CDRI
Cambodia Development Resource Institute

ANZ Royal

Cambodia Outlook Brief

Science and Technology for Industrialisation, Economic Growth and Development in Cambodia

"Development of science and technology will enhance productivity, growth, knowledge and technical capacity, which will help Cambodia build a knowledge-based economy."

Samdech Akka Moha Sena Padei Techo Hun Sen
Prime Minister, Kingdom of Cambodia

INTRODUCTION

Science and technology (S&T) are important drivers of innovative capacity and global competitiveness and critical inputs for structural economic transformation. There is a close relationship between economic dynamism and technological innovation performance. This is particularly evident in the stellar economic performance and the technical prowess of China, Hong Kong, Singapore, South Korea and Taiwan, all of which invest heavily in S&T through efforts in promoting higher education and technical training to create a highly qualified, skilled and disciplined workforce at all levels to meet the demand of inclusive and sustainable rapid industrialisation that led them to achieve exceptional long-term growth.

A country's capacity to harness the potential of S&T for industrialisation, growth and development depends on an enabling innovation ecosystem including policy and regulatory framework, physical infrastructure, human capital development, and research and development (R&D) investment. Although improving, Cambodia is lagging behind other ASEAN and Southeast Asian countries in most of the innovation input indicators and is ranked 101st overall (of 127) in the 2017 Global Innovation Index. Its weakest points are human capital and research (118th), infrastructure (113th) and business sophistication (111th) and its strongest is market sophistication (37th).

Cambodia's S&T development and innovation has been limited because until recently S&T were treated as independent and exclusive fields rather than as integral and fundamental elements of sustainable socioeconomic development. As Cambodia's Industrial Development Policy (IDP) 2015–25 acknowledges: "The values of technology/science are yet to be mainstreamed in Cambodia's current social environment".

ROLE OF S&T IN CAMBODIA'S INDUSTRIAL DEVELOPMENT AND ECONOMIC GROWTH

The 2018 Cambodia Outlook Conference highlighted three crucial linkages between development of Cambodia's S&T sector and

This brief summarises the key points of discussion at the 2018 Cambodia Outlook Conference, co-organised by CDRI and ANZ Royal on 15 March 2018. It highlights the needs for Cambodia to promote science and technology development, proposes policy recommendations, and presents key strategies for the sector's development in Cambodia.

A PRODUCT OF THE 2018 Cambodia Outlook Conference:
A Partnership of CDRI and ANZ Royal

realisation of the national vision of upper-middle-income status by 2030 and high-income status by 2050. Building capacities in S&T will enable the country to:

- Boost productivity and growth and diffuse technical knowledge and capacity to leapfrog to a knowledge-based economy
- Increase competitiveness and economic diversification
- Prepare for new challenges and grasp new opportunities to smooth digital transition to smart factories in the context of Industry 4.0.

S&T development is a key tool for transforming the country from an agrarian economy to an industrial knowledge-based economy, as envisioned in IDP 2015–25. S&T infrastructure has to be developed to enhance industry diversification, productivity and competitiveness. Equally important is commitment to develop home-grown S&T talent and build a skilled workforce. With about 65 percent of the population under the age of 30, the country has a large potential workforce. Cambodia cannot afford to miss out on this demographic window of opportunity and needs to move quickly to capitalise on it. This relies on government efforts to create a conductive ecosystem for S&T-led industrial development.

S&T investments also deliver lasting societal benefits, providing innovative solutions to pressing development challenges such as climate change and infectious disease outbreaks. At the individual level, S&T professionals have more career opportunities and command higher salaries than their non-S&T counterparts. Investment in S&T clearly yields competitive advantages for nations and individuals.

In addition, digital technology is transforming and disrupting current business and industry models around the world. Artificial intelligence, the Internet of Things, big data and blockchain technology are being integrated into all economic sectors, especially smart factories, transport, banking and agriculture. Cambodia's economic growth and development journey will be determined by its ability to react to the emergence of digital S&T and adopt and use digital technologies effectively. The rise of digital S&T provides Cambodia with opportunities for economic catch-up and leapfrogging to technologies that are critical for its industrialisation. In turn, the potential availability of efficient technologies creates incentives to invest in technological capabilities and to upgrade and modernise the production base.

Cambodia is moving in the right direction. As announced by the Ministry of Posts and Telecommunications in early 2018, the government aims to transform the country into a predominantly digital economy by 2023. The country is taking steps to develop its S&T sector including ICT infrastructure. The National Science and Technology Council was established in 2014. Its mission is to enable Cambodia's technological capability to catch up with that of other countries in the region and the world. The Ministry of Education, Youth and Sport is promoting STEM (science, technology, engineering, mathematics) education from primary school to postsecondary levels. This is aligned with IDP 2015–25, which emphasises the need to embrace modern S&T and invest in R&D and highlights the linkages between S&T and other priority sectors. Cambodia's new TVET Policy 2017–25 sets out four goals: to improve TVET quality to meet national and international market demand; to increase equitable access to TVET for employment generation; to promote public-private partnerships and aggregate resources from stakeholders to support sustainable development of the TVET system; and to improve governance of the TVET system. All in all, extra effort and policy coordination and visionary, inspiring and determined leadership at all levels are still needed for industrialisation.

SOME S&T DEVELOPMENT BENCHMARKS

University rankings. Out of 400 universities in the QS Asia University Rankings 2018, four Malaysian, two Singaporean and one Thai university are in the top 50.[1] To the best of our knowledge, Cambodian universities have not yet entered that academic race.

1 Quacquarelli Symonds. 2018. Top Universities. www.topuniversities.com/university-rankings/asian-university-rankings/2018.

S&T talent. The biggest challenge for S&T talent development in Cambodia is the widely documented STEM skills gap. Too few Cambodians enrol in science, engineering and technology university courses or TVET programs. Education reforms to address the need for S&T talent and workforce show some tangible and promising progress, however.

Research performance is commonly used to evaluate scientific productivity. Indicators include publication count, R&D spending, number of researchers, and resident patent filings. In terms of scientific and technical publications, in 1996–2017, published documents in Cambodia amounted to around 3,500, in Thailand 157,000, Malaysia 250,000 and Singapore 270,000.[2] The comparator countries also invest strategically in R&D, fuelling innovation and consequently boosting their industrial competitiveness and export performance. Cambodia's spending on R&D is low, standing at 0.12 percent of GDP in 2015 compared to Malaysia (1.30 percent), Singapore (2.18 percent in 2014) and Thailand (0.62 percent). The number of researchers (per million inhabitants) in 2015 was approximately 50 in Cambodia, 2,900 in Malaysia, 7,500 in Singapore (2014) and 1,600 in Thailand.[3] Resident patent filings reflect the quality of R&D and the incidence and quality of innovation in universities and TVET institutes. Cambodia filed 65 patents in 2015, and in 2016 Malaysia submitted 7,200, Singapore 11,000 and Thailand 7,800.[4]

STRATEGIC DIRECTIONS AND POLICY RECOMMENDATIONS

The government attaches great importance to the role of S&T as the main driver of industrial modernisation and economic catchup. Three subthemes emerged from critical discussion about the role of S&T for Cambodia's future development: 1) the indispensability of a foundational platform for S&T; 2) the importance of education in building S&T capacities; and 3) the need for a practical system of S&T in industry and markets. Building on those subthemes and based on the experiences of ASEAN countries that have achieved S&T success, this brief proposes the following strategic directions and policy recommendations.

Learn from successful technology and innovation governance in East and Southeast Asia

Visionary, tech-savvy, inspiring and resolute political leadership with a firm belief in the opportunity to leapfrog Cambodian industry into the digital era is essential. Many ASEAN countries have dedicated ministries for science and technology (Laos, Myanmar, the Philippines, Thailand and Vietnam) or science, technology and innovation (Malaysia). Exceptions are Brunei, where the Ministry of Development is responsible for S&T policy, and Singapore, which has the Agency for Science, Technology and Research (A*STAR), a statutory board of the Ministry of Trade and Industry. Several ASEAN countries also have chief scientific advisors attached to the Prime Minister's Office. Malaysia, for example, set up the Office of Science Advisor to design and formulate its industrial policy and strategy.

In Cambodia, some aspects of S&T are addressed at the Department of Technique, Science and Technology under the Ministry of Industry and Handicraft, and at the General Secretariat of the National Science and Technology Council (NSTC) under the Ministry of Planning. Key actions to establish a coordinated S&T governance structure include:

- Elevating the NSTC profile within the state administration and enhancing its own capacity to promote S&T across inter-ministerial bodies
- Institutionalising NSTC within the Cambodian administration by making it an autonomous budgeting unit
- Enabling the NSTC to develop and enforce a whole-of-government consensus on the creation and strengthening of a national science, technology and innovation system
- Creating a science advisory office at the Prime Minister's Cabinet
- Establishing a mechanism to engage national scientific and research communities to provide inputs and monitor S&T strategy implementation

2 SCImago, (n.d.). SCImage Journal and Country Rank: www.scimagojr.com.
3 UNESCO Institute for Statistics: http://data.uis.unesco.org/.
4 WIPO statistics database: www.wipo.int/ipstats/en/statistics/country_profile/. Last updated Dec 2017.

Build an innovation ecosystem to speed up industrialisation

A strong national innovation system is crucial for Cambodia's future industrialisation. This calls for S&T efforts to be directed by the government and for clear consensus on the value of S&T among government agencies, academics, researchers, industries and the public. Mechanisms must be put in place to ensure comprehensive, coherent and coordinated policies and interagency cooperation. Key recommendations include:

- Building a strong national science, technology and innovation system to boost industrial upgrading and sustain economic development
- Building S&T institutions and infrastructure within a coordinated framework for S&T in development
- Diversifying funding sources for R&D (foreign and domestic investments and public-private partnerships) with proper allocation of resources
- Creating incentives to encourage employers, industry and the workforce to value S&T talent while promoting the digital transformation of SMEs
- Establishing a mechanism to expedite patent applications at different intellectual property registration offices
- Increasing societal engagement in S&T by raising awareness of the value of S&T in daily life and its importance to economic growth

Build S&T talent and workforce

The explosion of S&T knowledge and digital technologies (artificial intelligence, big data, the Internet of Things, blockchain technology, virtual and augmented reality) is propelling manufacturing and services towards Industry 4.0. This digital revolution is already redefining school curricula from primary to tertiary education. A key to Cambodia's e-readiness and realisation of its vision of high-income status by 2050 will be to ensure the availability of highly skilled home-grown S&T talent. STEM education plays a vital role in achieving this. Policy priorities should focus on:

- Training outstanding STEM teachers to drive STEM education agenda
- Prioritising STEM education in general, vocational training and higher education to build a skilled S&T workforce
- Integrating STEM education with other disciplines such as economics, commerce and finance to optimise career pathways
- Preparing learners and STEM graduates to meet the demands of Industry 4.0
- Promoting joint S&T applied research activities, technical collaborations and partnerships between schools and industry through university-industry linkages
- Enhancing basic S&T knowledge and skills for all Cambodians as informed members of society

KEY SUCCESS FACTORS FOR CAMBODIA'S S&T DEVELOPMENT

- A technology-driven growth strategy led by strong government agencies able to formulate, implement and coordinate S&T strategies and policies
- An ecosystem conducive to creating a strong national innovation system for industrialisation that engages all stakeholders in technology-driven growth
- Adequate financial resources to support S&T institutions
- High-quality talent pool in S&T and skilled S&T workforce to promote and sustain industrialisation through strategic investment in STEM education and national TVET programs.

Cambodia Development Resource Institute (CDRI)

☞ 56 Street 315, Tuol Kork ✉ PO Box 622, Phnom Penh, Cambodia
☎ +85523881384/881701/881916/883603 🖷 +85523880734
email: cdri@cdri.org.kh website: www.cdri.org.kh