

Development And Achievements Of Science, Technology & Innovation Policy In ASEAN Countries: A Comparative Analysis Of Malaysia In Transition Stage With Myanmar, Cambodia And Laos In Developing Stage

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Abstract

ASEAN formally came into being in 1967 and sole purpose of developing this association was to accelerate economic growth, cultural development and social progress. To achieve the vision, ASEAN member nations kept their focus on development and implementing science technology and innovation policy. For this study desktop research was conducted to analyze and compare current scenario of Science technology and innovation policy in Malaysia with Cambodia, Myanmar and Laos. Comparison was done on the basis of structure, framework, barriers and breakthrough in the field of STI policy. It was deduced that Malaysia is currently in its transition phase as compared to Cambodia, Myanmar and Laos, where formulation of an official STI policy documents are still in progress. Some recommendations are proposed so the gap between STI development and implementation is reduced.

Keywords: ASEAN, Science technology and innovation policy, framework, global competitive index

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■ 1.0 INTRODUCTION

On 8th August 1967, Association of Southeast Asian Nations (ASEAN) was established by signing the ASEAN declaration in Bangkok, Thailand by founding countries, namely Malaysia, Indonesia, Singapore, Philippines and Thailand. Later on 7th January 1984, Brunei Darussalam joined, with Vietnam on 28th July 1995, Lao PDR and Myanmar on 23rd July 1997 and Cambodia on 30th April 1999. Currently there are ten member states of ASEAN. Basic aim of forming this association was to provide and strengthen foundational support, in order to achieve economic and socio cultural pillars of an integrated community, and political security. Thirty years after the formation of Association of Southeast Asian Nations, in 1997 member countries gathered in Kuala Lumpur to devise a vision for year 2020. That vision provides guideline for southeast Asian nations in becoming an outward looking, stable, prosper and living in peace community, where states will be bonded together in partnership for dynamic development. (ASEAN, 1997) In order to achieve this vision, science technology and innovation plays a significant role in economic growth and prosperity. As one of the goals of vision 2020 is to strengthen the integration, in result to promote progress, prosperity and peace in the region. To achieve these goals ASEAN aims to incorporate science technology and innovation along with development of human resource. (APAST, 2007).

Science and technology is an essential instrument for nation's prosperity and economic growth. It started when advanced countries in 1950s made science and technology their main focus, but it came under national science policy. During 1970s and early 1980s, there was shift in policies due to the deterioration of world economic environment. Science policy was replaced by technology as it was more effective base to support economic performance and national industry. Over the period of time, the concept of innovation process was highlighted, due to which now nations are encountering science technology and innovation in their national policy. Measuring and evaluating the development of science technology and innovation is fundamental for formulation of national strategies. Major obstacle in designing and implementing science technology and innovation policy is absence of relevant indicators. There are no specific or key indicators of measurement. Currently there are five established indicators to measure STI policy in developing countries, highlighted by various authors and scholars, which includes, research and development, patents, human resources, innovation and technology balance of payments. Although science technology and innovation is widely promoted by ASEAN, still little research has been conducted. (Dodgson, 2002)

Understanding the importance and significance of STI policy, Malaysia in 1986 established its first national science technology and innovation policy, to provide an outline for the framework of science and technology development. This policy was then incorporated in the fifth master plan in 1991, where strategies for strengthening technological and scientific capabilities were outlined for national industrial development. It was during the sixth Malaysian master plan when the goals and objectives for continuous science and technology development were highlighted. Emphasis was made to ensure that programs related to public research and development were more market oriented. On the other side, the private sector was expected to use appropriate technology assimilation, diffusion and application, which would complement government's science and technology and R&D activities. During seventh master plan in 1995-2000, main focus was on increasing the productivity for competitiveness and economic growth.

Currently eleventh master plan (2016-2020) focuses on growth of people along with development of human capital and infrastructure developments. Therefore Malaysia is in its transitional phase and is moving towards technology based economy. Thus this paper provides an overview of the development and achievements of STI policy of Malaysia. It will further critically compare the developments and achievements of Laos, Cambodia and Myanmar STI policy, as these countries are ASEAN member countries and are currently in their developing phase. Constructive suggestions regarding science technology and innovation will then be developed for future policy prospects.

■ 2.0 LITERATURE REVIEW

Innovation policy and STI policy are used interchangeably by academic researchers, international organizations and bureaucrats. In OECD (2012) these two terms are used interchangeably as compared to OECD 2014 where STI policy is used consistently. In twentieth century, science technology and innovation has become one of the areas of explicit and active policy making in developed economies. It helps to improve the quality of life, creation of employment and wealth with the help of introducing new products in the market. Therefore there is a need for explicit mechanism, institution and strategies to translate scientific knowledge to development. For this reason according to Olaopa in 2011, formulation and reviews of such policy leads to sustainable development. The concept of new knowledge was further highlighted by Metcalfe (2000) that if nation succeeds in generating new knowledge with the help of STI tends to unlock opportunities, which then create new frontiers for new knowledge. Yet till now it's difficult to predict the consequences of knowledge exploitation in development. Metcalfe however identifies four factors for shaping innovation, which includes opportunities, resources, managerial capabilities and incentives. These factors constitute the driving force behind the STI policy of the country.

Nowadays ASEAN countries are also cooperating in the area of science, technology and innovation with a view to making the ASEAN Community more competitive in technological terms. Currently focus is on the workforce to acquire better technological skills and scientific and technological institutions are to be intensified. At present, the share of corporate spending on research and development among the ASEAN countries varies greatly and is significantly less than in other economies. This can be attributed to the fact that the institutional framework supporting private sector involvement in the promotion of innovation and technology development is generally inadequate (GIZ, 2014-2016).

As the ASEAN economies still need to rely upon the global market for continued economic growth in the future, there is a great need for businesses and researchers within ASEAN to develop the capability for indigenous innovation. Without indigenous innovation, long term per-capita income may even decline relative to other regions as the traditional agro, resources, and manufacturing sectors cease to contribute substantial growth to the economy. Foreign firms and the local Chinese conglomerates within ASEAN show no signs of providing this necessary indigenous innovation that is needed to produce a competitive economy and assist the transformation into a fully developed region (New Mandala, 2012).

The launch of the Association of Southeast Asian Nations (ASEAN) Economic Community (AEC) at the end of 2015 is expected to have an impact on innovation. By facilitating economic integration, it can also forge framework conditions (general macroeconomic conditions, quality of infrastructure, levels of education, product and labour market regulations, tax systems, intellectual property regimes and so on) conducive to innovation performance and a regional knowledge market. The hypothesis is that this might play out in much the same way as economic integration in the Single Market Programme in the European Union (EU). Our argument is that for this to happen, the supranational support structures and innovation incentives at the ASEAN level would need to be strengthened. (Alexander Degelsegger et al, 2018).

■ 3.0 RESEARCH METHODOLOGY

A multi- dimensional research approach was used with the combination of desktop research and literature review. This research tries to identify and compare the current scenario of STI policy in Malaysia with Myanmar, Cambodia, and Laos. Various articles by different authors in the related research areas were analyzed. Review of literature majorly includes the significance of science technology and innovation policy in general and ASEAN perspective. Findings are deduced with the help of official documents related to recent global competitive index and global innovation index. Similar publications are then overviewed for the significance and reliability of the data. Conclusion and recommendations are latter drawn from the analysis accordingly.

■ 4.0 FINDINGS AND ANALYSIS

Findings and analysis are deduced on the basis of each country's science and technology structure, framework, barriers to achieve S&T visions and lastly current status of achievements. The performance of these countries were analysed with the help of global competitiveness index 2017-2018 as shown in table below. However there is no data available for Myanmar.

Table 1: ASEAN Countries Competitiveness 2017

Pillars	Cambodia	Laos	Malaysia
1st: Institutions	3.4	4.0	5.0
2nd: Infrastructure	3.1	3.3	5.5
3rd: Microeconomic environment	4.6	3.8	5.4
4th: Health & primary education	5.3	5.2	6.3
5th: Higher education & training	2.9	3.5	4.9
6th: Goods market efficiency	4.2	4.3	5.1
7th: Labour market efficiency	4.4	4.6	4.7
8th: Financial market development	4.1	3.9	5.0
9th: Technological readiness	3.4	3.0	4.9
10th: Market size	3.4	3.1	5.1
11th: Business sophistication	3.6	3.7	5.1
12th: Innovation	2.9	3.2	4.7

Comparison was also based on Global Innovation Index 2019, where Malaysia ranks highest among the countries at 35th with score 42.68. Malaysia managed to improve in four dimensions namely institution, infrastructure, Business Sophistication and Creative Outputs outs. Cambodia which remains the newest ASEAN economy to be part of the GII ranks at 99 out of 129 countries with score 26.59. Myanmar and Laos still absent from the global innovation landscape.

Table 2: Global Innovation Index Rankings among Countries in 2019.

Rank	Country	Score	Income*	Efficiency Ratio	Median = 0.62
101	Cambodia	26.59	LM	0.63	
n/a	Laos	n/a	n/a	n/a	n/a
n/a	Myanmar	n/a	n/a	n/a	n/a

Note: n/a – Not available, no data for Laos and Myanmar; *HI – High Income, UM – Upper Medium Income, LM – Lower Medium Income

Moreover, universities symbolize the development in a country. As most of the research and development in a country, especially in Science and Technology, comes from universities. Therefore, to analyse the performance of the universities among the country is referred by the QS World University Rankings. The Rankings rank universities based on academic reputation (40%), employer reputation (10%), faculty / Student Ratio (20%), citations per faculty (20%); and International faculty ratio / International student ratio (5% each). The details of the criteria are shown in table 3 below.

Table 3: Universities QS Ranking

Country	Main University	QS Ranking
Malaysia	University of Malaya	114
Myanmar	No research university	None
Cambodia	Royal University of Phnom Penh	None
Laos	National University of Laos	None

The analysis showed that QS World Universities Rankings seem to align with the performance of the countries in the Global Competitiveness Index (GCI) and Global Innovative Index (GII). Malaysia, which is highest in the GCI and GII among the countries, has its top university, University Malaya, ranked 114th in the world. For Laos and Cambodia, both do not have a specific policy in Science and Technology, their universities are outside the 700 Top University Rankings. Meanwhile, Myanmar does not have any research university. Therefore, it can be concluded that universities play an important role in the development of a country.

• **Structure of STI policy**

Structure of policy varies from country to country; whereas Malaysia is concerned the Prime Minister is the chairman of the National Science and Research Council. Prime Minister also gets advice from the Science Advisor on the matter related to Science and Technology. There is also Malaysian Industry-Government Group on High Technology, an independent, industry-driven and non-profit organization that drives the advancement of high technology competency and capacity in Malaysia. It is placed in the Prime Minister’s Department to support the Science Advisor to the Prime Minister. The Ministry of Science, Technology and Innovation (MOSTI) is the main ministry in Science and Technology. There also a number of ministries that support the Science and Technology in Malaysia such as the Ministry of Finance, Ministry of Education and others. Malaysia also has a lot of research universities that support the development of Science and Technology in Malaysia such as the University of Malaya (UM), University of Science, Malaysia (USM) and University of Technology, Malaysia (UTM).

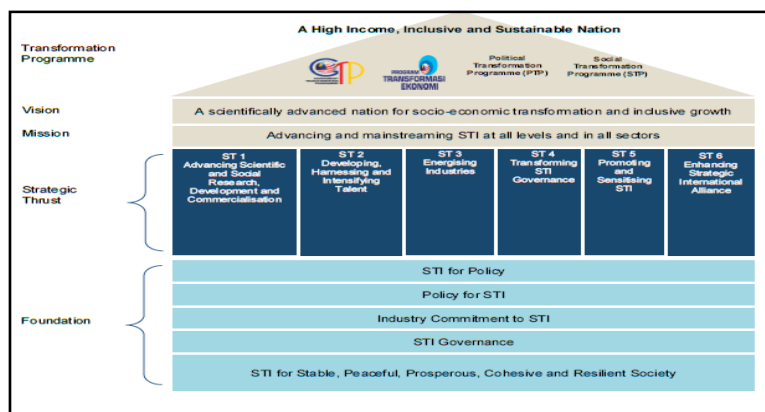
In Myanmar ministry of Science and Technology (MOST) purviews matters related to Science and Technology with the help of three (3) organizations related to Science and Technology. The organizations are Myanmar Scientific and Technological Research Department (MSTRD), Department of Technical and Vocational Education (DTVE) and Department of Advanced Science and Technology (DAST). However, in Cambodia there is no specific ministry that focuses on Science and Technology in Cambodia. Cambodia however does have a council that discuss Science and Technology in Cambodia, called the Cambodia Science and Technology Council. The Council is chaired by the Prime Minister of Cambodia. Its main function is to coordinate and make decision on Science and Technology policies. There is a Technical Committee that consists of experts in Science and Technology. Ministry of Planning also acts as the main secretariat for the Council.

On the other side in Laos, Ministry of Science and Technology, under the supervision of the Prime Minister, purviews matter related to Science and Technology. The ministry is supported by three (3) research institutes, namely the Institute of Ecology and Biological Technology, Institute of Renewable Energy and New Material and Institute of Computer Science and Electronics.

• **Framework of STI policy**

Framework of a policy sets out goals or procedures of the policy. With this respect Malaysia aims to be a high-income nation by 2020. The country believes advancement in Science and Technology as a major catalyst to achieve the vision. That is why it comes out with Framework for the National Policy on Science, Technology.

Figure 1: Framework for the National Policy on Science, Technology and Innovation Source: MOSTI (2013)



Whereas in Myanmar, a draft of law on Science and Technology namely the Science and Technology Development Law 1994. The law contains priority areas of science and technology linked to National Economic. The development plan includes several key areas like, agriculture, forestry, water quality preservation, development of water supply and sewage system, building construction and transportation, information and communication and medicine and drug development and renewable energy. The framework of Cambodia however consists of the Rectangular Strategy and National Strategic Development Plan that embedded the Science and Technology policy in Cambodia. Cambodia also establishes the National Science and Technology legal system to promote law on Science and Technology and the related regulations. Early 2020 the National Policy on Science, Technology and Innovation 2020-2030 was launched by the Ministry of Planning. This National Policy will be able the Government to achieve national development strategies leading to successfully realize the Vision 2050 to become upper-middle income country by 2030 and high-income country by 2050, and in global context it helps to achieve sustainable development goal (SDGs).

There is no specific policy on Science and Technology for Laos. The country does however have a specific law on Science and Technology. The Science and Technology Law gives a guideline on how to run activities related to Science and Technology. The Law also stated that the Government must allocate at least 1% of the overall yearly budget on the research and development of Science and Technology. The Law also states the obligation of the Ministry of Science and Technology; that is to formulate policies regarding Science and Technology matters.

- **Barriers in implementing STI policy**

The major barrier faced by Malaysia is its talent drain. Each year the country sends a number of students to study abroad. Unfortunately, most of the students continued to work in the countries they were sent to. The graduates found out that it is more lucrative to work in the other country than in Malaysia. Malaysia established Talent Corporation (Talent Corp) to try to lure these graduates to return and work in Malaysia. However, the programmes organized have not been successful. The Returning Expert Programme (REP) which was launched in 2011, has managed to attract 4,121 Malaysian expatriate to come back to work in Malaysia.

In Myanmar main challenge is the political instability of the country. The military just ended their rule in 2011. In 2012, there is a civil war between the Christians and the Rohingya Muslims. Armed conflict between ethnic Chinese rebels and the Armed Forces happened in 2015. Another issue faced by Myanmar is the human right issue. There are widespread reports of human rights violations in the country. However, Myanmar also performed badly in the Environment Performance Index (EPI). They ranked 153 out of 180 countries in 2016. EPI is used as a measurement of how well countries perform in implementing Sustainable Development Goals (SDG). The worst performance by Myanmar is in the area of air quality, health impacts of environmental issues and biodiversity and habitat. Cambodia main also facing many challenges such as their older population lacks education because of insufficient infrastructure and limited resources. Most of the roads need to be upgraded. Water supply to rural area is very low. Corruption is another major issue in Cambodia. The level of corruption exceeds most countries in the world. Bribes are demanded when certain companies want to obtain their licences and permits. Cambodia is ranked at 156th place among 176 countries in the Corruption Perceptions Index 2016 by the Transparency International with the score of just 21 out of 100. Due to these reasons, Cambodia also has the worst working environment for its workers. The International Trade Union Confederation ranks Cambodia among the worst place in the world for organized labour in 2015. Workers around the country have been going on protests demanding an increase in salary and improvements of working conditions. Laos also being a poor country lacks natural resources. Most of Laos consists of very thick forest and rugged mountains. Laos also faces environmental problems such as deforestation. Illegal logging is another big problem. Similar to Myanmar, human rights violations are a concern in Laos. The Democracy Index 2016 classified Laos as an authoritarian regime, ranked lowest among the ASEAN countries.

- **Achievements and breakthroughs in STI**

When it comes to achievements and breakthrough, as compared to other ASEAN nations, Malaysia has achieved a lot in Science and Technology. One of the significant achievements was in 2007, when Malaysia sent its first astronaut, Sheikh Muszaphar Shukor to space under the Malaysia Space Programme. Malaysia has also managed to design and build first remote sensing satellite named TiungSAT-1. The satellite was launched to the orbit on 26 September 2000.

However, the biggest achievement for Myanmar is in its agriculture sector. Rice is the major agricultural product in Myanmar. It covers around 60% of the country land area. Whereas all the barriers were concerned, Cambodia is currently implementing their National Policy on Science, Technology and Innovation 20120-2030. As stated the above, the aims of this policy also to elevate the country from poverty. On contrary Science and Technology in Laos focuses mainly on Information and Communication Technology (ICT). Laos is currently concentrating on building modern structures such as the National Internet Centre, Cyber Safe Protection Centre, Lao Satellite and Lao Computer Emergency Centre.

■ 5.0 CONCLUSION AND RECOMMENDATIONS

One significant motive in forming ASEAN was for development and to provide strength to regional countries. It is evidently seen that countries are moving towards science and technology development. Malaysia as being a developing country have encountered several barriers yet was able to achieve a lot in the field of science technology and innovation. As compared to Myanmar, Cambodia and Laos (Lao People's Democratic Republic), who are currently busy dealing with nation-building and infrastructure development, and they have yet to implement any S&T activities on a full scale. Initially it is highly recommended that SMEs in the ASEAN countries need to promote innovation and technology and commercialization of technology. Moreover, ASEAN committee of science and technology has plan to set up working group on framework conditions for private sector involvement in the promotion of innovation and technology. Thus, for this plan to execute well, training courses are to be provided to SMEs specially, to enhance their knowledge, expertise as well as extend their partnership. Apart from this for mutual benefit ASEAN countries should review and reform their Science and Technology policies and enhance existing collaboration so that all country members can benefit from this smart partnership.

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