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AEC BLUEPRINT 2025 ANALYSIS

AN ANALYSIS OF THE ASEAN COOPERATION IN SCIENCE AND TECHNOLOGY

Foreword

The AEC Blueprint Analysis series is a publication which seeks to provide insight into the ASEAN Economic Community Blueprint (AEC) 2025. The publication will seek to do so by adopting a holistic approach in its analysis; creating context by examining past achievements, defining present challenges, and discussing future plans. The series will pay special attention to strategic measures outlined within the AEC's new blueprint, providing insights with regards to the viability of regional economic integration under the AEC.

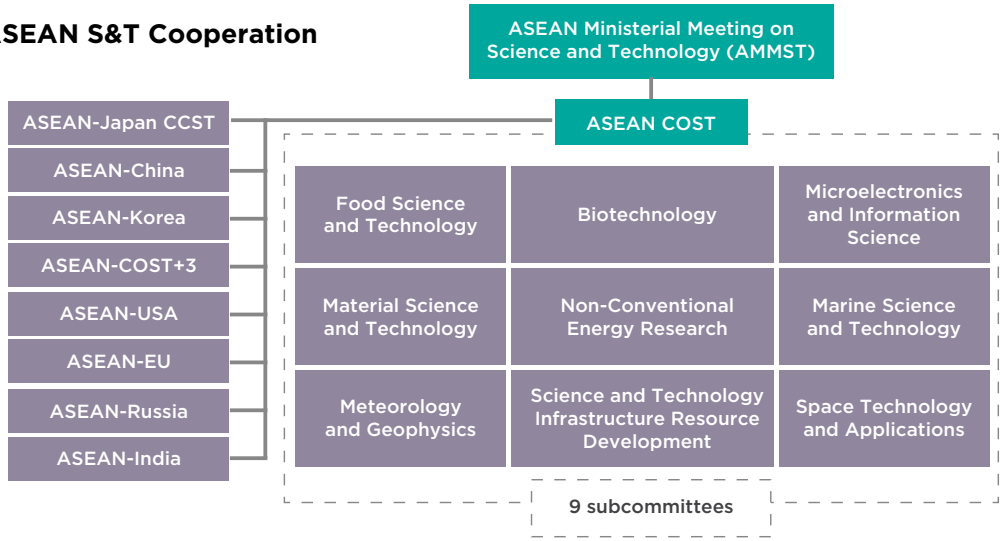
ASEAN Cooperation in Science and Technology (S&T)

The importance of S&T in supporting the ASEAN economic cooperation was already acknowledged back in 1970 when the ad-hoc Committee on Science and Technology met in April 1970 in Jakarta, Indonesia to discuss enhancement of S&T cooperation. In 1997 the 2nd ASEAN Informal Summit in Kuala Lumpur, Malaysia, adopted the ASEAN Vision 2020 which endorsed the vision of "a technologically competitive ASEAN competent in strategic and enabling technologies, with an adequate pool of technologically qualified and trained manpower, and strong networks of scientific and technological institutions and centers of excellence." With a view that rapidly advancing countries have strong support from their S&T sector, ASEAN has continued to strengthen their cooperation in this area and ASEAN Community blueprints for 2008-2015 and 2016-2025 have placed a strong emphasis on the measures that need to be implemented to promote S&T cooperation and bridge the gap across the region.

In the previous ASEAN Community Blueprint 2008-2015, the ASEAN S&T cooperation was under the pillar of ASEAN Socio-Cultural Community (ASCC) but in the new blueprint that will guide the establishment of ASEAN Community in 2016-2025, its is included within the AEC pillar, making it more relevant in supporting economic cooperation among member states. This report will look at and evaluate the progress made to date under the ASCC Blueprint 2015, analyse the measures under the new AEC Blueprint 2025, and make some recommendations on the implementation side.

Given the long history of ASEAN S&T sector, it has covered many areas. The structure of ASEAN S&T cooperation is given in figure 2. Each area is handled by a sub-committee who regularly meets to discuss the progress and plan ahead to improve the implementation. The figure also shows the dialogue partners that have been formally supporting ASEAN in developing the sector.

Figure 1: Structure of ASEAN S&T Cooperation



Source: Current Status on Science and Technology in ASEAN Countries, CDRS, Japan Science and Technology Agency, September 2015, p.8

A. Targets under the AEC 2015 Blueprint

S&T cooperation in ASEAN under the ASCC was specifically under the first pillar of enhancing human development in the regionThe strategic objective was to develop policies and mechanisms to support active cooperation in research, science and technology development, technology transfers and commercialisation and establishment of strong networks of scientific and technological institutions with the active participation of private sector and other relevant organisations.

The strategic actions that were envisaged to achieve the above objective include:

1. Establish a network of S&T centres of excellence to promote cooperation, sharing of research facilities, technology transfer and commercialisation, and joint research and technology development by 2011.
2. Strengthen collaborative research and development (R&D) in applied S&T to enhance community well-being.
3. Facilitate the exchange and mobility of scientists and researchers from both public S&T institutions and private sector according to the respective laws, rules, regulation, and national policies.
4. Establish strategic alliances with private sector to promote R&D collaboration and technology transfer and commercialisation.
5. Establish ASEAN scholarship and fellowship opportunities to support the **ASEAN Virtual Institute of Science and Technology (AVIST)** and other related science activities.
6. Heighten the awareness on applied S&T for sustainable development, develop a core set of S&T indicators that can serve as input in the development of human resource strategies by economic and industry planners.
7. Enhance and sustain the utilisation of the **ASEAN Science and Technology Network (ASTNET)** and other S&T networks.
8. Promote the development, use and sharing of digital content among ASEAN member states.

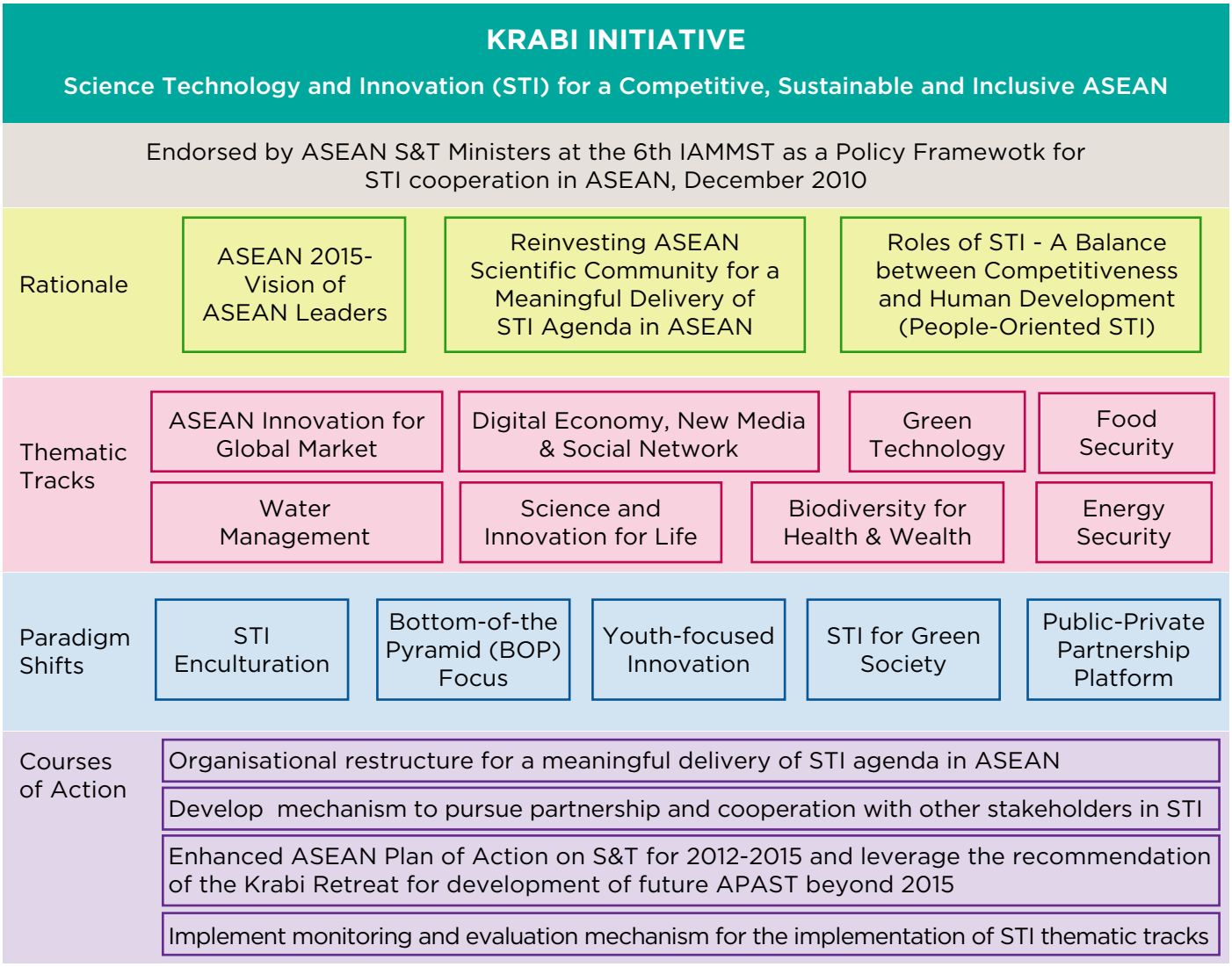
Specifically, the **ASEAN Plan of Action on S&T (APAST) 2007-2011** outlines the main strategic thrusts that aim to enhance ASEAN's S&T capability. These include:

1. Intensify R&D collaboration and technology commercialisation;
2. Develop S&T human resources;
3. Network S&T centers of excellence and programmes;
4. Promote S&T awareness and utilisation;
5. Strengthen S&T infrastructure and support systems; and
6. Forge closer cooperation with dialogue partners.

Measures under the two documents (ASCC Blueprint 2015 and APAST 2007-2011) seem more or less consistent in terms of what ASEAN member states plan to do to develop this sector.

In December 2010, ASEAN introduced the Krabi Initiative with the vision of increasing competitiveness, sustainability and inclusivity in ASEAN through Science, Technology and Innovation (STI)[1]. The ASEAN Krabi Initiative has been used to enhance the APAST 2011-2015 and used as a reference in the formulation of the next APAST for post-2015. The initiative focuses on eight thematic tracks:

1. ASEAN Innovation for Global Market,
2. Digital Economy, New Media and Social Networking,
3. Green Technology,
4. Food Security,
5. Energy Security,
6. Water Management,
7. Biodiversity for Health and Wealth, and
8. Science and Innovation for Life.



Source: ASEAN Krabi Initiative, National Science, Technology and Innovation Policy Office

[1] ASEAN Krabi Initiative, National Science, Technology and Innovation Policy Office (Thailand)

B. Significant Achievements to Date

- The progress made in S&T under the ASCC Blueprint 2015 is described below.

Area	Progress
Establishment of network of S&T centers of excellence to promote cooperation, sharing of research facilities, technology transfer and commercialisation, and joint research and technology development by 2011.	• Under the auspices of the **ASEAN Ministerial Meeting on Science and Technology (AMMST)** and **ASEAN Committee on Science and Technology (COST)**, the ASEAN Science and Technology Network (ASTNET) was established in 1997 as an ASEAN-wide electronic based technology information network and as a gateway to interconnect ASEAN S&T information resources to internal S&T and industrial databases. The ASTNET supports administration, monitoring and coordination of plans and programs of ASEAN COST to improve cooperation and coordination among ASEAN member countries. • The **ASEAN Science Fund (ASF)** was established to provide funding for various programmes, projects and activities under ASEAN S&T cooperation, as identified and approved by the ASEAN COST. Contributions by the member states make up the ASF but New Zealand, an important Dialogue Partner made a contribution to the ASF.
Stronger collaborative R&D in applied S&T to enhance community well-being.	• Many projects have been implemented to promote strong collaboration in R&D in applied S&T, mainly with the important ASEAN dialogue partners. • With the EU, S&T cooperation was conducted under the SEA-EU-NET initiative[2] which covered different areas such as (tsunami) early warning systems, sustainable aquaculture, aquatic ecosystems and fisheries, Indo-Pacific reefs restoration, animal health, tropical peatland restoration, metabolomics technology for plants and health, monitoring of food chain quality and safety, vaccination to poverty-related diseases, and dengue prevention and control. • Similar type of collaboration with the US was conducted under the ASEAN-US Science and Technology Fellowship[3], which focused on three priority areas: (i) sustainable energy to promote use of efficient, environmentally-friendly, clean, and renewable energy, (ii) climate change and climate variability to find strategies to mitigate the impacts of climate change on cities, communities and ecosystems, and (iii) science, technology and innovation (STI) policy to accelerate scientific activity or technology transfer, address intellectual property rights, foster collaboration between science and industry, catalyse STI investments, and promote entrepreneurship. • One important partner for ASEAN in this sector was Japan. Under the framework of East Asia Joint Research Program (e-Asia JRP)[4], collaboration took place in the areas of nanotechnology/materials, biomass, plant science, infectious diseases, disaster prevention, and advanced inter-disciplinary research towards innovation.

[2] Scientific and Technological Cooperation between the Association of Southeast Asian Nations (ASEAN) and the European Union: Past Achievements and Future Prospects, EU Commission, 2008

[3] United States Agency International Development

[4] R&D Collaborative Programs with ASEAN, presentation by Osamu Kobayashi of the Japan Science and Technology (JST) Agency, March 2014

Area	Progress
Exchange and mobility of scientists and researchers from both public S&T institutions and private sector according to the respective laws, rules, regulation, and national policies.	• Currently, ASEAN does not yet have a mutual recognition arrangement (MRA) for S&T professionals, and therefore any form of exchange and movement of scientists and researchers across the region cannot yet be facilitated. • One of the objectives of the Krabi Initiative was to promote mobility of S&T professionals to address the demand for such talents to enhance member states' S&T capabilities in order to strengthen national and regional STI initiatives and programs. However, there was no significant progress on the implementation of this idea.
Strategic alliances with private sector to promote R&D collaboration and technology transfer and commercialisation.	• Collaboration with the relevant stakeholders, including the private sectors, has been included in many plans and roadmaps, particularly those with the dialogue partners. However, there has not been any concrete implementation yet. More collaboration, as mentioned above, has been conducted with the government agencies of ASEAN's dialogue partners.
ASEAN scholarship and fellowship opportunities to support the ASEAN Virtual Institute of Science and Technology (AVIST) and other related science activities.	• AVIST is a virtual learning network for continuing professional development and advanced studies in science and technology. In January 2002, the pilot site of AVIST was set up by the Thailand Graduate Institute for Science and Technology (TGIST) and the Asian Institutes of Technology (AIT). AVIST courses are developed using the Vclass platform developed by AIT. Since AVIST is a virtual institution, it does not have its own physical set up, but rather the universities that participate in this initiative serve as the physical site. • The activities that AVIST organised are in the areas of technology and innovation management, sustainable ecotourism development, bioinformatics, mangrove ecosystem and management, marine coastal ecosystem, and integrated tropical coastal zone management.
Greater awareness on applied S&T for sustainable development, and development of a core set of S&T indicators that can serve as input in the development of human resource strategies by economic and industry planners.	• In 2014, 2015 and 2016, the Thailand National Science and Technology Development Agency (NSTDA) collaborated with the STS Forum Japan and the Japan External Trade Organization (JETRO) to hold workshops on Innovation, Science and Technology for Sustainable Development to discuss new strategies on human network that could resolve problems from the application of S&T. • Supported by the ASEAN Foundation, the ASEAN COST has completed a project on S&T Human Resources Development Programme (Phase 1). The project aims to provide training through non-degree programmes (short courses), promote short-term exchange of research personnel, and provide opportunities for on-the-job training programmes.

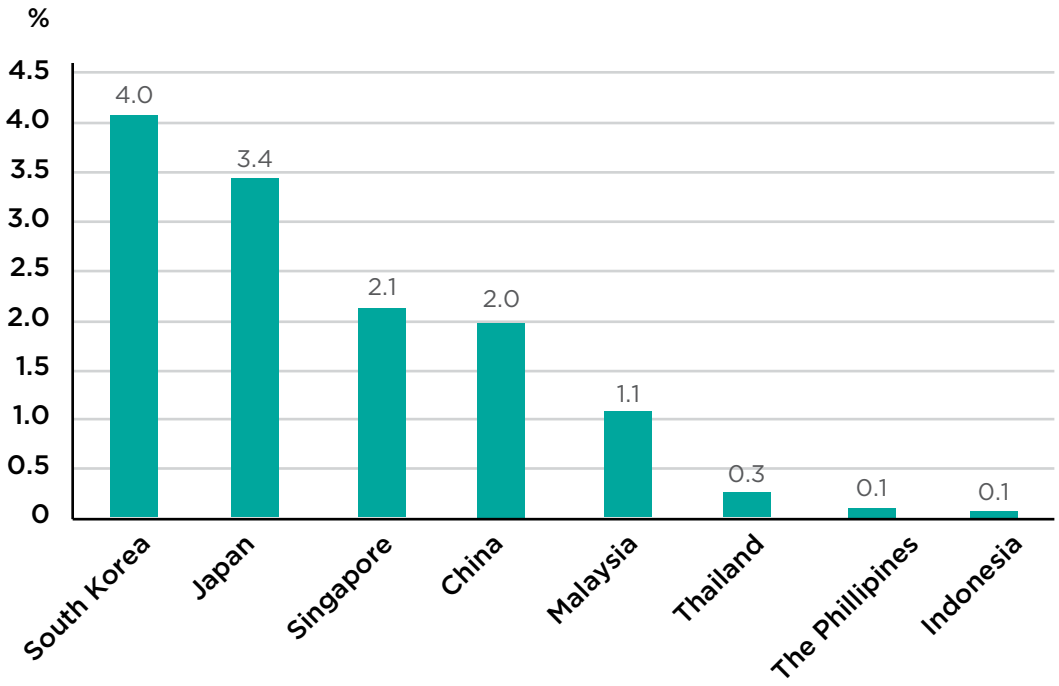
Area	Progress
Enhance and sustain the utilisation of the ASEAN Science and Technology Network (ASTNET) and other S&T networks.	• As explained above, the ASTNET is the flagship program of the ASEAN COST in connecting the S&T resources in the ASEAN region. Another network is the South East Asia Research Network (SEARN) which is housed under the London School of Hygiene and Tropical Medicine (LSHTM). Its focus is strengthening collaboration among the member states on tropical medicine and communicable diseases. • TDR, which is a forum of collaboration on research for diseases of poverty between UNICEF, UNDP, World Bank and WHO, established the Network for Drugs, Diagnostics, Vaccines and Traditional Medicines Innovation (ASEAN-NDI) as a forum for ASEAN researchers to work
Promotion of the development, use and sharing of digital content among ASEAN member states.	• AVIST is the digital platform which provides training programmes for ASEAN researchers.

C. Current Issues and Challenges

Lack of resource mobilisation and funds for S&T

- There are challenges in developing the ASEAN S&T sector[6]. The first is commitment from various government on implementation and resource mobilisation. While member states have agreed to work together as early as 1970, the sector still has not received much attention from governments. In terms of government expenditure on R&D, Singapore is the only ASEAN country whose S&T expenses as a percentage of GDP rank among those of the advanced economies (in the Asia Pacific region)[7]. Figure 3 describes S&T expenditure as a percentage of GDP of major East Asian economies. Malaysia and Thailand come next after Singapore, while the Philippines and Indonesia still spend around 0.1 percent of their GDP for R&D. The remainaing member states, namely BCLMV are still focusing on nation-building and infrastructure development.

Figure 3: Expenditure on R&D as percentage of GDP of East Asian economies (as of 2015)



Source: Current Status on Science and Technology in ASEAN Countries, CDRS, Japan Science and Technology Agency, September 2015, p.10

Lack of collaboration

- The next challenge comes from the lack of effective coordination mechanism as member states continue to work in silos. Despite the strong commitment by the AMMST and COST, most R&D activities are still carried out by individual countries and not under the regional framework.
- The progress of the ASEAN S&T sector relies on projects implemented in collaboration with other parties. Itrequires a strong monitoring and evaluation (M&E) system to measure the progress and come up with the plan of action based on the results of the M&E.t. Overall, the AEC Blueprint 2025 has a more detailed yet flexible strategic action plan and list of key performance indicators (KPIs) to provide a benchmark for targets and objectives and this willserve as the M&E mechanism for the measures implemented.

[6] ASEAN Cooperation in Science and Technology: towards Building the ASEAN Community, Alexander Lim, 2014
[7] Current Status on Science and Technology in ASEAN Countries, CDRS, Japan Science and Technology Agency, September 2015

Reliance on dialogue partner

- The sector has relied so much on small projects, usually in collaboration with dialogue partners and international organisations Progress in the sector will require regional initiatives to improve the cooperation and ensure that all member states are equally committed to implementing the agreed action plans. Small-scale national projects, while they can be useful, do not have the same impact as consistent and well-planned regional initiatives with common and agreed objectives. Stakeholders involved do not have strong ownership of the outcomes of the activities therefore have very little incentive to carry out follow-up activities. plan of action based on the results of the M&E.t. Overall, the AEC Blueprint 2025 has a more detailed yet flexible strategic action plan and list of key performance indicators (KPIs) to provide a benchmark for targets and objectives and this willserve as the M&E mechanism for the measures implemented.

D. Plans under the AEC 2025 Blueprint

For 2016-2025, the ASEAN S&T cooperation has been moved to the AEC pillar. This is likely based on the notion[8] that a single market would spur more cross-border movement of R&D professionals and therefore promote enhancement of S&T across the region, and that successful economic cooperation will greatly depend on how well member states can advance their S&T to support economic development and growth.

That notion above is further reiterated in the new AEC blueprint commitment to utilise science, technology and innovation (STI) to support and sustain economic growth and competitiveness. The ASEAN Plan of Action on Science, Technology and Innovation (APASTI) 2016-2025 and its implementation plan will be the important reference in achieving that objective. The strategic measures involved include:

i. Strengthen existing networks of S&T centers of excellence to promote cooperation, sharing of research facilitates and manpower towards joint research and technology development, technology transfer and commercialsation.
ii. Enhance mobility of scientists and researchers from both public S&T institutions and private sector through exchange programmes and other appropriate arrangements, according to the respective laws, rules, regulations and national policies.
iii. Establish systems and mechanisms that will increase the engagement of women and youth in STI to promote entrepreneurship.
iv. Raise public awareness of the various achievements derived from ASEAN cooperation in STI
v. Establish innovative support systems to promote and manage regional STI enterprise arising from spin-offs and joint ventures.
vi. Establish new strategies for partnership with dialogue partners and other relevant organisations on mutually beneficial projects.

[8] Asian Scientist, UNESCO: ASEAN Economy Community Likely To Spur Scientific Cooperation

E. AEC 2025 Blueprint Analysis

- Measures under the new AEC blueprint are listed in the table below with some analyses on the progress on each measure.

Issues	Current Status and Development
1 Networks of S&T centres and sharing of research facilities and manpower	
Strengthen existing networks of S&T centers of excellence to promote cooperation, sharing of research facilitates and manpower towards joint research and technology development, technology transfer and commercialisation.	• As explained before, the ASTNET remains the most important work under the AMMST. The ASTNET serves as a technology information network to connect ASEAN S&T information resources to internal S&T and industrial databases. • In terms of technology commercialisation, there are substantial gaps across ASEAN in connecting the outputs of R&D and their applicability in business. Singapore is at the forefront[9], with its R&D contributing to the development of industry, which in turn provides earnings for the population. As a result, progress of S&T in Singapore has been relatively fast compared to its neighbours. • R&D by the private sector in Singapore has also flourished with more patents applied, awarded and owned compared to those by the public sector, signalling that commercialisation of R&D outputs has been taken seriously. • **Malaysia's National Policy on Science, Technology & Innovation (NPSTI)** for 2013-2020 includes strong component of commercialising the results of R&D and enhancement of the human resources to support that objective. The national policy is currently being implemented. In addition, the Science to Action (S2A) program aims to vitalise the S&T activities and pass on the returns to society.
2 Mobility of scientists and researchers	
Enhance mobility of scientists and researchers from both public S&T institutions and private sector through exchange programmes and other appropriate arrangements, according to the respective laws, rules, regulations and national policies.	• To date ASEAN does not have an MRA to facilitate the free movement of S&T professionals and researchers. There has been any improvement in the mobility of talents, resulting in an unequal distribution of scientists and researchers across the region. This has further widened the gap between the more advanced and less developed countries in ASEAN. • Mobility has taken place in the form of exchange programmes for young researchers. This involves involves collaborationwith a dialogue partner.For example, the ASEAN-China Talented Young Scientist Visiting Program, where young scientists from ASEAN (under 45) are sponsored to work for a short period of time in universities or research centers in China.
3 Engagement of women and youth to promote entrepreneurshipand youth in STI to promote entrepreneurship.	
Establish systems and mechanisms that will increase the engagement of	• The first real event that recognised the relationship between women entrepreneurs and S&T was the recent conference organised by the ASEAN Women Entrepreneurs Network (AWEN) and the Women's Business Council of the Philippines (Womenbizph) in March 2017[10]. The

[9] Current Status on Science and Technology in ASEAN Countries, CDRS, Japan Science and Technology Agency, September 2015

Issues	Current Status and Development
women and youth in STI to promote entrepreneurship.	two-day event focused on opportunities for women entrepreneurs in ASEAN to grow their business through the use of technology and innovation, under the theme of "Science, Technology, Engineering, Arts, and Mathematics" (STEAM). • In July 2016, the Malaysia External Trade Development Cooperation (MATRADE) and the Malaysian Association of ASEAN Young Entrepreneurs (MAAYE) held the ASEAN Young Entrepreneurs Carnival 2016[11]. The event saw the launching of the Incubator Programme for
4 Public awareness of achievements in STI cooperation	
Raise public awareness of the various achievements derived from ASEAN cooperation in STI.	• Under the auspices of the ASEAN COST, member states take turns to host the Science Congress and Sub Committee Conference of ASEAN[12]. It is held triennially, the last of which was in 2014 in Bogor, Indonesia. The conference aimed to encourage networking, partnership and cooperation as well as technology transactions among policy makers, scientists, engineers, business players, industrial practitioners, from ASEAN member states, their counterparts from the international S&T community, and the private sector, to promote S&T culture-based-community and to accelerate human resources development. Special attention was paid to increasing S&T awareness among ASEAN's younger generation including undergraduates and post graduate students.
5 Innovative support systems to promote and manage STI enterprise	
Establish innovative support systems to promote and manage regional STI enterprise arising from spin-offs and joint ventures.	• This is a new measure and member states are still working out how to implement it. However, there are events that have more or less similar objectives. • Under the OECD – Southeast Asia Regional Programme, the ASEAN Regional SME Policy Network (SME RPN) meetings are held annually. The last SME RPN meeting in June 2016 in Singapore emphasised on the productivity ASEAN SMEs and addressing it by promoting the use of information and communication technology (ICT).
6 New strategies for partnership with dialogue partners and other organizations	
Establish new strategies for partnership with dialogue partners and other relevant organisations on mutually beneficial projects.	• The current partnerships established with dialogue partners, as shown in Figure 2, have worked quite well, with each partner supporting activities or projects in different S&T areas. Perhaps what is needed is development of regional initiatives that could further elevate the quality of achievement in the cooperation, taking advantage of the existing support from the partners and international organisations.

[10] Association of Southeast Asian Nations, ASEAN women entrepreneurs to harness technology and innovation for growth

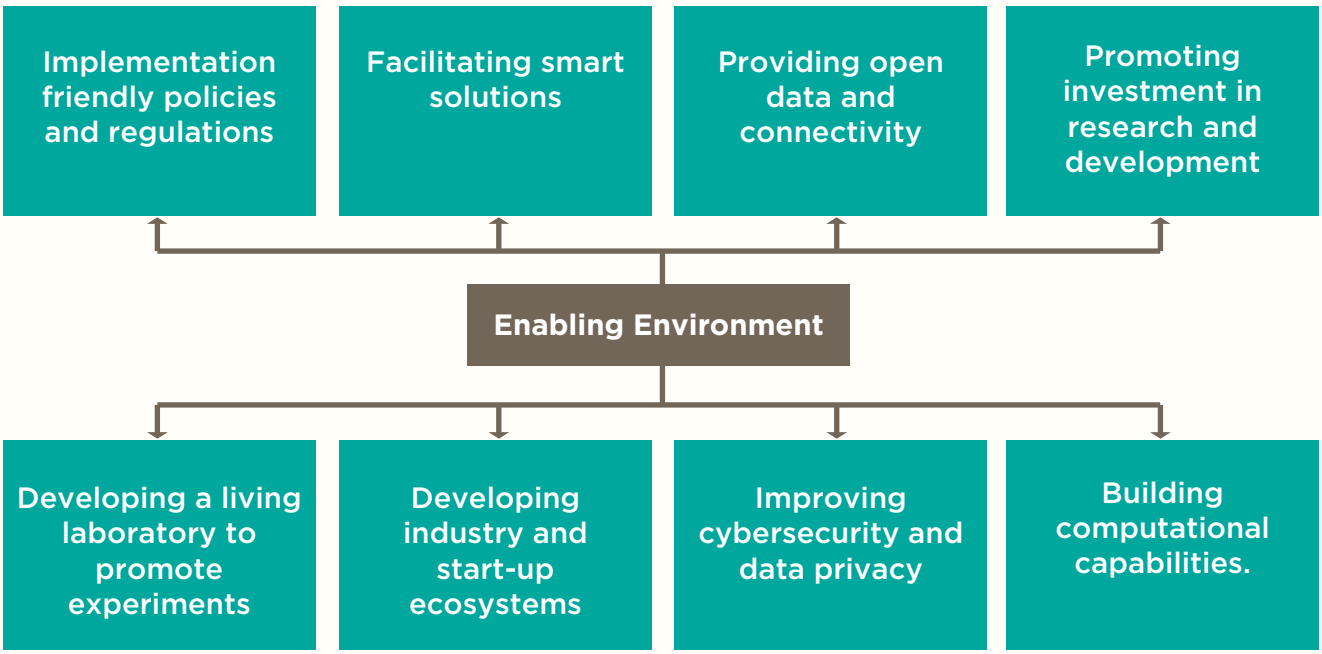
[11] Malaysia External Trade Development Corporation, Malaysia Champions ASEAN Young Entrepreneurship Agenda Through The 1st Asean Young Entrepreneurs

[12] Science and Technology Innovation in food, energy, water and related topics for ASEAN development

Singapore: Leading Technology Advancement and Utilisation in ASEAN

In November 2014, Prime Minister Lee Hsien Loong launched Singapore's Smart Nation initiative with the aim of creating better living conditions for all Singaporeans. The development and adoption of technology and networks will support his by providing solutions to everyday problems in the lives of the people Areas where digital technology is expected to improve efficiencies include transport, home and environment, business productivity, health and enabled ageing, and public sector services. The Smart Nation initiative is a dynamic collaboration between the people, who are invited to raise ideas to solve everyday challenges, and work with the government, who are responsible for putting in place the infrastructure, policies and enabling environment to encourage this innovation.

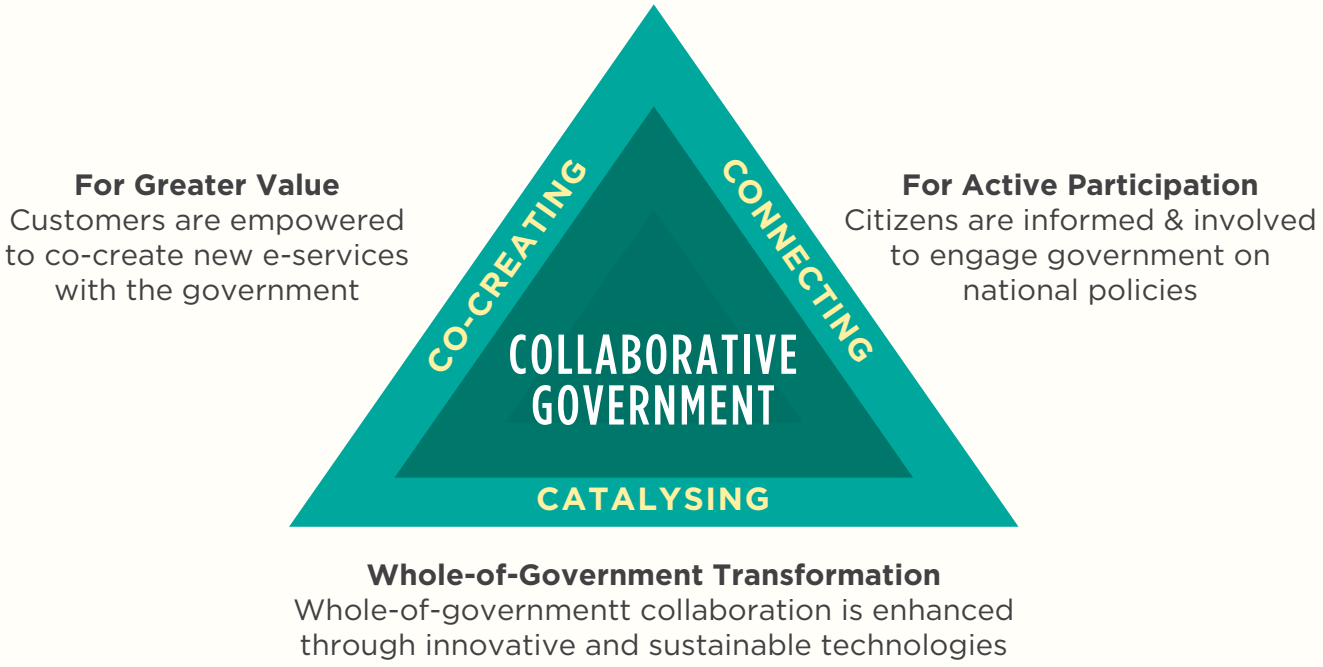
It is important to note that the Singapore government, through the Smart Nation and Digital Government Office (SMDGO) under the Prime Minister's Office, plays a crucial role in developing an environment that enables stakeholders to conveniently express their innovative ideas and begin work to fully operationalise them.



One important element that has improved the lives of Singaporeans is the use of ICT in public administration and delivery of government services. This has led to an improvement in convenience, productivity and efficiency when servicing people[13]. The current master plan, which is the eGov2015, promotes collaboration between government, private sector and people to discover new solutions to daily challenges. This builds on the success of the previous master plan: eGov2010, which resulted in 87 percent of the people satisfied with the quality of government's e-services, and 93 percent of them willing to recommend others to utilise the e-government services.

Governance of the e-government initiative is under the Ministry of Finance (MoF), who provides funding for e-government programmes and projects, Infocomm Development Authority (IDA) of Singapore, which serves as the Government Chief Information Officer (CIO), as well as CIOs of government agencies. This partnership is aimed at developing and implementing e-government programmes under three strategic thrusts: (i) co-creating for greater value, (ii) connecting for active participation, and (iii) catalysing whole-of-government transformation, as described by the figure below.

[13] Building a digital government in Singapore, Centre for Public Impact



Source: eGov 2015 Masterplan, Ministry of Finance, Singapore

Examples of important outcomes of the e-government program include[4]:

- **SingPass**

The Singapore Personal Access, introduced in March 2003, allows access to government e-services through a single platform, providing security for users and allowing the relevant ministries/agencies to leverage on it. In 2015, the SingPass was enhanced with options to customise the SingPass ID, mobile-friendly features, and stronger security capabilities.

- **data.gov.sg**

Launched in 2011, the portal provides access to publicly available government data and applications developed using government data. More than 60 government agencies contribute to the datasets, covering themes such as business, economy, housing, urban planning, etc. These datasets are free to use and are expected to support and encourage development of innovative ideas to solve challenges faced by Singaporeans.

- **eCitizen**

The portal was introduced in 1999 to provide information on government services. It introduced the concept of cross-agency, citizen-centred government services, through one single platform. It has made the way in which people access and transact for government services more efficient.

F. Conclusion: Moving Forward with the AEC 2025 Plans

In the younger member states of ASEAN, funding may be an issue as the governments' priorities are more on other sectors of the economy, particularly infrastructure. As a result, fully relying on government budget to develop the S&T sector may delay the progress that could otherwise be achieved. This is why ASEAN has established the ASEAN Science Fund and the ASEAN Innovation Fund. Utilisation of these funds must ensure that the targets set out in the plan of action can be systematically attained to realise the contribution of STI to the AEC.

Member states should strengthen the linkage between R&D and its applicability to business and industry. This could be improved via joint research that involves personnel from all the stakeholder groups , including businesses who have a better understanding of markets and consumer preferences. If such synergy can be established, commercialisation of R&D outputs will no longer be an issue, and R&D will be an important contributor to the success of the private sector. ASEAN can learn from Singapore's success in managing the sector and creating policies that support the progress.

The gaps in the progress of R&D in the ASEAN region could be addressed by allowing the S&T professionals to move freely across the region for better distribution of talents. To achieve this, the ASEAN bodies on S&T professionals must start to work on an MRA to facilitate freer mobility, which in the end could accelerate more even development of the sector across the ASEAN region.

Governments should have stronger dialogue and cooperation with the private sector who is the most important user of R&D. This could bridge the gaps and encourage greater progress through more efficient allocation of resources and implementation of the outlined AEC action plans.

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