid; ASEAN, *Gender Mainstreaming Strategic Framework 2021-2025*, September 2021.

- **Promoting stakeholder engagement:** facilitating ongoing engagement with a wide range of stakeholders to gather diverse perspectives and foster collaboration. This can help ensure that initiatives are responsive to the needs of all groups and can lead to a more coordinated response across governments, institutions and private sector organisations;
- **Utilising data and research:** collecting and analysing disaggregated data by demographics, such as gender, age and geography to inform decision-making and policy development. This data can highlight disparities and help tailor interventions to address specific challenges faced by different groups;
- **Encouraging partnerships:** building partnerships with organisations that focus on gender equality and social inclusion to leverage their expertise and resources. Collaborative efforts can enhance the effectiveness of initiatives aimed at promoting inclusivity; and
- **Implementing feedback mechanisms:** establishing feedback mechanisms that allow beneficiaries of programs to voice their experiences and suggestions. This can help ensure that the voices of underrepresented groups are heard and considered in governance processes.

By embedding these different perspectives, all activities pursuant to the APASTI will reflect a more nuanced understanding of gender and social inclusion, leading to the implementation of targeted initiatives that promote equity and participation across diverse communities across ASEAN.

For APASTI, this means ensuring that individuals and organisations from diverse backgrounds—especially young people, women, and other groups traditionally marginalised in science and technology—are given the opportunity to participate and succeed.

4.3.3. Relationships with Dialogue Partners could benefit from additional structure to support effective partnership

The implementation of the APASTI 2016–2025 has been supported largely by ASEAN Dialogue Partners. This support is inclusive of funding, policy development support and knowledge sharing.

Currently, Dialogue Partners collaborate with AMS through joint committees, working groups, taskforces and other forums. However, there is no formal framework for engagement between COSTI, AMS and Dialogue Partners. Formalised and structured arrangements with Dialogue Partners could help to drive targeted commitments towards meaningful joint undertakings from both parties.

Additionally, identifying and highlighting areas of common interest with Dialogue Partners could encourage Dialogue Partners to participate more fully in COSTI-related activities.⁶³ SDGs could be useful tool for achieving this given AMS and the Dialogue Partners, as UN members, are jointly bound in their commitment to the SDGs and Agenda 2030. Formal instruments such as Memoranda of Understanding or Agreement may also be useful to provide clarity of purpose,

⁶³ Mid-Term Review, p. 91.

establish joint objective and activities and secure firm commitments of support from Dialogue Partners.

4.4. Funding and resource allocation

Key Findings:

- AMS have experienced challenges and disparities in accessing funding for APASTI activities.
- The lack of a funding framework impacts strategic allocation of funds and could undermine efforts to encourage increased contributions from funders.
- The current process for securing an ASTIF grant is resource intensive and does not enable nuanced consideration of grant proposals.
- Although the funding available through ASTIF has increased over the last couple of years there remains limited dedicated funding available for APASTI initiatives.

4.4.1. There is not a clear framework to support funding allocation

Resources available to support APASTI initiatives are primarily comprised of direct contributions from AMS, Dialogue Partners, UN Agencies and other multi-national bodies, and other sources approved by COSTI.⁶⁴

ASEAN maintains ‘pooled resources’ in the ASEAN Science, Technology and Innovation Fund (ASTIF) and the ASEAN Development Fund (ADF). Funds can be appropriated for specific initiatives through established funding application processes for ASTIF and ADF or, as relevant, direct external funding procurement from AMS, Dialogue Partners, international organisations, or the private sector.⁶⁵

Of these resources, ETR Workshop participants reported that ASEAN Dialogue Partners provided the greatest perceived resource contribution to APASTI initiatives, followed by AMS governments for their own local initiatives, as shown in Appendix 2. However, overall APASTI initiatives are reliant on a range of different funding sources which have a range of differing requirements and processes to obtain funding.

Although there are many options for funding, there is currently no comprehensive funding framework that outlines the types of funding available and guidance on how funding is to be allocated, including information about funding criteria and processes, including for ASTIF.⁶⁶

The absence of a clear framework can lead to:

- Competition between AMS, SCs and other APASTI bodies for funding for similar activities, projects and initiatives;

⁶⁴ University of Cambridge, *Assessment of the results and utilisation of the ASEAN Science Technology and Innovation Fund (ASTIF)*, August 2023, p. 1.

⁶⁵ The ASEAN Secretary, *ASEAN Plan of Action on Science, Technology and Innovation (APASTI): Implementation Plan*, 2017, p. 34.

⁶⁶ University of Cambridge, *Assessment of the results and utilisation of the ASEAN Science Technology and Innovation Fund (ASTIF)*, August 2023, p. 3.

- Missed opportunities to explore different and innovative funding models to support activities, projects and initiatives; and
- Reluctance by funders to contribute more if they are not able to monitor and track how capital resources support the achievement of outcomes and align with their own strategic priorities.

A funding framework could be used to ensure that all relevant funding sources are considered, and that funds are allocated to the highest-priority activities, projects and initiatives. The framework should provide visibility regarding ASTIF and ADF, in addition to the different mechanisms available for leveraging external funding from international organisations, private sector and other potential funders. A comprehensive funding framework will also allow more efficient tracking of fund expenditure, enabling identification of successful funding disbursement models and mechanisms.

To enhance ASTIF utilisation in the new APASTI, the following measures could help to support a more structured, transparent, and efficient approach to funding allocation:

- Ensure AMS clarity and understanding of the criteria required to obtain funding and create a central repository of information to support understanding of available funds;
- Develop a standardised process to manage and review the administration of funding and to monitor project processes;
- To support funding transparency and fairness, establish common approval criteria across various funding sources to evaluate proposals;
- Clearly outline the strategic objectives of ASTIF and how AMS contributions will support these goals.

4.4.2. The ASTIF model could be made more efficient

ASTIF is the only dedicated source of funding for APASTI activities but represents a small proportion of total funding. Allocation of resources under ASTIF has evolved with changes in the strategic focus of APASTI, and the scope of ASTIF changed last in 2014 to integrate innovation initiatives in addition to science and technology.

ASTIF currently provides grant funding of up to US\$50,000 for projects lasting for up to two years. Activities and projects funded by ASTIF have been undertaken by COSTI, BAC, nine SCs, AMS Ministries, national innovation and research agencies, and universities based in AMS. Funds from ASTIF are allocated through two main methods:

- Direct proposals that can be submitted by any proponent organisation at any time; and
- Competitive proposal call that is open to ASEAN COSTI SCs' focal points and AMS government agencies, which can submit a competitive proposal aligned with the APASTI Thrusts and ASTIF scope as defined by BAC and COSTI.

Between 1993 and 2022, 66 projects were successfully funded through ASTIF, with a majority of the projects being funded as direct proposals.⁶⁷ Both processes are resource intensive and require involvement from multiple stakeholders across several months for endorsement and committee meetings.⁶⁸

Considering that the award amount is only US\$50,000 over a two-year period, this is a considerable investment of time and resources for a small amount of funding. As a result, proponents who may have limited resources at their disposal for proposal development may be deterred from seeking funding through ASTIF. This observation is reinforced by the feedback gathered from ETR Workshop participants who reflected that ASTIF funding is not a large contributor to APASTI activities (as shown in Figure 29).

As a result of these challenges, there is an opportunity to update the ASTIF to reflect how the STI sector has changed since 2014, including the level of funding required to deliver meaningful changes in STI across ASEAN. In addition, reducing the effort and resources required for funding proposals will allow these resources to be allocated elsewhere – creating more meaningful change.

To enhance ASTIF efficiency in the new APASTI, there is a need to strengthen coordination and address coordination gaps between COSTI and SCs. Ensuring alignment of strategic priorities between COSTI and SCs with the overall goals of APASTI could support more equitable distribution of funds between COSTI-initiated projects and those proposed by SCs.

There is also an opportunity to integrate the ASTIF proposal submission process into digital platforms such as ASTNET, with a related dashboard to monitor submission progress. This would streamline submission procedures and enhance standardisation and transparency of the proposals process.

4.4.3. Innovative opportunities to improve financial sustainability of APASTI initiatives should be a focus in the next decade

To maximise the financial sustainability of APASTI, other diverse and innovative funding mechanisms and partnerships should be explored. During the ETR Workshop, this was highlighted as a key focus to ensure the sustainability and long-term impact of the APASTI 2026-2035.

Consideration should be given to opportunities to increase the funding available through ASTIF

ETR workshop attendees noted that since the MTR, the ASTIF has been moved to a different bank with higher interest rates. Following this change there have been significant increases to the fund, creating more opportunities for STI initiatives. This highlights the importance of actively and effectively managing the fund to reduce financial constraints.

To improve financial sustainability for funding sources available to APASTI, consideration should be given to increasing the amount of funding available through ASTIF. As the only dedicated funding source for APASTI, there are opportunities to use different investment options to grow the size of ASTIF. This could include investing in selective commercially viable STI initiatives with the express intention of receiving a share of revenue generated, with revenue to be

⁶⁷ Ibid, p. 2.

⁶⁸ Ibid, p. 17

re-invested into the ASTIF for future projects. This would progress multiple objectives including building partnerships with the private sector and supporting the commercialisation of STI while also potentially providing an additional revenue stream.

To support AMS in addressing common challenges and goals, the allocation of ASTIF funds around criteria linked to grand challenges, such as food security, climate change, disasters and health could support more equitable funding allocation and mutual STI advancement across AMS. In this regard, collaboration with Dialogue Partners could be strengthened by increasing awareness of ASEAN priorities and demonstrating their alignment with Dialogue Partner interests and broader geopolitical challenges. AMS should also closely monitor regulatory changes that may impact APASTI funding areas, particularly regulations that create new funding opportunities, or which may reveal emerging common AMS and DP priority areas.

Other funding options for APASTI initiatives should be explored

Further exploration of whether private sector and governments would contribute funding for ASTIF-funded initiatives through matched funding, for example, should be undertaken. To facilitate this, however, changes to the ASTIF project appraisal process would be required to create greater clarity around funding criteria and objectives.⁶⁹ Greater consideration could be given to funding that supports larger joint projects between AMS and Dialogue Partners, leveraging external global grant funding where available.

Consideration should be given to how the ASEAN Development Fund (ADF) can be used to support implementation of APASTI. The ADF is managed by the ASEAN Secretariat and 80% of the annual income from the endowment is used for projects and 20% for capital development. The ADF is governed by the ADF Indicative Work Programme, approved by the Committee of Permanent Representatives (CPR) and funds are made available based on the availability and decision of the CPR informed by recommendations from ASEAN Secretariat. The funds are to be utilised on a regular basis every two years.

⁶⁹ University of Cambridge, *Assessment of the results and utilisation of the ASEAN Science Technology and Innovation Fund (ASTIF)*, August 2023, p. 17.

5. Limitations

This review was developed between 16 January and 15 May 2025. It provides a comprehensive assessment of the APASTI 2016-2025 to the extent permitted by the available information and time.

The availability of consistent and accurate data evidencing progress against the APASTI 2016-2025 presented a key limitation. Key issues included:

- The implementation framework for the APASTI 2016-2025 lacks a clear and cohesive logic linking together all components including the vision, goals, strategic thrusts, outputs/outcomes and KPIs, making it difficult to monitor and assess progress;
- Many of the KPIs specified for the APASTI 2016-2025 are not clear, specific and/or measurable, limiting their usefulness;
- KPIs and other performance metrics established for the APASTI 2016-2025 focus heavily on quantitative throughput measures and lack nuance in assessing the true value and impact delivered by the APASTI;
- Significant data gaps, including data disaggregated by gender, age and other key social demographic indicators, make it challenging to measure the impact of the APASTI; and
- Current data collection methods vary significantly across SCs and projects, which complicates the comparison and aggregation of project impacts.
- Responses during the ETR workshop could be subject to sampling bias, potentially not reflecting the true sentiment of the entire population of APASTI stakeholders. This limitation should be considered when interpreting the findings and recommendations.

These issues form the basis of several recommendations made to improve the next APASTI (particularly in the Implementation section of this report).

Appendices

Appendix 1. Stakeholders Consulted

Brunei Darussalam

- Ministry of Transport and Infocommunications
- Centre for Advanced Material and Energy Sciences (CAMES)
- Universiti Brunei Darussalam

Cambodia

- Ministry of Industry, Science, Technology and Innovation (MISTI)c
- Ministry of Mines and Energy of Cambodia

Indonesia

- National Research and Innovation Agency (BRIN)
- Bureau of Public Communication, General Affairs, and Secretariat (BRIN)
- SNSU BSN
- Australia for ASEAN Futures

Lao PDR

- Ministry of Education and Sports
- SEAMEO Regional Centre for Community Education Development

Malaysia

- ASEAN Secretariat
- Ministry of Science, Technology and Innovation (MISTI)
- National Metrology Institute of Malaysia (NMIM)

Myanmar

- Department of Meteorology and Hydrology
- Naypyitaw State Polytechnic University, Ministry of Science and Technology
- Ministry of Science and Technology
- Department of Research and Innovation
- University of Computer Studies, Yangon, Myanmar (UCSY)
- Department of Biotechnology Research, Ministry of Science and Technology
- Myanmar Aerospace Engineering University

Philippines

- Department of Science and Technology
- Philippine Council for Health Research and Development-Department of Science and Technology
- National Academy of Science and Technology- Philippines

Singapore

- Agency for Science, Technology and Research (A*STAR)
- Health Sciences Authority
- Singapore Institute of Technology

Thailand

- Thai Meteorological Department

- Office of National Higher Education Science Research and Innovation Policy Council (NXPO)
- Ministry of Higher Education, Science, Research and Innovation
- National Science and Technology Development Agency (NSTDA) / ASEAN Regional Research Infrastructure Strategy (ASEAN RRI)
- PMU-B/CMRU
- Thailand Institute of Nuclear Technology
- National institute of metrology

Viet Nam

- Ministry of Science and Technology Department of International Cooperation
- National Remote Sensing Department

Appendix 2. Outputs from ETR Review Workshop

On 13 February 2025, EY facilitated a workshop on behalf of ASEAN COSTI and Science and Technology Division (S&TD) of the ASEAN Secretariat to inform a comprehensive Final Review of the APASTI 2016-2025. This ETR Workshop aimed to review APASTI's achievements from 2016 to 2025 by assessing both the qualitative and quantitative impacts of its implementation, evaluating its effectiveness and contribution to regional STI goals, and discussing key recommendations for APASTI's future direction.

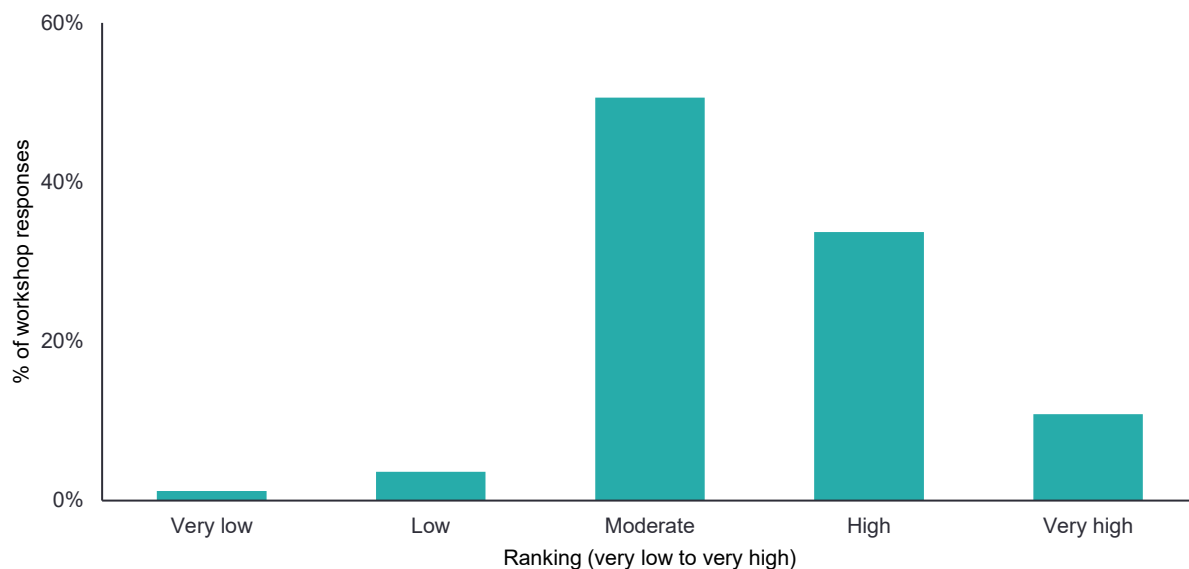
The outputs of this workshop informed this ETR alongside other consultations and documents completed throughout 2016-2025.

This workshop was organised with support from the Australian Government through the Australia ASEAN Futures (Aus4ASEANFutures) Initiative and took place virtually. The ETR Workshop invited representatives from APASTI Task Forces, the ASEAN Secretariat, BAC, National COSTI Secretariats, and Chairs of Sub-Committees under COSTI to provide their insights into APASTI 2016-2025 of which over 70 attended the workshop.

ETR Workshop key insights

Overall, workshop attendees believe that the APASTI 2016-2025 contributed a moderate level to the advancements of overall STI capabilities, as seen in Figure 24.

Figure 24: ETR Workshop responses to the question: To what extent has the APASTI contributed to the advancement of your overall STI capabilities?



The remainder of this appendix (Table 6) summarises feedback from workshop participants on the key achievements and challenges that likely contributed to this ranking and the opportunities for APASTI 2026-2035. Other key insights from the workshop are included throughout the body of this report.

Table 6: Key insights from ETR Workshop

	Clarity of Purpose	Monitoring and Evaluation	Governance	Funding and Resource Allocation	Partnerships and Collaboration	APASTI awareness and embeddedness in AMS
Key Achievements			<ul style="list-style-type: none"> Alignment to some global trends and innovations in climate change/ clean energy, technology and data, food science and technology, talent and mobility 	<ul style="list-style-type: none"> Maintaining ASTIF as a funding mechanism for regional STI development Since the MTR, there is greater PPP use, collaborating and funding management. 	<ul style="list-style-type: none"> Strengthened Regional Collaboration between AMS and in R&D and Innovation Enhanced technology transfer and commercialisation efforts Strong collaboration between researchers during COVID-19 Increased engagement from dialogue partners in strengthening ASEAN STI collaboration, especially Japan and China 	
Key Challenges	<ul style="list-style-type: none"> Diverse priorities, interests, and cultures between AMS and external partners Strategic thrusts are too general Lack of clear linkages 	<ul style="list-style-type: none"> Difficulties monitoring and evaluating APASTI outputs and outcomes Less consideration for some key trends / innovations including: AI, space technology, 	<ul style="list-style-type: none"> Redundancies amongst Sub-Committees Global uncertainties Lack of collaboration and coordination Language and communication barriers between 	<ul style="list-style-type: none"> Lack of commitment and contribution from all AMS / external partners Weak priority funding from Dialogue Partners Limited research infrastructure Funding access challenges and 	<ul style="list-style-type: none"> Limited collaboration with the private sector, wider ASEAN, academic research institutions and networks of excellence for technology and capability transfer and commercialisation 	<ul style="list-style-type: none"> National policies are not aligned

	Clarity of Purpose	Monitoring and Evaluation	Governance	Funding and Resource Allocation	Partnerships and Collaboration	APASTI awareness and embeddedness in AMS
	<p>throughout report</p> <ul style="list-style-type: none"> • Too many working/ subcommittee groups and priorities 	<p>quantum tech, geopolitics, climate change, energy resilience, and the pandemic</p> <ul style="list-style-type: none"> • Slow adoption of new technologies • Limited changes since the mid-term review • STI capacity gap between AMS 	<p>AMS and external partners</p> <ul style="list-style-type: none"> • Inequality between AMS • • 	<p>disparities between AMS</p> <ul style="list-style-type: none"> • Challenges in securing funding and expertise from around the world • Funding delays hindered program planning capacity and lead to increased program costs • 	<ul style="list-style-type: none"> • Limited data sharing between AMS and external partners 	
Key Opportunities	<ul style="list-style-type: none"> • Complete for foresight activity to discover key trends for the next 10 years. Opportunity for new APASTI to Focus on green economies, climate change, aging society, ecosystem, youth in STI, sustainability natural disasters, GEDSI, AI, quantum computing, and capacity building • Make a simple and precise plan • Prioritise common goals 	<ul style="list-style-type: none"> • Develop a simple and consistent method for collecting data to monitor and evaluate progress (potentially a dashboard) and encourage regular evaluation • Develop clear, detailed targets and indicators with clear priorities that link to the purpose of APASTI and national and regional challenges / plans / need / priorities 	<ul style="list-style-type: none"> • Highlight relevance of each Sub-Committee and remove those that are redundant • Improve synergies, collaboration and coordination between SCs, AMS, COSTI, ASTIF, and at a regional level 	<ul style="list-style-type: none"> • Provide more funding support and improve access (potential for funds matching, and more work with DPs, and innovative funding mechanisms) 	<ul style="list-style-type: none"> • Encourage more engagement, synergies, and collaboration with private sector, specialist / research bodies, and government / inter-gov organisations to maximise impact (might not necessarily be at ASEAN level) • Promote and better use entrepreneurship and research (e.g., by strengthening collaboration with universities, research institutions and others that would accelerate 	<ul style="list-style-type: none"> • Better onboarding required for new stakeholders within AMS • Build awareness, agreement, engagement, socialisation, and inclusivity of the APASTI, and incentivise support • Develop a policy coordination mechanism to better embed APASTI in national policies

	Clarity of Purpose	Monitoring and Evaluation	Governance	Funding and Resource Allocation	Partnerships and Collaboration	APASTI awareness and embeddedness in AMS
	<p>and have more of a clear focus in the plan (can't do everything) but one that is meaningful to all</p> <ul style="list-style-type: none"> Align the APASTI to the wider ASEAN vision 	<ul style="list-style-type: none"> More proactive and flexible approaches to keep the strategy relevant for its tenure allowing flexibility in implementation Adopting a more agile approach to STI implementation – do not be so prescriptive (potentially based on STI capacity staging in different AMS). 			<p>innovation and promote entrepreneurship through tech/data transfer, centres of excellence, increased venture capital availability etc.</p>	

Other key insights that came out of the workshop are illustrated below in a number of graphs that are referenced throughout the review.

Figure 25: Responses to ETR Workshop question - To what extent has the APASTI uplifted capacity building and knowledge transfer through collaboration between AMS?

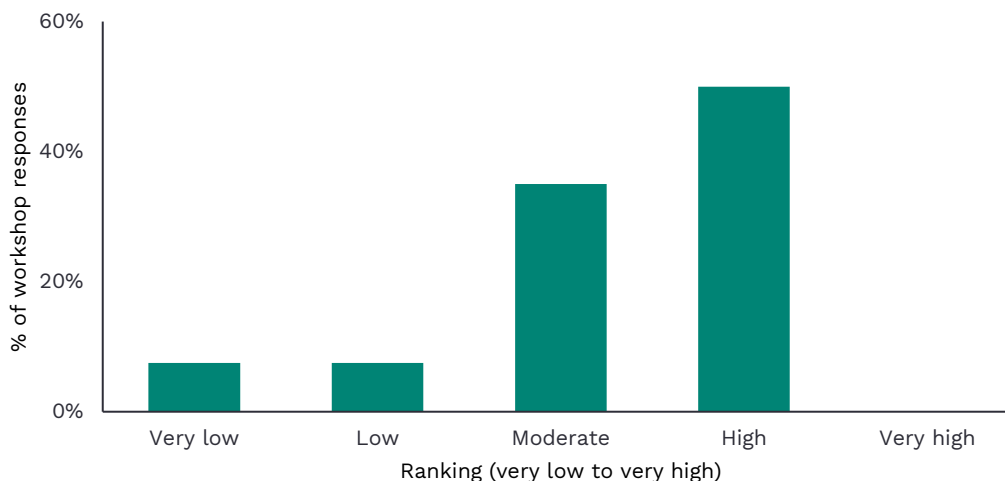


Figure 26: Responses to ETR Workshop question - Which of the APASTI thrusts was the most effective in advancing your STI capabilities?

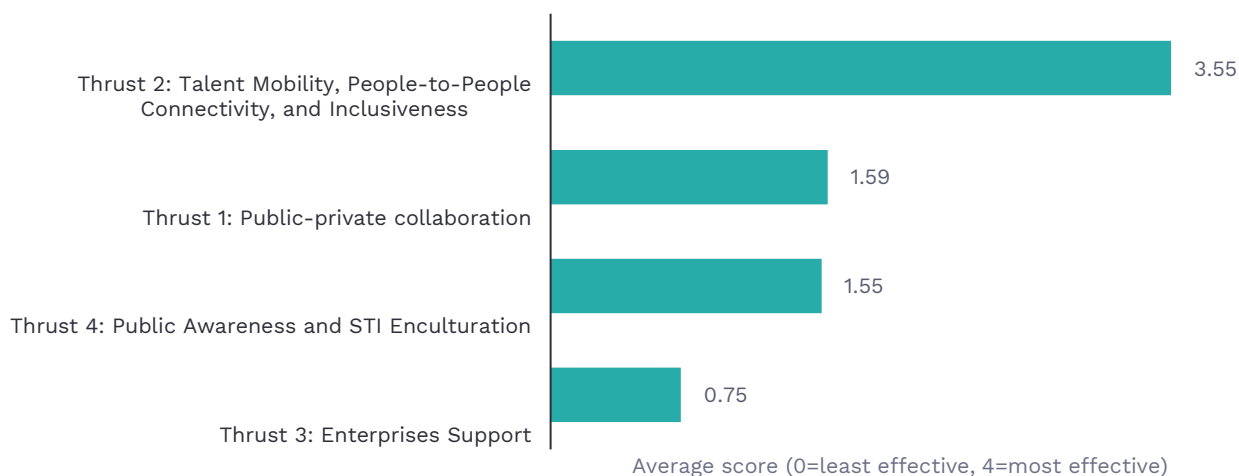


Figure 27: Responses to ETR Workshop question - What changes to subcommittee structures would enhance their effectiveness in implementing the APASTI?

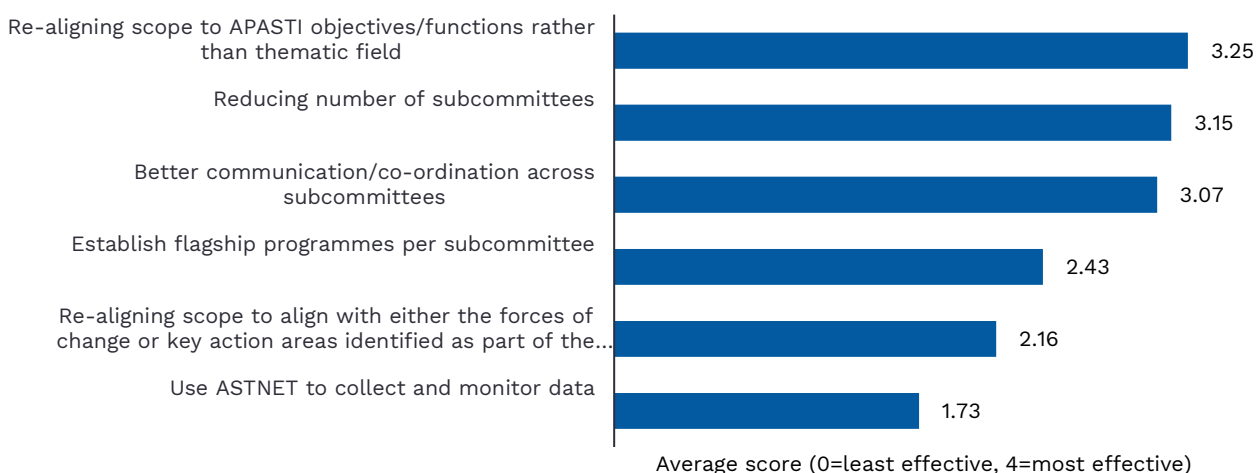


Figure 268: Responses to ETR Workshop question - What have been the top challenges to monitoring and evaluation over the past APASTI?

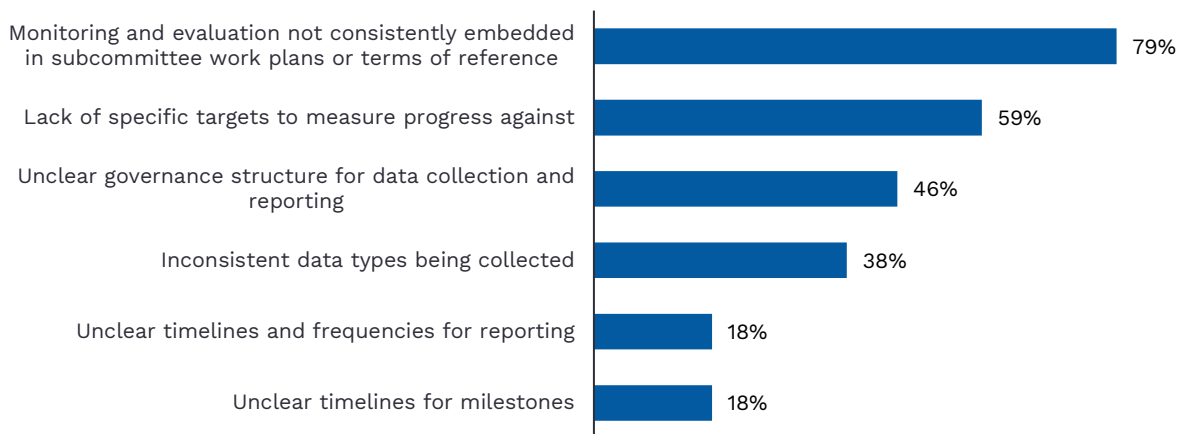


Figure 29: Responses to ETR Workshop question - What sources of resource mobilisation has had the greatest contribution to APASTI driven initiatives?

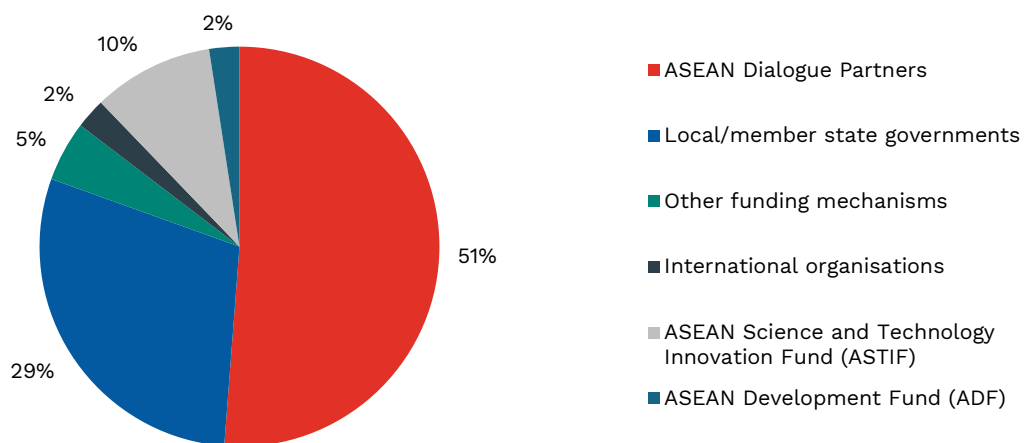
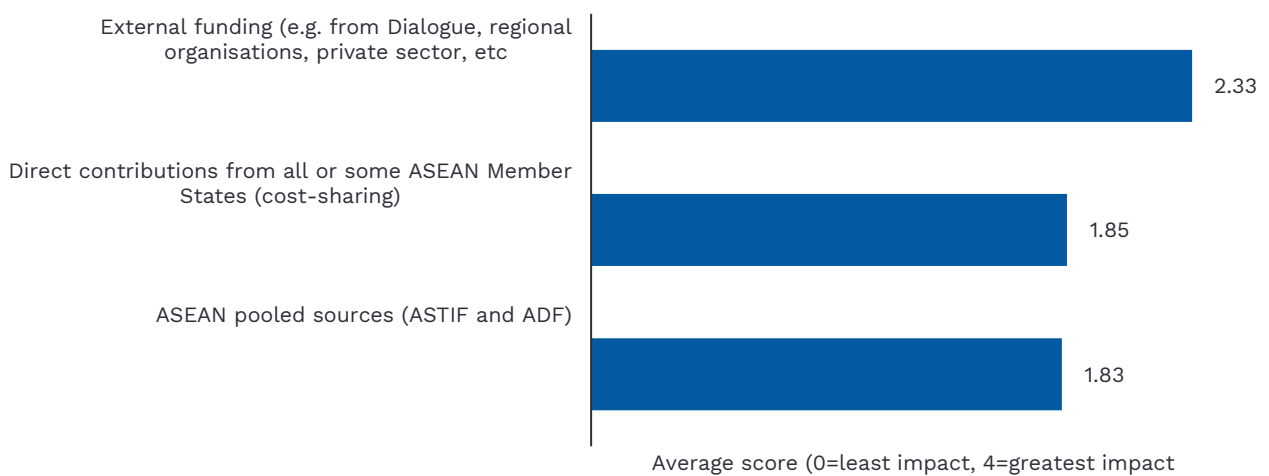


Figure 3027: Responses to ETR Workshop question - Looking forward to the next 10 years, and to ensure sustainability and long-term impact of the APASTI 2026-2035, what mix of resource mobilisation sources would enable the greatest impact for ASEAN?



Appendix 3. Strategic Thrusts Activity per Action

Figure 31: Thrust 1 Action Activity Status

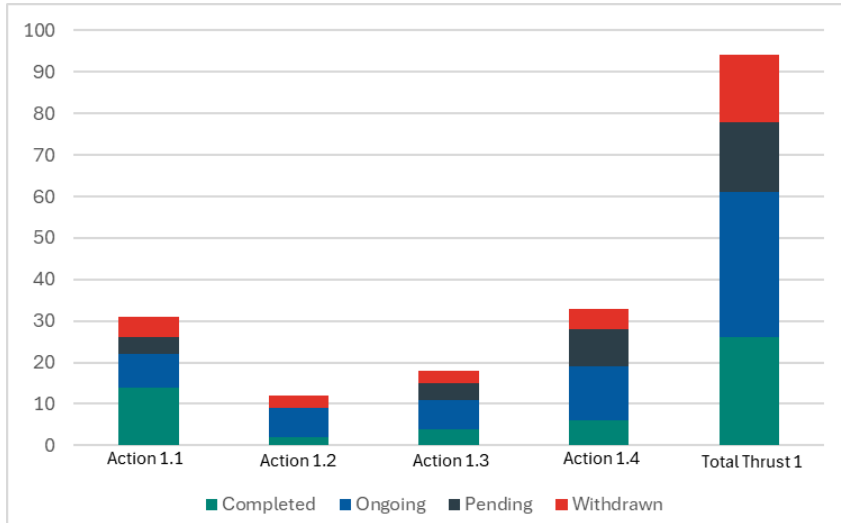


Figure 33: Thrust 3 Action Activity Progress Status

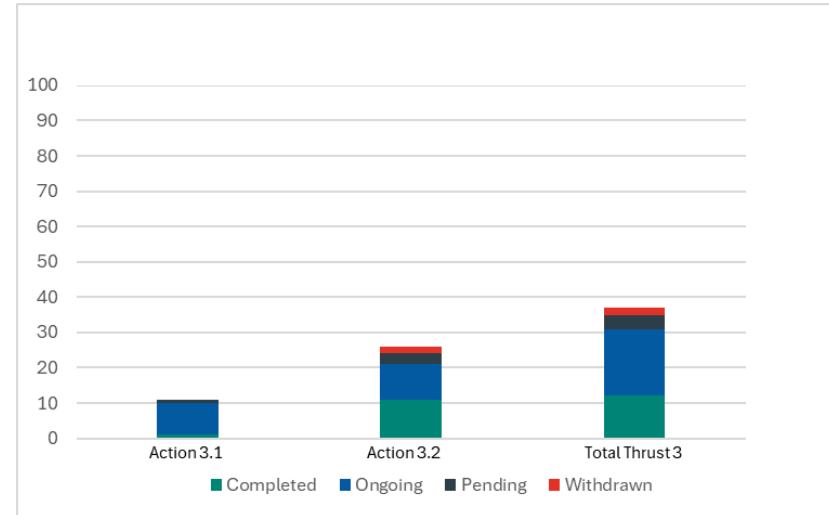


Figure 32: Thrust 2 Action Activity Progress Status

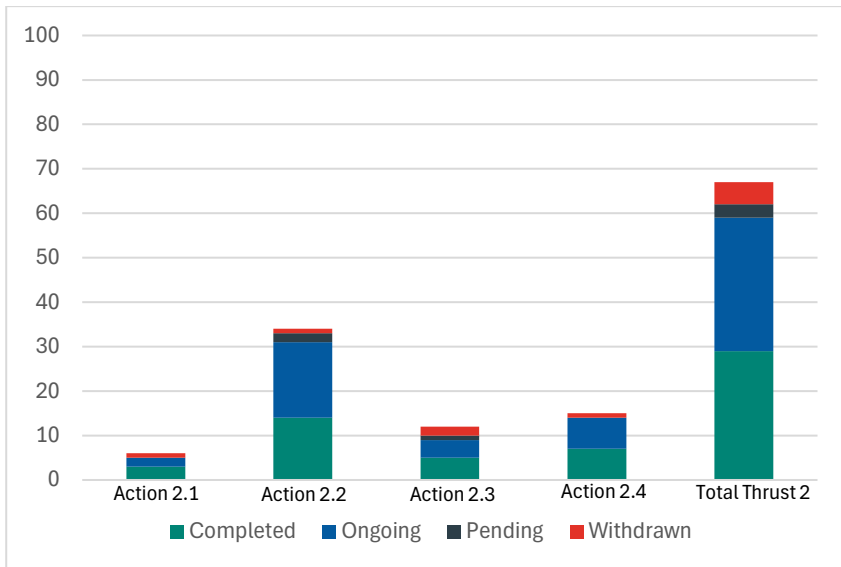
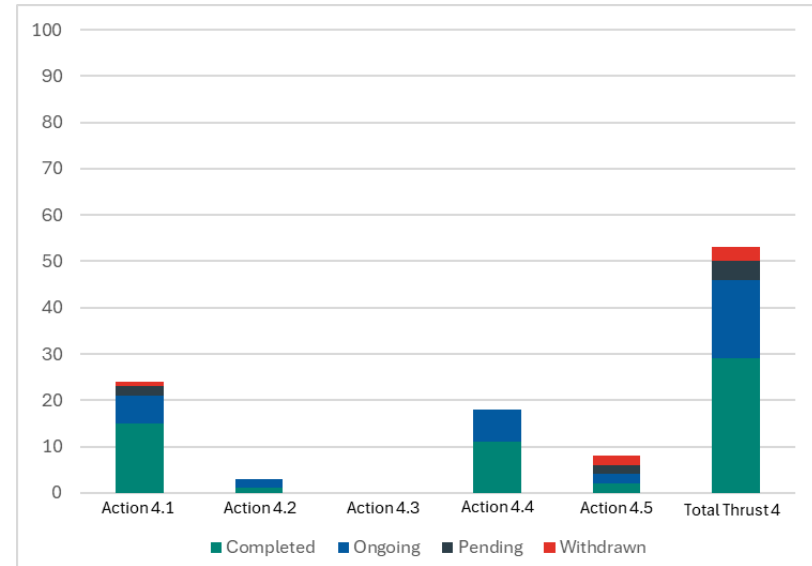


Figure 34: Thrust 4 Action Activity Progress Status



The review of the APASTI 2016-2025 revealed strong alignment with UN SDGs, as summarised below in Figure 35.

Given the extent of implicit alignment between the APASTI 2016-2025 and the UN SDGs and Agenda 2030, there may be an opportunity to directly align targets and initiatives in the APASTI 2026-2035 to SDG goals and targets.

The SDGs and Agenda 2030 offer resources to frame the narrative for the next APASTI and reduce duplication of efforts by adopting relevant strategies from Agenda 2030. Articulating this alignment will allow AMS to report progress on the SDGs as member states to UN and will minimise duplication of effort in the development of the strategy for the next phase for APASTI. It will also be easier to build consensus among member states as they have already agreed to the SDGs and its targets.

Figure 35: Thrust 1 APASTI alignment with SDGs

Sustainable Development Goal	Alignment with APASTI 2016-2025
Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Emphasis on the importance of education and capacity building in STI and creating lifelong opportunities for all
Goal 5: Achieve gender equality and empower all women and girls	Promotes gender equality and empowers women in STI, addressing barriers to participation
Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Fosters innovation and R&D, contributing to economic growth and increased work opportunities
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	Focuses on enhancing regional cooperation, promoting innovation and resilience
Goal 10: Reduce inequality within and among countries	Aims to have STI benefits accessible to all
Goal 13: Take urgent action to combat climate change and its impacts	Promotes sustainable practices and technologies
Goal 17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development	Encourages collaboration across ASEAN, the private sector, and international partners to achieve goals

Appendix 4. Alignment of APASTI activities to AEC Blueprint Strategic Measures

Table 8: Alignment of APASTI activities to AEC Blueprint Strategic Measures

AEC Blueprint Strategic Measure	Completed	Ongoing	Pending	Withdrawn	Total number of activities
SM43, Promote strategic partnerships among academia, research institutions and the private sector towards developing capabilities and creating an effective channel for technology transfer and commercialisation	44%	32%	12%	12%	114
SM44, Information sharing and networking to stimulate ideas and creativity at university and business level	61%	39%	0%	0%	18
SM45, Strengthen the competitiveness of MSMEs in ASEAN through the application of S&T tools and methodologies	9%	82%	9%	0%	11
SM47, Enhance the support system and enabling environment to nurture a highly mobile, intelligent and creative human resource that thrives on knowledge creation and application	50%	33%	0%	17%	6
SM49, Focus support on the development of research and technology parks, joint corporate, government and/or university research laboratories, R&D centres and similar S&T institutions and centres.	22%	39%	22%	17%	18
SM50, Develop and strengthen ASEAN linkage in global and regional R&D networks	17%	58%	0%	25%	12
SM52, Promote programmes that enhance ASEAN participation in global and regional value chains and production networks, including programmes and joint promotions that attract leading technology firms to set up shop in the region, develop industrial clusters and support	18%	39%	27%	15%	33
SM119, Strengthen existing networks and S&T centres of excellence to promote cooperation, sharing of research facilities	17%	58%	0%	25%	12

AEC Blueprint Strategic Measure	Completed	Ongoing	Pending	Withdrawn	Total number of activities
and manpower towards joint research and technology development, technology transfer and commercialisation					
SM120, Enhance the mobility of scientists and researchers from both public S&T institutions and the private sector through exchange programmes and other appropriate arrangements according to the respective laws, rules, regulations and national policies	41%	50%	6%	15%	34
SM121, Establish systems and mechanisms that will increase the engagement of women and young people in STI to promote entrepreneurship.	47%	47%	0%	3%	15
SM122, Raise public awareness of the various achievements derived from ASEAN cooperation in STI	0%	0%	0%	7%	0
SM123, Establish innovative support systems to promote and manage regional enterprise arising from spin-offs and joint ventures	9%	82%	9%	0%	11
SM124, Establish new strategies for partnership with Dialogue Partners and other relevant organisations on mutually beneficial projects	44%	32%	12%	12%	114

Appendix 5. Monitoring and Evaluation

the APASTI could benefit from more detailed planning

The APASTI dedicates less than a page to implementation and review arrangements, stating that:

*'The implementation of the APASTI 2016-2025 shall be reviewed and assessed regularly according to guidelines and criteria to be set up by the BAC. The implementation-focused monitoring system developed by the ASEAN Secretariat to review the ASCC Blueprint implementation may be considered as a useful mechanism. The Sub-Committees shall also undertake assessments of the efficiency and effectiveness of their work programme implementation. Formal reviews of the APASTI implementation can be conducted in 2020 and in 2025 respectively.'*⁷⁰

The Implementation Plan is similarly brief on the topic of monitoring and evaluation, stating:

*'BAC assisted by the ASEAN Secretariat, shall carry out regular monitoring and evaluation of the progress of the APASTI 2016-2025 for submission to COST/AMMSTI meetings. A guidelines/mechanism framework for regular monitoring and evaluation of the APASTI Implementation Plan shall be developed by BAC.'*⁷¹

Further information on guidelines or frameworks developed by BAC for monitoring and evaluation of the APASTI has not been obtained for the purposes of the ETR.

Current APASTI KPIs Measure Volume of Outputs rather than value delivered, or outcomes achieved

For example, Output Indicators listed in section F.1. of the Implementation Plan include:

- Number of users accessing ASTNET and other S&T networks (Action 1.2);
- Number of policy recommendations, guidelines and standards on IPR and technology transfer among centre of excellence and other relevant partners (Action 1.3); and
- Number of collaborations (e.g. trainings, advocacy, consultations, etc.) among other relevant ASEAN bodies institutions on standards and certification (Action 2.3).

Difficulty providing evidence of contribution of APASTI-related STI activities had on Outcome Indicator progress

Given Outcome Indicators are so broad, there are difficulties in understanding the level of contribution at regional and national levels of APASTI-related STI activities. Some indicators are not only impacted by APASTI activities but by other economic and social factors. For example, global events such as COVID-19 or geopolitical tensions may limit the capacity of businesses and governments to allocate surplus funds to R&D. Additionally, the extent of competition, regulation and trade integration with international markets will either catalyse or inhibit R&D expenditure for both private sector firms and the government sector.

⁷⁰ APASTI 2016-2025, p. 69.

⁷¹ APASTI 2016-2025 Implementation Plan, p. 35.

Indicators with defined baselines and targets could significantly enhance the ability to monitor progress more specifically related to activities of the APASTI. For example, the number of Exchange programs, scholarships and internships established are difficult to track on an AMS basis, with evidence of performance against this metric examined in this section from a qualitative perspective only. To progress this Outcome Indicator, the ERA Talent Platform could be utilised to redefine outcome indicators, their baselines and targets for talent mobility in the APAST 2026-2036. Job opportunities across ASEAN can be filtered for mobility incoming, outgoing and travel grants as funding types. Additionally, on top of monitoring jobs and careers, the RelCO proposes to monitor researcher's mobility with standardised indicators.⁷²

KPIs should be clear, specific and measurable

Significant resources can be preserved by drawing from the Sustainable Development Goals (SDGs) and Agenda 2030 Plan of Action for achieving targets set under each SDGs. UN Member states are already committed to working towards these targets and significant work has already been undertaken for compiling them. These targets can act as a starting point in determining the KPIs and additional indicators may be introduced as necessary to best track progress of initiatives under APASTI.

To help ensure KPIs are measurable when developing a monitoring and evaluation framework for APASTI 2026-2035, it is suggested that the SMART model should be used whereby KPIs are specific, measurable, achievable, relevant and time-bound.

Improving data quality and consistency

Current data collection methods vary significantly across SCs and projects, complicating the comparison and aggregation of project impacts. For example, while all SCs have maintained records of planned, ongoing and completed projects, activities and initiatives, the format of records varies between SCs and is often captured in free text. These records make it time-consuming to analyse progress and limits opportunities for comparative and systematic data analysis.

In addition to the above, indicators throughout the APASTI do not appear to have been selected based on the availability of a consistent and accurate data repository. For example, there is no central repository of data for GERD financed by industry and government, nor the number of foreign and local researchers.

To this end, a standardised reporting framework should be a focus of the implementation and monitoring and evaluation planning for the subsequent APASTI (potentially including use of dashboards for summary reporting as noted in the ETR Workshop). In particular this framework should incorporate the below to enable uniformity of data collection and generate comparable metrics that reflect the true progress of STI efforts within their AMS and across ASEAN. This will not only support informed decision-making but also enable the identification of gaps and areas for improvement.

- Include a consistent reporting template and guidance on how to populate particular fields.

⁷² Data from the World Bank Group on medium and high-tech manufacturing industries include chemicals (excl. pharmaceuticals, machinery and equipment, electrical machinery and apparatus, radio, TV, and communications equipment, motor vehicles and other vehicles. Caution should be taken when drawing links between the APASTI and changes to these measures over time.

- Extend to SCs and other governance bodies.
- Use data validation features to restrict the content entered/create consistency.
- Link each activity to the rest of the APASTI (e.g. upstream to actions and downstream to outcomes/outputs) so that measuring success is simpler.

Greater utilisation of ASTNET can also play a pivotal role in this initiative.

ASTNET serves as a valuable platform for information sharing and collaboration among AMS, providing a centralised repository for data related to science and technology activities. By leveraging ASTNET, stakeholders can access real-time data, track progress against key performance indicators, and share best practices more effectively. This centralised approach will facilitate cross-border collaboration, enabling AMS to learn from one another and implement successful strategies in their respective contexts.

It is important, however, that data is not simply collected 'for data's sake'. There is an administrative burden associated with all data collection and reporting, for COSTI, SCs and AMS, meaning that ineffective data collection can lead to inefficiencies and wasted resources. It can also create confusion and overwhelm stakeholders with unnecessary information, making it difficult to focus on what truly matters for evaluating progress and driving effective actions.

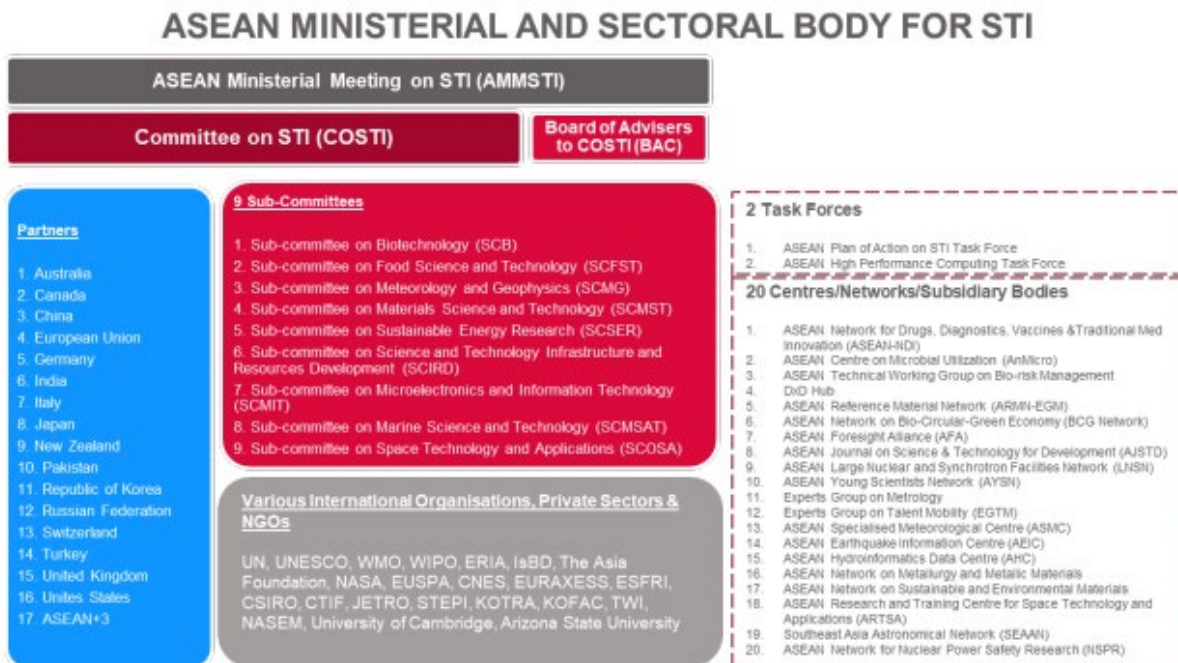
Therefore, it is essential to establish clear objectives for data collection, ensuring that the information gathered is relevant, measurable, and directly linked to the goals of the initiatives being implemented.

Appendix 6. Key Governance Bodies Relevant to APASTI 2016-2025

Table 7: Key governance bodies

Body	Responsibilities – as set out in APASTI 2016-2025	Responsibilities – as set out in Implementation Plan
ASEAN Ministerial Meeting on Science and Technology (AMMSTI)	Establish policies for ASEAN cooperation in STI.	Provide overall guidance and advice on implementation of APASTI. Provide further direction and guidance on future programmes/activities to address key issues, challenges and common interest identified in APASTI and ASEAN Community Blueprint.
Committee on Science and Technology (COST) <i>Note: now Committee on Science, Technology and Innovation (COSTI)</i>	Operationalising and translating the APASTI strategic thrusts into specific actions. Creating public awareness of regional S&T activities and their contribution to economic development. Reviewing overall progress of collaboration, including the progress of its relations with the ASEAN's Dialogue Partners and other external collaborators.	Initiate, direct and oversee the development, monitoring and implementation of programmes and activities of COSTI and its subsidiary bodies.
Board of Advisers to COSTI (BAC)	Take the lead in developing a more detailed implementation plan for the APASTI 2016-2025. Formulation of criteria for the selection of STI projects to be supported by the ASTIF.	Establish appropriate performance review mechanisms. Assess the progress of implementation of the various initiatives of ASEAN COSTI SCs according to their respective work plans. Facilitate the development, monitoring, review and assessment of the APASTI 2016-2025.
COSTI SCs	Develop their respective work programmes that would clearly describe the targets, milestones and strategies in implementing specific activities consistent with their new thematic priorities and the APASTI goals and strategic thrusts, in general. The SCs are expected to assess the effectiveness and impact of their projects in strengthening the regional S&T capabilities.	Undertake assessments of specific programmes and activities under their respective work plans in support the SCs thematic priorities of the APASTI 2016-2025.
ASEAN Secretariat		Assist COSTI, BAC and SCs in facilitating the implementation of the APASTI Implementation Plan.

Figure 36: APASTI 2016-2025 governance structure⁷³



Source: ASEAN Secretariat. Updated in July 2023.

⁷³ Mid-Term Review, p. 29.